

EVALUATION OF THE NATURA 2000 GRASSLAND HABITATS PRODUCTIVITY FROM THE ROMANIAN CARPATHIANS (FIRST APPROACH)

Teodor Marușca^{*,**}

^{*}Grasslands Research And Development Institute, 5 Cucului St., Brașov, 500128, România

^{**}Corresponding author e-mail: maruscat@yahoo.com

Abstract

*The productivity of the permanent grasslands from 33 mountains belonging to the Romanian Carpathians was evaluated based on floristic surveys from works and treatises drafted by geobotanists in the last 60 years. The average pastoral value in the Carpathians is 39.3 and the production of green fodder is 7.71 t/ha. Habitats 6150, 6210, 6440 and 6520 have both a normal composition according to the Natura 2000 classification and degraded 3-5 times, due to the invasion of non-valuable species *Nardus stricta*, *Botriochloa ischaemum*, *Pteridium aquilinum*, *Deschampsia caespitosa*, *Juncus conglomeratus* and others. Habitats 6410 and 6510 have no economically degraded variants. In general, the grasslands of the Western Carpathians have a higher productivity than the Eastern and Southern ones, due to the more favorable climatic conditions (humidity and temperature). By continuing to assess productivity in other mountains in the Carpathians, it will be possible to improve the data needed to draw up general plans for the development of the mountain area and environmental protection.*

Keywords: mountain grasslands, Natura 2000 habitats, pastoral value, green mass production, grazing capacity.

INTRODUCTION

Knowing the green mass production and the forage quality of a grassland is essential for its proper management, biodiversity conservation, protection of pastoral landscapes and other economic, ecological and aesthetic measures.

The presentation of vegetation and productivity in the new European classification of Natura 2000 habitats is a requirement and a necessity to

compare ourselves with other grasslands on our continent. After 4 years of establishing the productivity of the mountain grasslands in the Carpathians, according to the new evaluation method based on floristic survey (Marușca, 2019), we present a first approximation for 6 more widespread habitats: 6150, 6210, 6410, 6440, 6510 and 6520, with normal or degraded vegetation, published in the literature to date.

MATERIAL AND METHOD

This summary presents the productivity of grasslands at the level of published phytosociological

associations or alliances (Marușca, Nicolin 2020; Marușca *at al.* 2020 a, b, c; Marușca 2021 a, b, c;

Marușca, Pășcuț 2021; Marușca, Taulescu 2021; Marușca *at al.* 2021 a, b, c, d; Marușca, 2022; Marușca, Vințan 2022; Marușca *at al.* 2022).

All these published works and new ones evaluated directly this year after great synthesis works on the vegetation of the mountain grasslands (Borza 1959; Beldie 1967; Raclaru 1967; Resmeriță 1970; Boșcaiu 1971; Ularu 1972; Coldea 1972, 1990; Pavel 1973; Danciu 1974; Ștefan 1980; Marușca 1982; Ciucă 1984; Drăgulescu 1995; Arsene 1998; Ionescu 2001; Groza 2008; Oprea, Sîrbu 2009; Pășcuț 2012; Vințan 2014; Nicolin 2015) were reordered after Gafta and Mountford (2008) for Natura 2000, taking into account the principles of habitat classification according to Doniță *at al.* (2005) for our country.

The working method has been described in detail in previous works, presented in the bibliography, so it is no longer

presented in this synthesis.

A first ordering of associations and grasslands alliances was made on the 6 most important habitats in the Natura 2000 network, namely 6150, 6210, 6410, 6440, 6510 and 6520.

Only 2 habitats 6410 *Molinia coerulea* grasslands and 6510 low altitude grasslands with *Arrhenatherum elatius* are compliant with Natura 2000, being considered normal.

For habitats 6150, 6210, 6440 and 6520, the floristically and economically degraded variant was introduced in addition to the normal Natura 2000 ones.

Finally, a synthesis of all habitats in the Carpathians and their physical-geographical subdivision for Romania into Eastern, Southern and Western was performed.

Grassland productivity in 33 mountains was assessed as follows:

CARPAȚII ORIENTALI

Munți: *Rodna, Rarău, Stânișoarei, Baraolt, Perșani, Ciucaș*

Zone - Bazin Râmnicu Sărat: *Vrancei*

- Județul Brașov: *Perșani, Ciucaș, Piatra Craiului, Bârsei*

CARPAȚII MERIDIONALI

Munți: *Bucegi, Țarcu, Godeanu, Cerna*

Zone - Județul Brașov: *Bucegi, Făgăraș*

- Bazin Valea Sadului: *Cibin, Lotru*

- Valea Sebeșului: *Cibin, Sebeș, Șureanu*

- Subcarpații Olteniei: *Parâng, Vâlcan*

- Nordul Olteniei: *Căpățâni, Lotrului, Parâng, Vâlcan, Godeanu*

- Bazin râul Timiș: *Țarcu, Godeanu*

CARPAȚII OCCIDENTALI

Munții: *Poiana Ruscă, Codru Moma, Vlădeasa, Pădurea Craiului, Plopiș*

Zone - Bazin râul Timiș: *Semenic, Poiana Ruscă*
 - Parcul Natural Apuseni: *Bihor, Gilău, Vlădeasa*

As new data on the productivity of mountain grasslands are accumulated and the areas occupied by each grassland habitat are mapped, it will be possible to

develop a new, more accurate approximation, which will be the basis for future general management plans for the country's pastoral heritage.

RESULTS AND DISCUSSION

The detailed analysis of the geobotanical surveys carried out by many authors in over 60 years in the Carpathians, the evaluation of the pastoral value, the production of green fodder and the ability to graze with animals allowed as main result

the present synthesis at Natura 2000 habitat level.

- **Habitat 6150 Siliceous alpine and boreal grasslands**, is spread over the highest peaks of the Carpathians between 1450 and 2450 m altitude (table 1).

Table 1

Distribution, productivity and grazing capacity of Habitat 6150, Siliceous alpine and boreal grasslands

Mountains (Location)	Altitude gap (m)	PV (ind)	GMP (t/ha)	Grazing season duration (days)	Animal loading (LU/ha)
Habitat 6150 normal					
<i>Caricion curvulae</i> (Br.Bl., 26) Krajna 33					
Rodna	1.600 - 2.200	34,8	1,72	70	0,38
Ciucaș	1.800 - 1.950	35,8	2,78	70	0,61
Bucegi	2.300 - 2.450	38,6	1,90	35	0,84
Bazin Valea Sadului	1.760 - 2.210	30,1	4,40	65	1,04
Nord Oltenia	1.990 - 2.300	39,7	3.17	50	0,98
Țarcu, Godeanu, Cernei	1.550 - 2.235	42,3	1,94	70	0,84
Bazin Superior Timiș	2.100 - 2.190	x	2,73	50	0,79
Average Habitat 6150 normal	1.550 - 2.450	36,9	2,66	70	0,58
Habitat 6150 degraded by <i>Nardus stricta</i> and <i>Deschampsia caespitosa</i>					
<i>Potentillo - Nardion</i> Simon 57, <i>Eu - Nardion</i> , Br.-Bl. 1936					
Rodna	1.450 - 2.020	29,3	1,95	85	0,35
Județul Brașov	1.780 - 2.210	21,0	1,14	60	0,29
Bucegi	1.700 - 2.050	16,1	1,34	70	0,29
Valea Sebeșului	1.600 - 1.950	17,9	1,60	80	0,31
Nord Oltenia	1.900 - 2.200	13,5	1,3	60	0,33
Vlădeasa	1.500 - 1.830	15,3	1,99	90	0,36
<i>Deschampsion caespitosae</i> , Borza 1959					
Bucegi	1.600 - 1.850	19,0	2,61	85	0,47
Average Habitat 6150 degraded	1.450 - 2.210	18,9	1,70	75	0,35

Under normal vegetation conditions, the average pastoral value (PV) is 36.9 (mediocre), a green mass production (GMP) of 2.66 t/ha (poor) that supports a load of 0.58 LU / ha (weak) in 70 days grazing season.

The degraded variant by the invasion of *Nardus stricta* and *Deschampsia caespitosa* species reaches only 51% of PV and 64% of GMP with the corresponding decrease of grazing capacity.

- **Habitat 6210 Seminatural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometea*)**, located at lower altitudes between 200 -1200 m, has both a normal and a degraded variant due to the invasion and dominance of the species *Botriochloa ischaemum* and *Pteridium aquilinum*, that are favored by overgrazing or abandonment (table 2).

Table 2

Habitat spreading, productivity and grazing capacity 6210,
Semi-natural xerophilous grasslands

Mountains (Location)	Altitude gap (m)	PV (ind)	GMP (t/ha)	Grazing season duration (days)	Animal loading (LU/ha)
Habitat 6210 normal					
<i>Festuciom rupicolae</i> Soó 64 Al Timio - <i>Festucion rupicolae</i> <i>Festucion valesiacae</i>					
Rarău	600 - 1.200	37,7	4,52	150	0,47
Perșani	600 - 770	42,2	6,65	160	0,65
Bazin Orăștie	235 - 510	38,4	6,10	185	0,51
Subcarpații Oltenia	200 - 600	39,2	9,58	175	0,86
Nord Oltenia	500 - 600	30,7	8,95	170	0,87
Bazin Timiș	220 - 470	x	7,43	185	0,65
Poiana Ruscă	200 - 800	61,1	11,49	175	1,01
Codru - Moma	390 - 800	42,4	5,63	170	0,51
Vlădeasa	700 - 800	52,0	10,58	155	1,05
Pădurea Craiului	300 - 700	33,7	7,11	175	0,63
<i>Al. Danthonio - Brachypodion</i> , Boșcaiu 1970					
Subcarpații Oltenia	260 - 530	58,4	9,98	185	0,83
Bazin Timiș	270 - 370	x	10,82	185	0,90
Average Habitat 6210 normal	200 - 1.200	43.6	8.24	170	0.70
Habitat 6210 degraded by <i>Botriochloa ischaemum</i> and <i>Pteridium aquilinum</i>					
<i>Cirsio - Brachypodion</i> , Hadač et Kika 1944; <i>Bromion</i> Br. Bl., 1925, 1961; <i>Seslerio- Festucion pallentis</i> Klika 1931					
Baraolt Sud	510 - 670	12,6	1,13	165	0,11
Perșani	470 - 650	10,8	1,16	170	0,11
Bazin Valea Sadului	390 - 410	15,1	1,52	180	0,13
Bazin Orăștie	370 - 460	7,4	0,83	180	0,07
Subcarpații Oltenia	260 - 530	14,1	1,31	185	0,11
Bazin Timiș	210 - 350	x	1,92	190	0,16
Poiana Ruscă	200 - 800	13,6	1,76	175	0,15
Pădurea Craiului	550 - 650	2,8	0,24	170	0,02
<i>Trifolion medii</i> , T. Müller 1961					
Stânișoara	650 - 750	6,1	2,77	160	0,26
Bazin Orăștie	410 - 980	5,2	0,58	160	0,06

Mountains (Location)	Altitude gap (m)	PV (ind)	GMP (t/ha)	Grazing season duration (days)	Animal loading (LU/ha)
Bazin Timiș	200 - 950	x	1,04	170	0,10
Poiana Ruscă	200 - 800	6,7	0,74	175	0,07
Codru - Moma	450 - 800	7,2	0,74	170	0,07
Average Habitat 6210 degradat	200 - 980	9,2	1,21	175	0,11

The normal variant of habitat 6210 has 43.6 PV (average), 8.24 t/ha GMP (medium) and 0.70 LU / ha (mediocre) in 170 days of grazing. The degraded variant barely reaches 21% PV and 15% GMP with the same level of LU / ha (low) compared to the normal variant.

- **Habitat 6410** *Molinia grasslands on calcareous, peaty or clayey-silt-laden soils* (*Molinion caeruleae*) are mainly used by mowing in hayfields and are spread over smaller areas between 200 - 1460 m altitudes (table 3).

Table 3

Distribution, productivity of Habitat 6410,
Molinia grasslands on carbonate, peaty and loamy-sandy soils

Mountains (Location)	Altitude gap (m)	PV (ind)	GMP (t/ha)
<i>Molinion caeruleae</i> , W. Koch. 1926			
Perșani	540 - 650	3,5	0,40
Bazin Valea Sadului	420 - 430	15,7	2,36
Bazin Orăștie	310 - 1.200	6,0	0,38
Bazin Timiș	200 - 380	x	1,12
Poiana Ruscă	900	30,8	4,07
<i>Calthion palustris</i> , Tx. 1937			
Bazin Timiș	200 - 1.460	x	4,81
Vlădeasa	780 - 1.110	11,3	1,38
Average Habitat 6410	200 - 1.460	13,5	2,07

From an economic point of view, they have a low value, having 13.5 PV (very weak) and 2.07 t/ha GMP (weak) due mainly to the excess moisture of the soil where they meet.

- **Habitat 6440** *Alluvial grasslands of river valleys of the Cnidion dubii*, found in the grasslands of the Carpathian rivers between 200 - 1240 m altitude, also has a normal variant according to Natura 2000 and a degraded variant

due to the invasion of the species *Deschampsia caespitosa* and *Juncus conglomeratus* (table 4).

The normal variant of habitat 6440 harvested mainly as hay has an index of 68.6 PV (good) and an average productivity of 15.27 t/ha GMP (good). By degrading the grass carpet, it reaches 21% of PV and 14% of GMP, compared to the normal variant.

- **Habitat 6510** *Lowland hay grasslands* (*Alopecurus pratensis*,

Sanguisorba officinalis), located between 200 -1150 m attitude, are the best managed and productive

grasslands in the Carpathian area, being used as hayfields for winter feeding of animals (table 5).

Table 4

Habitat spread and productivity 6440,
Alluvial grasslands of the rivers with *Cnidion dubii*

Mountains (Location)	Altitude gap (m)	PV (ind)	GMP (t/ha)
Habitat 6440 normal			
<i>Agrostion stoloniferae</i> , Soó 1933; <i>Alopecurion pratensis</i> , Soó 1938, Pass 1946; <i>Holco - Juncion</i> , Pass 1964			
Bazin Râmnicu Sărat	200 - 760	67,5	13,47
Baraolt Sud	460 - 660	79,6	19,08
Perșani	450 - 680	82,4	19,57
Bazin Valea Sadului	390 - 1.240	54,8	14,50
Bazin Orăștie	225 - 355	66,0	13,61
Subcarpații Olteniei	200 - 450	63,5	11,58
Nord Oltenia	300 - 700	72,8	14,05
Bazin Timiș	240 - 620	x	14,01
Vlădeasa	600 - 1.110	64,8	13,95
Pădurea Craiului	300 - 800	65,9	18,9
Average Habitat 6440 normal	200 - 1.240	68,6	15,27
Habitat 6440 degraded by <i>Deschampsia caespitosa</i> and <i>Juncus conglomeratus</i>			
Baraolt Sud	470 - 500	13,2	2,00
Perșani	460 - 620	19,2	2,98
Bazin Valea Sadului	410 - 1.240	12,0	1,64
Nord Oltenia	300 - 700	5,6	0,58
Pădurea Craiului	420 - 800	23,3	3,74
Average Habitat 6440 degraded	420 - 1.240	14,7	2,19

Table 5

Habitat spread and productivity 6510: Low altitude hayfields

Mountains (Location)	Altitude gap (m)	PV (ind)	GMP (t/ha)
<i>Arrhenatherion elatioris</i> (Br.- Bl. 1925) Pawl. 1928			
Rarău	600 - 1.000	67,7	13,58
Stânișoarei	780 - 1.150	79,0	21,42
Baraolt Sud	470 - 620	79,8	20,37
Perșani	460 - 740	79,6	20,74
Ciucaș	800 - 1.000	84,0	19,88
Bazin Orăștie	255 - 355	82,8	23,29
Subcarpații Olteniei	200 - 350	69,9	12,23
Bazin Timiș	200 - 750	x	17,87
Pădurea Craiului	700	81,4	22,91
Plopiș	300 - 740	76,0	16,57
Average Habitat 6510	200 - 1.150	77,8	18,89

Under these conditions of proper maintenance of the grassy carpet in which the most valuable spontaneous species of perennial grasses and legumes predominate (*Arrhenatherum elatius*, *Triseum flavescens*, *Festuca pratensis*, *Alopecurus pratensis*, *Phleum pratense*, *Trifolium pratense*, *Lotus*

corniculatus, etc.) a 77.8 PV (good - very good) and 18.89 t/ha GMP (good) was evaluated.

- **Habitat 6520 Mountain hay grasslands**, located between 200 -1900 m altitude, is the most widespread in the Romanian Carpathians (table 6).

Table 6

Habitat 6520 distribution, productivity and grazing capacity,
Mountain grasslands (Syn. Mountain hayfields)

Mountains (Location)	Altitude gap (m)	PV (ind)	GMP (t/ha)	Grazing season duration (days)	Animal loading (LU/ha)
Habitat 6520 normal					
<i>Cynosurion cristati</i> Br.- Bl. et Tx. 1943					
Rodnei	630 - 1.240	63,5	11,21	140	1,23
Rarău	600 - 1.600	51,5	7,09	130	0,84
Stânișoarei	500 - 1.250	56,3	10,28	140	1,11
Baraolt Sud	600 - 840	56,5	10,43	165	0,97
Bazin Râmnicu Sărat	410 - 635	60,5	11,69	175	1,00
Perșani	580 - 800	65,3	12,26	160	1,20
Ciucaș	800 - 1.200	63,2	9,98	140	1,28
Bucegi	1.650 - 1.850	64,1	9,85	80	1,89
Bazin Valea Sadului	400 - 1.850	49,9	7,60	130	0,90
Bazin Orăștie	245 - 840	69,9	13,46	170	1,22
Subcarpații Olteniei	200 - 680	61,1	10,72	180	0,92
Nord Oltenia	350 - 1.200	61,4	10,55	155	1,17
Bazin superior Timiș	500 - 1.400	x	11,69	140	1,24
Poiana Ruscă	200 - 1.100	58,7	11,62	165	1,08
Codru - Moma	300 - 880	70,7	13,17	170	1,19
Parc Natural Apuseni	1.115 - 1.425	43,7	6,95	115	0,93
Vlădeasa	750 - 1.000	85,5	18,30	145	1,94
Pădurea Craiului	300 - 720	69,0	12,31	175	1,25
Plopiș	340 - 760	73,6	14,77	170	1,28
<i>Agrostideto - Festucion rubrae</i> Pușcaru et al. 1956					
Bazin Râmnicu Sărat	745 - 1.340	62,4	11,40	140	1,30
Vlădeasa	700 - 1.650	61,7	10,75	125	1,32
Average Habitat 6520 normal	200 - 1.850	62,4	11,24	150	1,15
Habitat 6520 degraded by <i>Nardus stricta</i> and <i>Deschampsia caespitosa</i>					
<i>Potentillo - Nardion</i> Simon 1957; <i>Violo declinatae - Nardion</i> ; <i>Nardion strictae montanum</i> Domin 1933; <i>Deschampsion caespitosae</i> Borza 1959					
Rarău	1.300 - 1.600	20,1	2,02	105	0,30

Mountains (Location)	Altitude gap (m)	PV (ind)	GMP (t/ha)	Grazing season duration (days)	Animal loading (LU/ha)
Bazin Râmnicu Sărat	1.020 - 1.315	15,8	2,17	125	0,27
Perșani	510 - 1.020	21,7	3,00	155	0,28
Ciucaș	800 - 1.900	20,9	2,86	110	0,37
Județul Brașov	480 - 1.750	22,7	2,82	130	0,33
Bazin Orăștie	1.280 - 1.620	21,6	2,93	105	0,43
Bazin Timiș	820 - 1800	x	1,29	115	0,17
Poiana Ruscă	100 - 1300	5,0	0,61	125	0,08
Codru Moma	600 - 800	18,7	2,66	160	0,26
Parc Natural Apuseni	1.060 - 1.670	22,1	3,06	110	0,43
Vlădeasa	950 - 1.450	16,3	2,14	120	0,27
Pădurea Craiului	500 - 730	13,9	1,12	165	0,10
Plopiș	625 - 750	13,2	1,60	160	0,15
Average Habitat 6520 degraded	480 - 1.900	17,6	2,16	130	0,26

In its normal version in accordance with the European Natura 2000 network, an average of 62.4 PV (good) was evaluated, with limits between 43.7 PV (average) up to 85.5 PV (very good) and GMP productions on average 11.24 t/ha (medium) with a grazing capacity of 1.15 LU / ha in 150 days of vegetation season.

In the degraded version by *Nardus stricta* and *Deschampsia caespitosa* of Habitat 6520, the productivity decreases a lot, being only at 28% of PV with 19% of GMP, which ensures only 23% of LU / ha in 130 days of grazing compared to the normal variant. These findings regarding the decrease of productivity of Habitat 6420 degraded 4-5 times compared to the habitat with normal floristic composition, raises very urgently the problem of their improvement by all possible means.

In general, in Habitats 6150,

6210 and 6520 used mainly by grazing with animals, there are 47.6 PV (average) and 7.38 t/ha GMP (medium) at the normal variants and much lower than only 15.2 (32%) PV (weak) and 1.62 t/ha (23%) GMP (very weak) for degraded variants.

Habitats 6410, 6440 and 6510 harvested as hayfields, have on average 73.2 PV (good) and 17.8 t/ha GMP (good) at normal variants compared to 14.1 (19%) PV (very poor) and 2.13 t/ha (12%) GMP (weak) for degraded variants.

It can be seen that degraded variants of grasslands have a stronger decrease in productivity (81-88%) by comparison to degraded variants of pastures (68-77%) compared to habitats with normal vegetation, in accordance with the Natura 2000 classification.

Regarding the average productivity of the grassland habitats on the 3 large groups of the

Romanian Carpathians from the east, south and west, Eastern, Southern and Western (***) 1987)

there are sometimes quite large differences (table 7).

Table 7

Average productivity and grazing capacity of Natura 2000 grasslands habitats from the Carpathians

Grasslands habitats	Carpathians	Altitude gap (m)	Pastoral value		Green mass production		Grazing capacity	
			ind.	%	t/ha	%	Days	LU/ha
6.150	Romanians	1.450 - 2.450	25,0	100	2,22	100	65	0,52
	Eastern	1.450 - 2.200	33,3	133	2,15	96	75	0,44
	Southern	1.550 - 2.450	26,5	106	2,16	97	60	0,55
	Western	1.500 - 1.830	15,3	61	2,36	107	85	0,43
6.210	Romanians	200 - 1.200	25,1	100	4,35	100	160	0,42
	Eastern	510 - 1.200	21,9	87	3,25	75	150	0,33
	Southern	200 - 980	26,1	104	5,01	115	165	0,47
	Western	200 - 800	27,4	109	4,79	110	175	0,42
6.410	Romanians	200 - 1.460	11,8	100	1,77	100	Hayfields	
	Eastern	540 - 650	3,5	30	0,40	23		
	Southern	200 - 1.460	10,9	92	2,17	123		
	Western	780 - 1.110	21,1	178	2,73	154		
6.440	Romanians	200 - 1.240	49,8	100	11,21	100	Hayfields	
	Eastern	200 - 760	52,4	105	11,42	102		
	Southern	200 - 1.240	45,8	98	10,00	89		
	Western	300 - 800	51,3	103	12,20	109		
6.510	Romanians	200 - 1.150	7,77	100	18,91	100	Hayfields	
	Eastern	460 - 1.150	78,0	100	19,20	102		
	Southern	200 - 750	76,4	98	17,80	94		
	Western	300 - 740	78,7	102	19,74	104		
6.520	Romanians	200 - 1.900	46,4	100	7,79	100	135	0,89
	Eastern	410 - 1.900	46,5	100	7,87	101	125	0,97
	Southern	200 - 1.850	50,1	108	7,88	101	135	0,97
	Western	200 - 1.450	42,5	92	7,62	98	150	0,78
Average for grasslands habitats	Romanians	200 - 2.450	39,3	100	7,71	100	x	x
	Eastern	410 - 2.200	39,3	100	7,38	96	x	x
	Southern	200 - 2.450	39,3	100	7,50	97	x	x
	Western	200 - 1.830	39,4	100	8,24	107	x	x

- Habitat 6150 has the highest PV in the Eastern Carpathians (133%) and highest GMP in the Western Carpathians (107%) compared to the average of the Romanian Carpathians, considered 100%;

- Habitat 6210 has higher PV in the Western Carpathians (109%) and highest GMP production (115%) in the Southern Carpathians;
- Habitat 6410 has the highest PV (178%) and GMP (154%) in the Western Carpathians

compared to the average of the Romanian Carpathians;

- Habitat 6440 has a higher PV (105%) in the Eastern and a higher GMP (109%) in the Western Carpathians;

- Habitat 6510 has highest PV (102%) and GMP (104%) compared to the average of the Romanian Carpathians, in the Western Carpathians;

- Habitat 6520 has the highest PV (108%) in the Southern Carpathians and almost equal GMP production (98-101%) in all three Carpathian groups.

On average in the Carpathians, the six grasslands habitats, to our surprise, have the same value of 39.3 - 39.4 PV at the limit of appreciation between

mediocre and average and an average of 7.71 t/ha GMP in the Romanian Carpathians, with a slight superiority (107%) for Western Carpathians, where humidity and temperature conditions are better.

As new data on productivity assessments accumulate in other Carpathian Mountains, the data presented so far will undergo some adjustments, which we believe will not be too large.

These studies will serve the future plans for the socio-economic development of the mountain area, the ecological reconstruction of degraded grasslands and their rational use in harmony with the conservation of biodiversity and the protection of Carpathian pastoral landscapes.

CONCLUSIONS

Determining the productivity of grasslands habitats in the Romanian Carpathians is very topical for drawing up plans for the development and protection of the mountain area, subsidies, comparison with other mountain ranges in the European Union and other purposes.

The general productivity of the Carpathians in a first approximation on the altitude gap of 200 - 2450 m with the six most widespread grasslands habitats: 6150, 6210, 6410, 6440, 6510 and 6520 has a 39.3 pastoral value index and a 7.71 t/ha green mass production.

The productivity of the

Western Carpathians is higher than that of the Eastern and Southern Carpathians, due in particular to more favorable climatic conditions, in particular, more abundant rainfall and more balanced temperatures.

Habitats 6150 and 6520 are degraded by *Nardus stricta* and *Deschampsia caespitosa*, Habitat 6210 is invaded by *Botriochloa ischaemum* and *Pteridium aquilinum* and Habitat 6440 by *Juncus conglomeratus*, which is why their productivity is 3-5 times lower than the same grassland habitats normally included in the Natura 2000 network;

The evaluation of the productivity of grasslands based on

floristic survey is necessary to be continued on other mountain grasslands in the Carpathians for

their proper management, biodiversity conservation and protection of pastoral landscapes.

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