

## PASTORAL ARRANGEMENT - VECTOR OF MANAGEMENT FOR SUSTAINABLE GRASSLAND EXPLOITATION

Romulus IAGĂRU, Pompilica IAGĂRU

Lucian Blaga University of Sibiu, 10 Victoriei, Romania, Phone: +40269216062, Fax: +40269217887, Mobile: +40729950222, Email: romulus.iagaru@ulbsibiu.ro, pompilica.iagaru@ulbsibiu.ro.

*Corresponding author:* romulus.iagaru@ulbsibiu.ro

### *Abstract*

*The present study starts from the premise that the grassland is an essential element for sustainable development systems due to its impact on animal fodder and animal welfare, but also on the maintenance of humus content in soil and of the micro-fauna, diseases and pests by interrupting their biological cycles, land lacking vegetation as a result of their grassing. It is important that these influences to be positive, which is why the functional structure of the meadows should not be disturbed by the inappropriate exploitation. For this purpose, at the level of institutions, key local factors, enterprises etc., it is necessary to adopt a specific management in which the manner of valorisation of meadows is established by pastoral arrangements under the law (GD 1064 11/12/2013). Concretely, the paper briefly presents the main elements of the realization of a pastoral arrangement in the commune of Bazna, Sibiu County.*

*Key words:* agricultural, grassland, pastoral arrangement, sustainable development systems, specific management

### INTRODUCTION

The grassland is a "area of land occupied with grassy vegetation" [10], consisting of "herbaceous plant species belonging to several botanical families" [4], which from the point of view of the ecological and physiological classification, are part of the "herbaceous terrestrial communities" [5]. The debate on climate change caused by the greenhouse effect poses grassland as an important carbon deposit by storing it in greater quantity than the arable land [2,3]. The grassland is the vegetable resource that can be transformed into the most valuable and most efficient fodder for animal growth. It is therefore the basic component of sustainable farming systems, contributing fundamentally for fodder, animal welfare, the introduction of a significant amount of organic matter into the soil, maintaining humus content in the soil, microfauna maintenance, interruption of biological cycles for diseases and pests and consolidating the lands lacking vegetation [9]. It is obvious the multifunctional character of the meadows, a long debated concept, whose dimensions include the extreme diversity of

the products obtained in agriculture and which give sense to the profession of farmer [6]. In this context, there is a common trend at the global level to promote sustainable farming systems and to valorify separately the multiple functions of agriculture [1]. The sustainability of grassland multifunctionality is a major concern of specialists and is based on an integrated management of grass vegetation. This approach is strongly influenced by a series of features that define grasslands, such as the spreading area (with impact on the diversity of static conditions generally characterized by areas unfit for other cultures) and human activity. In support of this approach, the competent forums intervene with a series of legislative measures that create a technical, organizational and economic framework favorable to the sustainability of the multifunctional character of the meadows. For our country, taking into account the not very favorable status of permanent meadows with a rather pronounced level of degradation due to their invasion of mounds, worthless vegetation, the presence of erosion and landslides, the European Union Council Regulation (EC) no. 1782 of 2003

enforce a special attention to the Romanian pastoral heritage as follows: maintaining the existing area on 1 January 2007; ensuring a minimum level of maintenance; avoiding the spread of unwanted vegetation. In this regard, in order to reduce or eliminate the process of degradation of permanent meadows, in our country the legislative framework was created by HG 1064/11.12.2013 on the application of the methodological norms for the application of the conditions of OUG 34/2013 on the organization, management and exploitation of permanent meadows and for changing and completing the Land Fund Law no. 18/1991. It is stipulated that the management of the meadows is established by pastoral arrangements according to the law [7].

## MATERIALS AND METHODS

The pastoral arrangement is a complex work which addresses the elements of the pastoral economy and highlights the specific measures to improve the meadows in order to achieve the technical and scientific documentation necessary for the elaboration of the prospective plans in accordance with the real possibilities of the meadow. The purpose of the present study is the purpose of the pastoral arrangement and refers to the time and space regulation of the rational valorisation of grassland productions in the commune of Bazna, Sibiu County, taking into account the static conditions, the agricultural and environmental measures, the improvement and maintenance of biodiversity and the protection of the environment. The objectives are to list the meadows belonging to a territorial administrative unit, to study their characteristics, and to elaborate a documentation useful for the planning process of the specific works to the proposed goal. Organizationally, the present study is based on grounding elements regarding the territorial administrative and organizational situation, the organization of the territory, the geographic and climatic characteristics, the vegetation and the setting up framework, and is finalized with the organization, improvement, endowment and use of the meadows including the parcel description. We

emphasize that the sustainable valorisation of grassland productions is a major problem also for many specialists [8].

## RESULTS AND DISCUSSIONS

The meadows under the study belong from an administrative point of view to the Bazna commune located in the north of Sibiu County, in a hilly region at an average altitude of 320 m. The legal holder of the analyzed meadows is the Bazna Local Council. The respective grassland areas have been registered since 2003 and have a total of 866 ha with the following structure (Table 1).

Table 1. The structure of grasslands in Bazna commune.

Location		Category of use			Area (ha)
		meadow	hayfield	unproductive	
UAT Bazna	Village Bazna	149.68			149.68
	Village Boian	389.40		2.29	391.69
	Village Velț	324.63			324.63
TOTAL					866.00

Source: documents of the Bazna district

The present study highlights the particularities of the rational valorisation of grasslands in the commune of Bazna, having as a case study the meadow called the Bazna's Thorns, constituted as a body, which group the land 46 in the surface area of 47.06 ha. The meadow is exploited by grazing. The grazing time is 160 days and the number of grazing cycles is 3. The state of the meadow shows that it has not been adequately maintained in the sense that it has a large percentage of lacks (20%) and wooden vegetation cover (20%), but preserves the premises of a good productive potential by the presence of a high percentage of plants from the Fabaceae Family (30%) and the lack of mole mounds. The analyzed meadow is formed on two soil categories: deep with medium texture, moderately acid, mesobasic, with brown humifere of poor natural fertility; deep with medium to fine texture, slightly alkaline, carbonated, saturated in low to moderate natural fertility bases, belonging to quality classes II, III. The ground water is at depths between 3 and 5 m, and over 5 m on the mountainsides. The climate is

temperate with mild oceanic influences with riverside and valley topo-climates with impact on the temperature and precipitation which favor the temperature inversions, mist frequency and aisle currents. The average annual air temperature is between +8°C ÷ +8.4°C, the multiannual average is + 8.2°C, the average values of relative air humidity for the typical months of the year are 88-92% for January and 77-80% for July. The average annual sum of atmospheric precipitation rises to 650-700 mm, and the dominant direction of air mass movement is from NW sector, followed by NE and N. From the point of view of the natural conditions that characterize the area or the vegetation floor the analysed meadow is geobotanic framed in the immoral area (of the oak forests) the sub-area of the mesophilic oak forests. The main plant species that make up the grass carpet of the grasslands analyzed are: *Lolium perene* (12%), *Festuca sulcata* (12%), *Brachipodium pinnatum* (2%), *Agrostis tenuis* (2%), *Puccinella distans* (2%); *Trifolium repens* (25%), *Medicago falcata* (3%), *Trifolium pratense* (2%); *Cichorium intybus* (3%), *Urtica dioica* (3%), *Alchillea millefolium* (3%), *Carium carvi* (3%), *Plantago lanceolata* (1%), *Mentha longifolia* (1%), *Ononis spinosa* (1%); *Carduus acanthoides* (2%), *Sambucus aebulus* (2%), *Euphorbia cyparissias* (1%). The invading wooden species are: *Crataegus monogyna* (10%), *Prunus spinosa* (5%), *Rosa canina* (5%). A degree of vegetation coverage of 80% was identified and the presence of landslides, respectively, the degradation of the grass carpet by 20%. The identified vegetation data allowed the calculation of the pastoral value (Table 2), for which we used the gravimetric method as a floristic method (the actual weighing of the plant species (G) harvested by mowing on 1 square meter in several rehearsals according to the variation of the grass carpet, followed by their expression in percentages).

Based on the data obtained using the calculation formula:

$$VP = \sum PC(\%) * IC / 5,$$

where:

VP is pastoral value indicator (0-100), the PC is the percentage of participation in the grass carpet of a species, and IC is the index of fodder quality.

The determination of the animal load of the analyzed meadow was based on the total grass production (Pt) on grazing cycles and on the determination of the coefficient of grass usage (Cf). Total grass production was determined by mowing and weighing on sites of 2 square meters and got the amount of 21,000 kg. green mass at ha.

Table 2. Calculation of Pastoral Value of the Bazna's Thorns meadow

Species	%PC	IC	PC*IC
<b>Poaceae</b>	<b>30</b>		
<i>Lolium perene</i>	12	5	60
<i>Festuca sulcata</i>	12	2	24
<i>Brachipodium pinnatum</i>	2	1	2
<i>Agrostis tenuis</i>	2	3	6
<i>Puccinella distans</i>	2	3	6
<b>Fabaceae</b>	<b>30</b>		
<i>Trifolium repens</i>	25	4	100
<i>Medicago falcata</i>	3	4	12
<i>Trifolium pratense</i>	2	4	8
<b>Other families</b>	<b>20</b>		
<i>Cichorium intybus</i>	3	1	3
<i>Urtica dioica</i>	3	0	0
<i>Alchillea millefolium</i>	3	2	6
<i>Carium carvi</i>	3	2	6
<i>Plantago lanceolata</i>	1	2	2
<i>Mentha longifolia</i>	1	0	0
<i>Ononis spinosa</i>	1	0	0
<i>Carduus acanthoides</i>	2	0	0
<i>Sambucus aebulus</i>	2	0	0
<i>Euphorbia cyparissias</i>	1	0	0
<b>Wooden species</b>	<b>20</b>		
<i>Crataegus monogyna</i>	10	0	0
<i>Prunus spinosa</i>	5	0	0
<i>Rosa canina</i>	5	0	0
<b>TOTAL</b>	<b>100</b>	<b>x</b>	<b>235</b>
<b>Pastoral value</b>	<b>x</b>	<b>x</b>	<b>47</b>
<b>Assessment of VP</b>	<b>Medium-Good</b>		

Source: own determinations.

The coefficient of utilization expressed in percentage was determined by mowing and weighing of the unconsumed residues (Rn), which weighed 3,500 kg/ha) per 10 square meters and reporting it to the total production by the formula:

$$Cf(\%) = [(Pt(\text{kg/ha}) - Rn(\text{kg/ha})) / Pt(\text{kg/ha})] * 100.$$

The resulting coefficient of utilization is:

$$Cf(\%) = [(21,000 - 3,500) / 21,000] * 100 = 83.34.$$

Further, we proceeded to establish of the meadow load, regarding the daily grass requirement for each animal head, in our case the dairy cows (Nz) and the number of grazing days (Zp) using the formula:

$$I_p (\text{head/ha}) = P_t * C_f / N_z * Z_p * 100.$$

For the analyzed meadow, knowing that it belongs to the mesophilic oak forests sub-area at the altitude of 300 m, according to the formula, results the following meadow load:

$$I_p = 2100 * 83.34 / 65 * 160 * 100 = 1.68 \text{ cows per ha (UVM/ha)}.$$

The data obtained allow the total meadow load (IAP) to be calculated as the product between the meadow area (ha) and the meadow load (Ip), so that:

$$IAP = 47.06 * 1.68 = 79.06 \text{ no. of heads (UVM)}.$$

The analyzed meadow did not benefit from ameliorative works over the last 5 years, making it possible to increase the grazing capacity by improving the use coefficient according to the literature on the application of specific measures for improvement [9], which results in a meadow load of up to 3.69 UVM / ha and a total meadow load of up to 173.65 cows (UVM). The description of the analysed grassland vegetation and the appreciation of the pastoral value as a medium to good, requires the implementation of improvement works that are the object of the pastoral arrangement and contribute to the adoption of a specific management oriented to the integrated management of the resulting grass carpet. The pastoral arrangement will include a logical succession of analytical and time-labeled ameliorative works such as: removal of wooden vegetation and of harmful and toxic plants; stopping the landslides and the degradation of the grass carpet through specific works, taking into account the causes that have caused them; restoring the grass carpet by overseeding; improving the floristic composition by self-fertilization and natural and chemical fertilization in accordance with

the code of good agricultural practices; practicing a rational grazing considering the productivity and durability of the grass carpet; the endowment of the grassland with drinking water through drilling works, water supply, and the construction of drinking places for animals according to the standards.

## CONCLUSIONS

The meadow represents the basic component of sustainable farming systems, contributing fundamentally to the fodder provision and animal welfare. The regulation in time and space of the rational valorisation of meadows productions in the commune of Bazna, Sibiu County, taking into account the static conditions, agricultural-environmental measures, improvement and maintenance of biodiversity and environmental protection, ensures the sustainability of the meadow agroecosystem. The rational utilization of the meadows in Bazna commune, having as a case study the meadow called Bazna's Thorns, highlights the particularities of the regulation and insurence of the meadow agroecosystem sustainability. The state of the meadow shows that it was not properly maintained, which enforce the introduction of a specific management, specific to regulate the sustainable valorisation of the production of the analyzed meadows. The description of the grassland vegetation analyzed and the appreciation of the pastoral value as a medium to good, requires the implementation of improvement works that are the object of the pastoral arrangement and contribute to the adoption of a specific management oriented to the integrated management of the resulting grass carpet.

## REFERENCES

- [1]Beranger, C., 2002, La multifonctionnalité des prairies: les acquis et les interrogations du 19e Congrès Européen des Herbages, Fourrages, 171.
- [2]Bogdan (Pleșa) Anca-Dorina, 2012, Cercetări privind folosirea și menținerea păjiștilor montane cu low-input. Research concerning the use and maintenance of the low-input mountain meadows). Teză de doctorat, (Ph.D.Thesis) Universitatea de Științe Agricole și Medicină Veterinară Cluj-Napoca.

[3]Brown, L., 2001, Eco-economia, București, Editura Tehnică, (Eco-Economy, Bucharest, Engineering Publishing), p.86, 89, 91.

[4]Dragomir, N., 2005, Pajiști și plante furajere tehnologii de cultivare. Editura Eurobit, Timișoara, (Meadows and forage crops- Cultivation technologies. Eurobit Publishing House, Timisoara). p.6.

[5]Elleberg, H., Mueller Dombois, D., 1967, A key to Raunkiaer plant life forms with revised subdivisions. Ber. Geobot. Inst. Eidg. Tech. Hochschule Rubel. 37. 56-73.

[6]Hervieu, B., 2002, La multifonctionnalité: un cadre conceptuel pour une nouvelle organisation de la recherche sur les herbages et les systèmes d'élevage, Fourrages,171, p. 219-226

[7]HG 1064/2013 privind aprobarea Normelor metodologice pentru aplicarea prevederilor OUG 34/2013 privind organizarea, administrarea si exploatarea pajistilor permanente si pentru modificarea si completarea Legii fondului funciar nr. 18/1991.

[8]Iagaru, P., Marcuta, L., Marcuta, A., Iagaru, R., 2017, Sustainable management for grassland agroecosystem resources. Scientific Papers: Management, Economic Engineering in Agriculture & Rural Development, 17(4):161-166.

[9]Marușca T., Mocanu, V., Has, E.C., Tod, M.A., Andreoiu, A.C., Dragos, M. M., Blaj, V., Ene, T.A., Silistru, D., Ichim, E., Zevedei, P.M., Constnatescu, C. S., Tod, S.V., 2014. Ghid de întocmire a amenajamentelor pastorale. Editura Capolovoro, (Guide for setting up the pastoral improvement management, Capolovoro Publishing House), Brașov, p.7.

[10]Rotar, I., Carlier, L., 2005, Cultura pajiștilor. Editura Risoprint, (Mewdows Cropping, Risoprint Publishing House), Cluj-Napoca, p 12.

