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Original paper

Sustainable resource management, the source of production integration, biodiversity conservation and socio-cultural values in grasway ecosystems

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Abstract

The grassland ecosystem is considered one of the Earth's main ecosystems with a major impact in providing the food needed by wildlife species and domesticated herbivores. The current context of Romania, characterized by major changes, including pasture ecosystems, requires addressing the issue of qualitative and quantitative improvement of production and floristic composition in terms of modeling and improving endogenous factors with a positive impact on animal quality, conservation and biodiversity. The research methodology used is the case study due to its adaptability to territorial specificity and is based on the secondary analysis of statistical data and relevant literature, PESTEL and SWOT analysis. The study begins with the diagnosis of grassland ecosystems in Șura Mare commune, Sibiu county and reveals a vulnerable state that requires the adoption of specific methods and techniques of recovery. The study briefly presents a possible model for analyzing and promoting the sustainability of the grassland ecosystem.

Keywords

Biodiversity conservation, grassland ecosystem, endogenous factors, integration of agricultural production, sustainable development.

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Introduction

The study of grassland ecosystems in terms of integrating agricultural production, biodiversity conservation and socio-cultural values in order to support sustainability (FISCHER & al [1]) is a topic of global interest. Arguments in this regard are the wide range, grassland ecosystems occupy about 24% of the Earth's dry surface (GLENN & al [2]; SIMS & RISSER, [3]) and the fact that it is one of the main ecosystems of the Earth (FAO, [4]). The spatial representativeness of grassland ecosystems emphasizes their multiple importance, it is the economic importance given by the productive potential with an essential role in animal husbandry (BEAUFOY [5]; HARTEL, & al [6]; ROELLIG & al [7]) and the importance ecological highlighted by its mediogenic and regulatory function (CRISTEA & al [8]), respectively by its eco-protective function given by the storage capacity of atmospheric CO₂ and by limiting or stopping the phenomenon of soil erosion (SIMA [9]; Ó MARA [10]). At the same time, grassland ecosystems as a distinctive element of the traditional rural landscape (WIEZIK & al. [11]) also exert a socio-cultural importance due to their role in conserving cultural landscapes (GARRIDO [12]; HARTEL & PLIENINGER [13]; HARTEL & al [14]; PLIENINGER & al. [15]). Although the productive, conservative and eco-protective value of grassland ecosystems is unanimously recognized, they are dominated on a fairly large scale by a trend of degradation due to climate change and inappropriate land use, especially as a result of the abandonment of traditional maintenance techniques and capitalization or intensification of agricultural activities (STOATE & al. [16]; WICK & al [17]). It is current that many countries in the European Union register losses in the level of practical heritage due to the promotion of an intensive management of capitalization of renewable biological productions in grassland ecosystems (PE'ER & al [18]). The study of the literature, with reference to the grassland ecosystems in Romania underlines the previously stated, thus highlighting that: the existence of a certain stage of grassland degradation is due to very different ecological conditions enhanced by socio-economic changes in our country (MARUȘCA & al [19]); grassland ecosystems present a degraded grassy carpet at the level of floristic composition with negative consequences on the quantity and quality of production (DRAGOMIR [20]); grassland habitats in a large share (34%) have a low conservation value which emphasizes the advanced degradation and a very low level of animal loading (DONIȚĂ & al [21]). From the presented results the need to reduce and / or stop the degradation process with a positive impact on the conservation and / or improvement of biodiversity by promoting a sustainable management of pastoral heritage, a prerequisite for sustainable use of renewable organic production in grassland ecosystems. This study promotes the need for sustainable management of endogenous resources and the development of relevant strategic options for sustainable use of renewable organic production with a positive impact on turf quality, animal welfare, environmental protection and absorption of European funds. In other words, the idea of adopting at the level of agricultural enterprise

a sustainable management of endogenous resources to maintain unaltered the functional structure of grassland ecosystems, in which the way of capitalization of grasslands is established through pastoral arrangements under the law (GD 1064 [22]). The regulation in time and space of the rational capitalization of grassland productions, taking into account the seasonal conditions, agri-environmental measures, improvement and maintenance of biodiversity, respectively environmental protection means ensuring the sustainability of grassland ecosystems (IAGĂRU R. & IAGĂRU P. [23]). In essence, the study presents a possible model of endogenous resource management, necessary to be adopted at the level of agricultural enterprise oriented to the diagnostic analysis of the grass carpet, methods of its restoration / improvement and options for sustainable recovery of renewable biological productions obtained.

Materials and Methods

In choosing the research methodology, it was taken into account that the grassland ecosystems in Romania are semi-natural, so it requires human intervention (PĂCURAR & ROTAR [24]) in order to maintain a pastoral value with an appropriate load in high cattle units per hectare of grassland, respectively the conservation and improvement of biodiversity, knowing that the meadows in Romania present a diversity of the floristic structure with high biodiversity indices (MARUȘCA & al [19]). The issues subject to research are characterized by complexity and timeliness, elements that determined the choice of the case study as a research method. The case study is a holistic analysis, useful and relevant for complex problems, completely illustrates a given situation and allows obtaining a clear picture of the phenomena correlated with the understanding of the causes that determined them (IAGĂRU [25]). The study was conducted in 2016 on grassland ecosystems owned by the Șura Mare Local Council. Șura Mare commune is located in the Central Development Region of Romania, in the central part of Sibiu county, respectively at the northern edge of the Depression located at 45°51' north latitude and 24°10' east longitude (Environmental Report, [26]). The meadow ecosystems from Șura Mare commune are located in the Transylvanian Plateau, more precisely between the Hârtibaciului Plateau and the Sibiu plain on a hilly relief with elevations that reach heights of up to 440 m above sea level. The climate is of a moderate continental type with an average annual temperature of 8°C and frequent temperature reversals with rainfall amounting to 600-800 mm annually (Environmental Report [26]). The use of the case study as a research methodology is justified by its adaptability to territorial specificity. The methodology includes secondary analysis of statistical data and relevant literature, diagnosis of meadow ecosystems, PESTEL analysis by grouping the dimensions of the living environment, in a set of six analysis criteria (political, economic, social, technological, environmental and legal), and SWOT analysis by simultaneously studying both internal characteristics (strengths and weaknesses) and external environmental influences (opportunities and threats). The diagnosis of grassland ecosystems concerns the composition of the

grassy carpet, its structure at the level of the main categories of plants, the number of species and biodiversity. The diagnosis of the grass carpet was made using the double meter method (DAGET & POISSONET [27]) on the grounds that the data collected also allow the calculation of biodiversity indices (Shannon-Weaver) and dominance (Simpson). Specifically, the analysis was performed on the grassland ecosystems in the commune of Şura Mare, which belong territorially to the village of Hamba, represented by 3 bodies with an area of 271.1 ha. The PESTEL model is a process of deep analysis of the components that directly and indirectly influence the condition of the grass carpet and its sustainable use, is an important step in developing strategic options because it sets the framework in which to operate and make decisions (GARRETTE & al [28]). The SWOT model is used because it combines the conclusions of previous analyzes presented in the form of strengths, weaknesses, opportunities and threats in order to identify problems and develop solutions to solve them. The SWOT model represents the premise of preparing strategies for sustainable capitalization of grassland ecosystems by involving stakeholders in the process of identifying problems, defining objectives and choosing the most relevant strategic options (IAGĂRU & al [29]). The Excel program was used to process the data collected regarding the composition, structure, number and biodiversity of the grass carpet.

Results and Discussion

The secondary analysis of the relevant statistical data and literature attests to the fact that many specialists are concerned with promoting solutions to reduce the state

of degradation manifested in grassland ecosystems, but without significant results in ensuring their sustainability (NITA & al [30]). At the same time, it is highlighted that the adoption at the level of economic entities / public institutions, which have grassland ecosystems in their patrimony, of a sustainable management of endogenous resources determines the improvement of the floristic composition with positive impact on productivity and quality of renewable biological productions (VÎNTU & al [31]; [32]) and implicitly on the decrease of their degradation state. The diagnosis of grassland ecosystems consisted of qualitative and quantitative analysis of the grass carpet. Specifically, we proceeded to identify the species present and to estimate their percentage participation in the composition of the grass carpet. For this, a method from the category of punctual ones was used (double meter method) considered a fine method of analysis of the grass carpet (SAMFIRA & al [33]), implemented in three phases: 1. Recognition and delimitation of the resort which consisted in identifying within the grassland ecosystems from the patrimony of Şura Mare commune three bodies with an area of 271.1 ha belonging territorially to the village of Hamba (Table 1); 2. The analysis of the floristic composition was performed within each descriptive plot by delimiting linear distances bordered by two pickets at a distance of 2 m in which observations were made every 5 cm on the grassy carpet. 3. Vegetation analysis consisted in the use of a double meter on the graduated edge of which at intervals at intervals of 4 cm observations were made to identify the species and mark them only once, first of the tall ones and then of the other species.

Table 1. Delimitation of the resort (vegetation units)

locality (village)	Meadow body		Descriptive plot		altitude	exhibition	Type of meadow	Surface (ha)
	no	name	no	category				
Hamba	1	Rînjerauă, Țempe, Valea Plopilor	1.	Ps 1949	548	E	<i>Trifolium campestre</i> S. & <i>Agrostis capillaris</i> L.	6,04
			2.	Ps 1868	520-600	E	<i>Agrostis capillaris</i> L. & <i>Festuca sulcata</i> (<i>rupicola</i>) H.	9,92
			3.	Ps 1905/1	510-600	E	<i>Agrostis tenuis</i> L. & <i>Bromus erectus</i> H.	49,18
			4.	Ps 1940/1	510	E	<i>Agrostis tenuis</i> L. & <i>Bromus erectus</i> H. + <i>Lolium perenne</i> L. <i>Trifolium repens</i> L.	148,68
	2	Masguri	5.	Ps 1807/1	510-600	NS	<i>Festuca sulcata</i> (<i>rupicola</i>) H & <i>Agrostis capillaris</i> L.	38,32
	3	Grosărauă	6.	Ps 1837/1	588-600	NS	<i>Festuca sulcata</i> (<i>rupicola</i>) H & <i>Agrostis capillaris</i> L.	9,64
			7.	Ps 1864	585-595	NS	<i>Festuca sulcata</i> (<i>rupicola</i>) H & <i>Agrostis capillaris</i> L.	9,32
TOTAL	3		7					271,1

The readings provided provide sufficient information to quantify the presence of the species and to calculate the specific volume. It indicates the dispersion and the degree of homogeneity of the individuals of a species per unit area (BORZA & BOȘCAIU [34]). The data obtained are useful for assessing the pastoral value – an important indicator in illustrating the forage potential of grassland ecosystems. For the calculation of pastoral value (VP) a scientific method of knowledge and research of grassland ecosystems was used, the foundations of which were laid by DAGET & POISSONET [35], currently agreed by the Central

European School using the following calculation formula: $VP = \sum_{i=1}^n (Vs_i \times Is_i) / 5$ (1), where: Vs represents the estimation of the specific abundance by the specific volume; Is represents the specific index; i represents the species; n represents the number of species; 5 is the maximum grade given. The data obtained are centralized in table no. 2, and their analysis highlights a medium, good, respectively very good appreciation of the pastoral value in the analyzed descriptive plots, with the mention that the very good appreciation belongs to the descriptive plot (Ps 1940/1) with the largest surface (148.68 ha). The data

obtained at the diagnosis of the grass carpet also allowed the quantification of the biodiversity specific to the analyzed grassland ecosystems. The quantification of biodiversity was achieved by using two biodiversity indices: the Shannon diversity index and the Simpson diversity index. The results obtained are useful for understanding and comparing the structure of these communities (BEGON & al [36]). The quantification of biodiversity with the help of the Shannon diversity index allowed the characterization of the diversity of existing species in the descriptive plots analyzed taking into account both the abundance and the equity of the distribution of the species. The calculation of this index was based on the formula $H' = H' = -\sum_{i=1}^s p_i \ln p_i$ (2), where

H is the Shannon diversity index; s is the number of species in a community; p_i is the proportion of each species in a community (SHANNON [37]). Equity is the measure of the relative abundance of different species and was calculated by dividing H by H max where $H_{max} = \ln S$, so $E = H / \ln S$. The quantification of biodiversity using the Simpson diversity index allows the description of the diversity of grassland ecosystems analyzed taking into account the number of species present and the abundance of each species using the following calculation formula: $D = 1 / \sum_{i=1}^s p_i^2$ (3), where D is the Simpson index of diversity; s is the total number of species in a community; p_i is the proportion of each species in the community (SIMPSON [38]).

Table 2. Appreciation of pastoral value

Descriptive plot Species	IS	VS%							VS*IS						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7
Poaceae		50	60	60	50	50	60	60	108	168	158	220	121	174	175
Agrostis capillaris L.	3	20	20	20	-	20	17	18	60	60	60	-	60	51	54
Arrhenatherum elatius L.	4	1	-	-	-	1	1	-	4	-	-	-	4	4	-
Botriochloa ischaemum L.	0	10	-	-	-	-	-	-	0	-	-	-	-	-	-
Bromus erectus H.	2	-	-	10	3	-	-	-	-	-	20	6	-	-	-
Cynodon dactylon L.	1	2	-	-	-	2	-	-	2	-	-	-	1	1	-
Cynosurus cristatus L.	3	-	10	10	3	-	2	3	-	30	30	9	-	6	9
Festuca sulcata H.	2	10	10	-	-	25	28	26	20	20	-	-	50	56	52
Holcus lanatus L.	2	-	2	2	0.5	-	1	1	-	4	4	1	-	2	2
Lolium hybridum H.	5	-	2	2	1	-	-	-	-	10	10	5	-	-	-
Lolium perenne L.	5	-	-	-	38	-	-	-	-	-	-	190	-	-	-
Phleum alpinum L.	2	-	15	15	3	1	-	-	-	30	30	6	2	-	-
Phleum pratense L.	5	-	-	-	-	-	10	10	-	-	-	-	-	50	50
Poa annua L.	2	1	-	-	-	-	-	-	2	-	-	-	-	-	-
Poa pratensis L.	4	5	-	-	-	-	-	-	20	-	-	-	-	-	-
Phleum alpinum L.	2	-	15	15	3	1	-	-	-	30	30	6	2	-	-
Phleum pratense L.	5	-	-	-	-	-	10	10	-	-	-	-	-	50	50
Trisetum flavescens L.	4	-	1	1	1	1	1	2	-	4	4	4	4	4	8
Fabaceae		30	15	20	40	20	20	10	143	73	96	192	74	70	36
Lotus corniculatus L.	4	2	2	4	3	3	2	3	8	8	16	12	12	8	12
Medicago falcata L.	4	3	-	-	-	7	10	3	12	-	-	-	28	40	12
Medicago lupulina L.	4	2	-	-	-	7	3	2	8	-	-	-	28	12	8
Trifolium campestre S.	2	-	-	-	-	3	5	2	-	-	-	-	6	10	4
Trifolium pratense L.	5	5	5	4	3	-	-	-	25	25	20	15	-	-	-
Trifolium repens L.	5	18	8	12	33	-	-	-	90	40	60	165	-	-	-
Alte familii		20	25	20	10	25	20	20	30	20	18	11.3	19.5	17	21
Achillea millefolium L.	2	8	-	-	-	-	-	1	16	-	-	-	-	-	2
Agrimonia eupatoria L.	0	0.5	2	1	0.1	0.5	-	-	0	0	0	0	0	-	-
Carex repens B.	0	0.5	-	-	-	-	-	-	0	-	-	-	-	-	-
Centaurea nervosa W.	0	-	2	1	0.3	2	1	-	-	0	0	0	0	0	-
Cichorium intybus L.	1	-	2	3	2	1	-	1	-	2	3	2	1	-	1
Daucus carota L.	0	1	-	-	-	2	1	-	0	-	-	-	0	0	-
Geranium pratense L.	1	-	10	8	3	7	4	4	-	10	8	3	7	4	4
Juncus inflexus L.	0	-	2	1	0.3	1	-	-	-	0	0	0	0	-	-
Plantago lanceolata L.	2	-	3	3	2	2	-	1	-	6	6	6	4	-	2
Potentilla reptans L.	1	0.5	-	-	-	-	5	6	0.5	-	-	-	-	5	6
Prunella vulgaris L.	1	1	-	-	-	7	7	5	1	-	-	-	7	7	5
Rumex acetosella L.	1	0.5	2	1	0.3	0.5	1	1	0.5	2	1	0.3	0.5	1	1
Thymus vulgaris L.	1	3	-	-	-	-	-	-	3	-	-	-	-	-	-
Taraxacum officinale W.	3	3	-	-	-	-	-	-	9	-	-	-	-	-	-
Carduus candicans W.	0	1	1	1	1	-	-	-	0	0	0	0	-	-	-
Eryngium campestre L.	0	1	1	1	1	-	-	-	0	0	0	0	-	-	-
Euphorbia cyparissias L.	0	-	-	-	-	0.5	0.2	0.3	-	-	-	-	0	0	0
Lepidium ruderaLe L:	0	-	-	-	-	0.5	0.2	0.2	-	-	-	-	0	0	0
Xanthium strumarium L.	0	-	-	-	-	0.5	0.3	0.2	-	-	-	-	0	0	0
Xeranthemum annuum L.	0	-	-	-	-	0.2	0.2	0.2	-	-	-	-	0	0	0
Veratrum album L.	0	-	-	-	-	0.3	0.1	0.1	-	-	-	-	0	0	0
TOTAL		23	20	20	20	25	23	23	281	261	272	423	215	261	232
Pastoral value (VP)									56	52	54	85	43	52	46
Appreciation VP									B	B	B	FB	M	B	M
Large Beef Unit/ha									2.6	2.4	2.5	3.9	1.9	2.4	2.1

IS = the specific index; VS = estimating the specific abundance by the specific volume

The results obtained are presented in Table 3 and highlight different values of the diversity indices used. Significant values of diversity were registered in the descriptive plot number 4 category P_s 1940/1, compared to the other descriptive plots analyzed. It is characterized by large area (S = 148.68 ha), location at an altitude of 510 m,

eastern exposure, is a meadow type *Agrostis capillaris* L. containing in a high proportion species such as: *Bromus erectus* H., *Lolium perenne* L. and *Trifolium repens* L., are exploited by grazing and record the lowest values of diversity indices, but the highest value of useful vegetation.

Table 3. Values of specific biodiversity indices for the analyzed descriptive plots

Descriptive plot		Pastoral value	Shannon index (H')	Simpson Index (D)	equitability (E)
No.	category				
1.	P _s 1949	B	2.63	0.9	0.4
2.	P _s 1868	B	2.67	0.91	0.39
3.	P _s 1905/1	B	2.59	0.9	0.39
4.	P _s 1940/1	FB	1.98	0.77	0.31
5.	P _s 1807/1	M	2.55	0.87	0.39
6.	P _s 1837/1	B	2.52	0.89	0.37
7.	P _s 1864	M	2.48	0.88	0.79

This relationship of negative correlation between the value of useful vegetation of the grass carpet and the level of its biodiversity is often found in the case of permanent grasslands (SAMFIRA & al [39]), as a result of ecosystem management to maintain an average number of species, but with high forage value. The diversity indices used reveal values that attest to the existence of a medium to low diversity in the descriptive plots analyzed, which requires the adoption of specific methods and techniques by which it is maintained and improved. It is necessary to maintain and improve biodiversity in the analyzed semi-natural grasslands to ensure their functional diversity capable of strengthening the stability and resistance to disturbances, adaptability and productivity of natural (semi-natural) systems and to serve as a warning indicator of critical ecosystem changes (NICOARĂ & ROTARY [40]). Maintaining and improving biodiversity by adopting an endogenous resource management is based on the diagnosis of grass cover, strategic analysis of socio-economic characterization criteria of the area analyzed using the PESTEL model and combining the conclusions using the SWOT matrix. The use of the PESTEL model has proved useful for illustrating the elements that give specificity to the studied grassland ecosystems and for the efficient and effective orientation of the process of elaboration and implementation of strategic options for sustainable capitalization of renewable biological productions and maintaining / improving their biodiversity. The political criterion of analysis highlights that the policy positively influences the sustainable capitalization of renewable biological productions and the maintenance / improvement of biodiversity in the sense of regulating the way of capitalization through pastoral arrangements. It also emphasizes the role of the National Rural Development Program (NRDP) in maintaining and improving biodiversity by encouraging and supporting farmers in adopting practices, methods and techniques to ensure not only superior production in terms of quality and quantity but also the maintenance of value environmental protection of the areas concerned, namely the sustainable use of endogenous resources and the preservation of traditional landscapes. The economic criterion of strategic analysis at the level of the studied areas highlights the fact that at the level of Șura Mare

commune, Sibiu county, the rural economy is significantly supported by the traditional activity of animal husbandry by the fact that the surface of pastures and hayfields totals 2660.45 ha holding a share of 55.1% of the agricultural area used (General agricultural census [41]). The number of animals owned by farmers in the commune is according to the 2010 general agricultural census of 410 cattle, 8510 sheep and 219 goats, a number considered below the agricultural potential and which can be increased by adopting relevant strategies aimed at both grass restoration and diversification supply of agricultural and agri-food products. The social criterion highlights the role of the population in maintaining and improving the biodiversity of grassland ecosystems and together with the economic criterion is the foundation of analyzes of sustainable use of renewable organic production. The evolution of the number and economic structure of the population, their level of education and professional training is crucial for the adoption of environmentally friendly practices, methods and techniques (IAGĂRU & al [29]). The numerical evolution of the rural population in the period 2002-2011 at the level of Șura Mare commune Sibiu County registered an ascending trend with an immigration rate of 29.03 % and an emigration rate of 15.92% (IAGĂRU [25]). The population employed in agricultural activities has a high share, a low level of education, fails to attract young people with higher education which translates into a low level of labor productivity and income from agricultural activities. This highlights the lack of proper management and the orientation towards an irrational exploitation of renewable biological productions from meadow ecosystems. The technological criterion highlights the existence of a relatively high interest in technology, transposed into the increase in spending on innovation in obtaining agricultural products, which attests to a relatively good receptivity to innovation. The environmental diagnosis reinforces the need to ensure a sustainable recovery of renewable organic production in grassland ecosystems and the adoption of management to maintain and improve biodiversity. The NRDP supports the implementation of agricultural projects promotes the sustainable management of endogenous resources and contributes significantly to maintaining and improving the biodiversity and ecological value of agricultural land through measures

M 10 that support agri-environment practices and M 11 that support organic farming. The legislative criterion for strategic analysis of the analyzed territory highlights the existence of relevant legislative levers to support the process of sustainable capitalization of renewable biological productions in grassland ecosystems in the conditions of maintaining and / or improving biodiversity. Biodiversity conservation in Romania is regulated by GEO no. 57 [42] regarding the regime of protected natural areas, conservation of natural habitats, of wild flora and fauna, approved with modifications and completions by Law no. 49/2011,

which ensures the full transposition of the community legislation in the field. The information obtained is relevant, but to complete the identified socio-economic characteristics, the SWOT analysis was performed. This allowed the identification of strengths and weaknesses, respectively opportunities and threats (VINCZE & al [43]) regarding the sustainable use of renewable organic productions specific to grassland ecosystems and the maintenance and / or improvement of their biodiversity. Their arrangement is briefly presented in the SWOT matrix (Table 4).

Table 4. SWOT analysis

Strong points		Weaknesses	
1	The existence of large areas of pastures and hayfields in the commune	1	Poor knowledge of attracting EU funds
2	Medium, good, respectively very good appreciation of the pastoral value in the analyzed descriptive plot	2	Strategies for sustainable capitalization of irrelevant renewable organic productions
3	Long tradition in animal husbandry	3	Not attracting young people with higher education
4	Existence of a herd of quality bovine, ovine and caprine animals	4	Improper exploitation of endogenous resources in grassland ecosystems
5	Advantageous geographical position, in the immediate vicinity of Sibiu	5	Strong traditional mentality that slows down the development of an entrepreneurial attitude
opportunities		threats	
1	Encourage and support farmers in adopting practices, methods and techniques for maintaining / improving biodiversity through NRDP	1	Impairment of the practical heritage through irrational exploitation of biological productions
2	Encourage and support non-agricultural activities through NRDPs and other sources of funding	2	Low capacity of local accountability factors in attracting development funds
3	Existence of a relatively high interest in technology	3	Low level of education of the population involved in agricultural activities
4	High share of the population involved in agricultural activities	4	Lack of actions to support agricultural entrepreneurship
5	Existence of relevant legislative levers to support the process of sustainable recovery of renewable organic production	5	Shyness of actions to promote and support traditional agri-food products

The brief information presented suggestively in the SWOT matrix highlights the following: the advantages of sustainable capitalization of renewable biological productions in grassland ecosystems are represented by the large share of area owned by grassland ecosystems in the total agricultural area used in Șura Mare commune; the average, good and very good appreciation of the pastoral value, the long tradition in the activity of raising animals and the existence of a herd of quality cattle, sheep and goats; the weaknesses of the sustainable use of renewable organic production in grassland ecosystems are represented by poor knowledge on attracting development funds; strategies for the sustainable recovery of inadequate organic production; not attracting young people with higher education; inadequate exploitation of endogenous resources, strong traditional mentality that slows down the development of an entrepreneurial attitude. The external environment fully participates in the sustainable capitalization of renewable organic production in grassland ecosystems through its two sides: opportunities and threats. Opportunities for sustainable exploitation of renewable organic production in the analyzed grassland ecosystems are highlighted in the National Rural Development Program (NRDP [44]) by encouraging and supporting farmers in adopting practices, methods and

techniques to maintain and / or improve biodiversity, the existence of a relatively high interest in innovation. Threats of the process of sustainable capitalization of renewable biological productions from the analyzed grassland ecosystems are represented by the impairment of the practical heritage by promoting irrational practices, low capacity to attract development funds; low level of training of the population working in agriculture lack of support actions for agricultural entrepreneurship, respectively shyness of actions to promote and support traditional agri-food products. The synthesis of the information provided by the methodology used recommends a series of strategic options for the sustainable capitalization of renewable biological productions in the studied grassland ecosystems, of which the most relevant we consider to be the following: Encouraging and supporting agricultural and agri-food entrepreneurship; Encourage and support farmers in adopting practices, methods and techniques for maintaining and / or improving the biodiversity of grassland ecosystems studied by accessing specific measures under the National Rural Development Program; Promoting information and consultancy services offered to farmers and local public administration staff on funding sources and how to access them; Superior capitalization of the endogenous resources

of the studied grassland ecosystems; Superior capitalization of the human potential involved in agricultural and agri-food activities; Increasing the capacity to integrate agricultural production, biodiversity conservation and socio-cultural values in order to support sustainability; Promotion and superior capitalization of specific agricultural and agri-food products.

Conclusion

The integration of agricultural production, biodiversity conservation and socio-cultural value in grassland ecosystems is based on the use of both quantitative and qualitative strategic analysis methods such as: secondary analysis of statistical data and relevant literature, PESTEL analysis, and SWOT analysis.

The secondary analysis of statistical data and relevant literature attests to the fact that many specialists are concerned with promoting solutions to reduce the state of degradation manifested in grassland ecosystems.

The adoption at the level of economic entities / public institutions, which have grassland ecosystems in their patrimony, of a sustainable management of endogenous resources determines the improvement of the floristic composition with positive impact on the productivity and quality of renewable biological productions obtained and implicitly on their degradation.

For the calculation of pastoral value (VP) a scientific method of knowledge and research of grassland ecosystems was used, the foundations of which were laid by Daget and Poissonet, 1972, currently approved by the Central European School. The obtained data show a medium, good, respectively very good appreciation of the pastoral value in the analyzed descriptive plots, with the mention that the very good appreciation belongs to the descriptive plot (Ps 1940/1) with the largest surface (148.68 ha).

The data obtained from the diagnosis of the grass carpet also allowed the quantification of the biodiversity specific to the grassland ecosystems analyzed by using two biodiversity characterization indices: the Shannon diversity index and the Simpson diversity index. The results obtained highlight different values of the diversity indices used. Significant values of diversity were registered in the descriptive plot number 4 category Ps 1940/1, compared to the other descriptive plots analyzed. There is a negative correlation between the value of useful vegetation of the grass carpet and its biodiversity level often found in the case of permanent grasslands, as a result of ecosystem management to maintain an average number of species, but with high forage value.

The diversity indices used reveal values that attest to the existence of a medium to low diversity in the descriptive plots analyzed, which requires the adoption of specific methods and techniques by which it is maintained and improved. Maintaining and improving biodiversity by adopting an endogenous resource management is based on the diagnosis of grass cover, strategic analysis of socio-economic characterization criteria of the area analyzed using the PESTEL model and combining the conclusions using the SWOT matrix.

The use of these models has proved useful to illustrate the elements that give specificity to the studied grassland

ecosystems and to guide the efficient and effective process of developing strategic options for sustainable use of renewable organic production and maintaining / improving their biodiversity.

The methodology used recommends a series of strategic options for the sustainable capitalization of renewable organic productions in the studied grassland ecosystems, among which we mention: encouraging and supporting farmers in adopting practices, methods and techniques to maintain and / or improve the biodiversity of grassland ecosystems studied by accessing specific measures within the National Rural Development Program; increasing the capacity to integrate agricultural production, biodiversity conservation and socio-cultural values in order to support sustainability; promotion and superior use of specific agricultural and agri-food products.

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