**Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development**
**Vol. 21, Issue 4, 2021**
**PRINT ISSN 2284-7995, E-ISSN 2285-3952**

# PASTORAL, IMPERATIVE ARRANGEMENT OF THE SUSTAINABILITY OF PRACTICAL ECOSYSTEMS

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***Abstract***

*This research is based on the need to ensure adequate quantitative and qualitative feed in the context of population growth, climate change and the need to protect the environment. The research is characterized by topicality and complexity, highlighting a series of elements meant to ensure the sustainability and multifunctionality of the meadows through a sustainable management of the grass carpet and the resources involved. The research highlights the role of legislative measures in creating a relevant technical, organizational and economic framework, but also takes into account the characteristics of the meadow, respectively human activity. The research methodology used is the case study, due to its adaptability to territorial specificity and is based on the diagnosis of the grassland ecosystem researched using the gravimetric method. The diagnosis of the researched grassland ecosystem highlights a vulnerable state of them that requires the development of special management plans that contain specific measures of care, maintenance and recovery. In essence, the research highlights the particularities of setting up a pastoral arrangement in the commune of Arpașu de Jos, in Sibiu County.*

***Key words*****:** *grass carpet**,** meadow, management, pastoral value, settlement,*

## INTRODUCTION

The notion of meadow is defined by different authors in different ways, with a narrower or broader meaning. It is generally accepted that grasslands are "an area of land occupied by grassy vegetation" [10], made up of "species of grassy (plants belonging to several botanical families" [2], which from the point of view of the ecological-physiognomic classification, they are part of the category of "terrestrial herbaceous communities" [3]. The meadow represents the renewable biological resource from which the most efficient and valuable fodder for animal breeding is obtained [5]. Also, the meadow fulfills an important multifunctional ecological and social economic role, offering at the same time favorable support for the coexistence of various habitats and species [12]. Romania has a generous pastoral heritage valued at an area exceeding 4.8 million hectares. The literature indicates that the practical ecosystem is strongly influenced by a number of factors of natural and anthropogenic origin whose meaning has been negative in recent decades [11]. It is known that the renewable biological productions within the practical ecosystems as well as the diversity of the plants that make up the grass carpet are different from one location to another mainly due to the differences in the availability of resources and the way of capitalization. Thus, measures are needed to promote a sustainable management of practical ecosystems in order to obtain higher production and better quality in terms of preserving and / or improving the biodiversity of species, respectively environmental protection [9]. In order to support this initiative, the responsible factors adopt a set of measures, including legislative ones meant to favor from a technical, organizational and economic point of view a framework that ensures the sustainability of the multifunctional of the meadows. It is defined by Government Emergency Ordinance no. 34/2013 and the implementing rules approved by H.G. 1064/2013, normative acts that subsequently underwent several amendments [4]. By elaborating these norms,

the Romanian legislator wanted to clearly establish the organization, administration and exploitation of pastures and hayfields. In this context, the purpose of this research is to regulate in time and space the rational and efficient use of grassland production in Arpașu de Jos commune, Sibiu county by developing special management plans containing specific measures of care, maintenance and recovery.

## MATERIALS AND METHODS

The methodology for drawing up the pastoral arrangement is the one provided in the Guide for drawing up the pastoral arrangements, elaborated by the Research - Development Institute for Meadows, Brașov, and in the legislation in the field [7] (GEO no. 34/2013 on the organization, administration and operation of permanent meadows and for the amendment and completion of the Land Fund Law No. 18/1991, with subsequent approvals and amendments).

The purpose of the research derives from the purpose of pastoral arrangement and refers to the regulation in time and space of rational and efficient capitalization of meadow productions in Arpașu de Jos commune, Sibiu county (geographically identified by the following coordinates: parallel 45°46'41' 'northern latitude and meridian of 24°37'24' 'east longitude), taking into account seasonal conditions, available resources, agri-environmental measures, the improvement and maintenance of biodiversity and environmental protection.

Sustainable recovery of grasslands is a major problem that many specialists adhere to [6] and requires the development of special management plans that contain specific measures of care and maintenance, timely harvesting of hayfields, use rational use of pastures as grazing time, animal loading, traffic, etc. [8].

The objectives are represented by the identification and characterization of the meadows belonging to the territorial administrative unit, the study of their characteristics, as well as the elaboration of a relevant documentation for the planning of the activities specific to the achievement of the proposed purpose.

## RESULTS AND DISCUSSIONS

The present research has as object of study the quality of the grassy carpet of the meadows located in the southeast of Sibiu county at an altitude of 540 m and under the administration of Arpașu de Jos commune. It is 47 km from Sibiu and 15 km from Victoria on the road that connects Sibiu with Brasov. These meadows have an area of 5096.55 ha, are tabulated since 2003 and have the following categories of use (Table 1):

Table 1. Meadows and categories of use

| Grasslands belonging to the administrative point of view of Arpașu de Jos commune (ha) | Pasture (ha) | Grassland (ha) | No productive purposes (ha) | Total |
|---|---|---|---|---|
| | 3,160.25 | 1,803.45 | 132.44 | 5,096.55 |

Source: Sibiu County Agricultural Directorate.

The present research is characterized by addressing the specific elements of the technical, organizational and economic framework conducive to ensuring the sustainability of the multifunctional character of meadows by conducting a case study that includes both the category of pasture use area of 9.18 ha located in plot 5 locally called "Gropanele (5) "as well as the category of hay use in an area of 34.19 ha located in plots 5,6,7 locally called" Gropanele (5,7) "and" În Făget (6) ".

The researched meadow presents a set of characteristics that particularize the specific activities starting from the exploitation mode. The meadow exploited by grazing is located in Noul Român in a single plot (Pș 236/1) at an altitude between 420-475 m, exposure S, SE, inclination from 5-35$^{O}$ on two types of soil (calcareous regosol, respectively typical faeozium). The meadow exploited as hay is located in Noul Român in several plots: Fn 162, Fn 164, FN 166 in the field called locally "In Făget (6)" and Fn 173, Fn 206, Fn 215, Fn 217, Fn 219, Fn 157, Fn 222/1, Fn 223, Fn 231, Fn 244, Fn 246, Fn 249, Fn 256/1 in the field locally called "Gropanele (5,7)" at an altitude between 410-460 m, exhibition S, SE,

inclination from 5-35$^0$ on three soil types (calcareous regosol, entic-calcareous alluvial, respectively stegnogleized luvosol). Soil drainage is diversified from very weak to gleiosols, to weak-imperfect to most identified soil types, respectively moderately-good to alluvial soils. The territory on which the researched meadow is located is part of the temperate-continental climate, influenced by ocean air masses. The annual temperature range is 21-24 ° C, and the maximum annual rainfall is 1,000-1,300 mm. The studied meadow belongs from a geobotanical point of view in the immoral area and belongs to the undergrowth of sessile oak and sessile oak forests. The plant species that make up the grassy carpet attest that the meadow belongs to the series and implicitly to the type *Agrostis tenuis sibth - Festuca rupicola heuff*. The floristic relief of the studied meadow is different depending on the location and the mode of exploitation. For the meadow exploited by grazing, the following composition is highlighted: *Festuca rupicola H* (15%), *Agrostis tenuis S.* (11%), *Festuca rubra L.* (5%), *Cynosurus cristatus L.* (5%), *Festuca ovina ssp. Sudetica K.* (3%), *Agropyron repens L.* (2%), *Dactylis glomerata L.* (2%), *Briza media L.* (1%), *Chrysopogon grillus L.* (1%), *Trifolium repens L* (9%), *Trifolium pretense L* (4%), *Medicago sativa L* (3%), *Lotus corniculatus L* (2%), *Achillea millefolium L* (2%), *Thymus serpyllum L* (2%), *Plantago major L* (2%), *Rhinanthus minor L* (1%), *Cichorum intybus L* (1%), *Mentha longifolia L* (1%), *Equisetum arvense L* (1%). At the same time, a degree of vegetation cover of 73% and the presence of woody vegetation was identified, accompanied by the degradation of the grass carpet on an area of 27%. The identified invasive wood species are: *Carpinus betulus L* (8%), *Crataegus monogyna J.* (6%), *Prunus spinosa L.* (5%), *Rosa canina L.* (4%), *Corylus avelana L.* (3%), *Sambucus nigra L.* (2%). In the meadow exploited by hay, the following composition is highlighted: *Festuca rupicola H.* (12%), *Festuca valesiaca S.* (9%), *Festuca pratensis H.* (7%), *Agrostis tenuis S.* (6%), *Holcus lanatus L.* (3%), *Dactylis glomerata* L (2%), *Briza media L.* (2%), *Chrysopogon grillus L.* (1%), *Trifolium repens L* (4%), *Trifolium pretense L* (3%), *Medicago sativa L* (4%), *Lotus corniculatus L* (2%), *Achillea millefolium L* (2%), *Thymus serpyllum L* (2%), *Plantago major L* (2%), *Rhinanthus minor L* (1%), *Cichorum intybus L* (1%) %), *Mentha longifolia L* (1%), *Prunella speciens L* (1%). At the same time, a degree of vegetation cover of 65% and the presence of woody vegetation accompanied by the degradation of the grassy carpet on an area of 35% were identified. The identified invasive wood species are: *Carpinus betulus L* (9%), *Crataegus monogyna J.* (7%), *Prunus spinosa L.* (6%), *Rosa canina L.* (6%), *Corylus avelana L.* (4%), *Sambucus nigra L.* (3%), *Robinia pseudoacacia L.* (2%).

Table 2. Calculation of the pastoral value of the meadow in an area of 9.18 ha located in plot 5 locally called "Gropanele (5.7)" and "in Făget (6)" category of pasture use

| Species | %PC | IC | PC*IC |
|---|---|---|---|
| ***Poaceae*** | ***45*** | | |
| *Festuca rupicola H.* | 15 | 2 | 30 |
| *Agrostis tenuis S.* | 11 | 3 | 33 |
| *Festuca rubra L.* | 5 | 3 | 15 |
| *Cynosurus cristatus* | 5 | 3 | 15 |
| *Festuca ovina ssp. sudetica K.* | 3 | 1 | 3 |
| *Agropyron repens L.* | 2 | 2 | 4 |
| *Dactylis glomerata L.* | 2 | 5 | 10 |
| *Briza media L.* | 1 | 1 | 1 |
| *Chrysopogon grillus L.* | 1 | 0 | 0 |
| ***Fabaceae*** | ***18*** | | |
| *Trifolium repens L* | 9 | 5 | 45 |
| *Trifolium pretense L* | 4 | 5 | 20 |
| *Medicago sativa L* | 3 | 5 | 15 |
| *Lotus corniculatus L* | 2 | 4 | 8 |
| ***Other families*** | ***10*** | | |
| *Achillea millefolium L* | 2 | 2 | 4 |
| *Thymus serpyllum L* | 2 | 1 | 2 |
| *Plantago major L* | 2 | 2 | 4 |
| *Rhinanthus minor L* | 1 | 0 | 0 |
| *Cichorum intybus L* | 1 | 1 | 1 |
| *Mentha longifolia L* | 1 | 0 | 0 |
| *Equisetum arvense L* | 1 | 0 | 0 |
| ***Wooden species*** | ***27*** | | |
| *Carpinus betulus L* | 7 | 0 | 0 |
| *Crataegus monogyna J.* | 6 | 0 | 0 |
| *Prunus spinosa L.* | 5 | 0 | 0 |
| *Rosa canina L.* | 4 | 0 | 0 |
| *Corylus avelana L.* | 3 | 0 | 0 |
| *Sambucus nigra L.* | 2 | 0 | 0 |
| **TOTAL** | 100 | x | 210 |
| **Pastoral value** | x | x | 42 |
| **Assessment of VP** | **Medium-Good** | | |

Source: own processing.

The identification of the plants that make up the grassy carpet of the studied meadows, allowed using the gravitational method the appreciation of the pastoral value (Table 2).

For this, areas of 1 sqm were delimited, from which the plants and their weight by weighing were identified. The results obtained were used to determine the pastoral value using the formula VP = ∑PC (%) * IC / 5.

Table 3. Calculation of the pastoral value of the meadow in an area of 34.19 ha located in plots 5,6,7 locally called "Gropanele (5)" category of pasture use

| Species | %PC | IC | PC*IC |
|---|---|---|---|
| ***Poaceae*** | ***42*** | | |
| *Festuca rupicola H.* | 12 | 2 | 24 |
| *Festuca valesiaca S.* | 9 | 2 | 18 |
| *Festuca pratensis H.* | 7 | 5 | 35 |
| *Agrostis tenuis S.* | 6 | 3 | 18 |
| *Holcus lanatus L.* | 3 | 2 | 6 |
| *Dactylis glomerata L* | 2 | 5 | 10 |
| *Briza media L.* | 2 | 1 | 2 |
| *Chrysopogon grillus L.* | 1 | 0 | 0 |
| *Festuca rupicola H.* | ***13*** | | |
| *Festuca valesiaca S.* | 4 | 5 | 20 |
| ***Fabaceae*** | 3 | 5 | 15 |
| *Trifolium repens L* | 4 | 5 | 20 |
| *Trifolium pretense L* | 2 | 4 | 8 |
| *Medicago sativa L* | ***10*** | | |
| *Lotus corniculatus L* | 2 | 2 | 4 |
| ***Other families*** | 2 | 1 | 2 |
| *Achillea millefolium L* | 2 | 2 | 4 |
| *Thymus serpyllum L* | 1 | 0 | 0 |
| *Plantago major L* | 1 | 1 | 1 |
| *Rhinanthus minor L* | 1 | 0 | 0 |
| *Cichorum intybus L* | 1 | 0 | 0 |
| *Mentha longifolia L* | ***35*** | | |
| *Prunella speciens L* | 8 | 0 | 0 |
| ***Wooden species*** | 7 | 0 | 0 |
| *Carpinus betulus L* | 6 | 0 | 0 |
| *Crataegus monogyna J.* | 5 | 0 | 0 |
| *Prunus spinosa L.* | 4 | 0 | 0 |
| *Rosa canina L.* | 3 | 0 | 0 |
| *Corylus avelana L.* | 2 | | |
| *Sambucus nigra L.* | 100 | X | 187 |
| *Robinia pseudoaccacia L.* | x | X | 37,4 |
| **TOTAL** | ***42*** | | |
| **Pastoral value** | 12 | 2 | 24 |
| **Assessment of VP** | **Medium** | | |

Source: own processing.

After assessing the pastoral value, the animal load was calculated. For this it was necessary to know the total grass production (Pt) and to establish the grass utilization coefficient (Cf). The total production was obtained by weighing the grass carpet harvested from areas of 2 sqm delimited for this purpose. It totaled 9,000 kg. green table per ha. The calculation of the utilization coefficient required the establishment of the unconsumed residues (Rn) by mowing and weighing them on surfaces of 10 sqm. The value of 2000 kg / ha was thus obtained. Both the value of the total production and the value of the unconsumed residues were used to calculate the utilization coefficient of the grass using the formula: Cf (%) = [(Pt (kg / ha) - Rn (kg / ha) / Pt (kg / ha)] * 100 and the value Cf (%) = [(9000-2000) / 9000] * 100 = 77.78. The determination of the pasture load taking into account the daily grass requirement per animal, in our case dairy cows (Nz) and the number of days of grazing (Zp) was done using the formula Ip (head / ha) = Pt * Cf /Nz * Zp * 100 and recorded the value of Ip = 9,000 * 77,378/65 * 160 * 100 = 0.67 cows per ha (UVM/ha) The data obtained allow the calculation of the load total pasture (IAP) as the product between pasture area (ha) and pasture load (Ip), so IAP = 9.18 * 0.67 = 6.15 head no. (UVM) Similar production values were obtained and The analyzed meadow did not benefit from amelioration works, which makes it possible that by applying specific improvement measures as well as by promoting a rational capitalization, the grazing capacity will increase by improving the coefficient. and use according to the literature [11] which leads to a pasture load of over 1.5 LU/ha, respectively to a total pasture load of at least 13.78 cows (LU). The obtained results, respectively the average / medium to good quality of the studied meadows, highlight the lack of elaboration and implementation of some improvement measures. They represent the object of pastoral arrangement and lead to the implementation of a management relevant to obtaining an integrated management by coordinating the factors of production and ensuring the sustainability of renewable biological productions [5].

The measures to improve the analyzed meadow are the object of the arrangement established for this purpose and include a set of technical-cultural works adapted to the specifics of the meadow, respectively to the climatic conditions in accordance with the legislation, agri-environmental measures and good practices. The main proposed works aim at: the removal of the woody vegetation with the maintenance for the protection against erosion of the solitary or grouped trees for shade; removal of plants that harm the quality of animal production, respectively animal health, stop land deforestation; improving

biodiversity and pastoral value; promoting the sustainable use of renewable organic production; equipping the lawn with drinkers, etc. Also, the improvement of the quality of the grass carpet as a result of the increase of the percentage of leguminous plants as an effect of the applied measures contributes to the increase of the soil fertility [1].

## CONCLUSIONS

The research highlights a number of elements designed to ensure the sustainability and multifunctionality of grasslands through a sustainable management of the grass carpet and the resources involved.

The research highlights the role of legislative measures in creating a relevant technical, organizational and economic framework, but also takes into account the characteristics of the meadow, respectively human activity.

The research highlights the particularities of setting up a pastoral arrangement in Arpașu de Jos commune, Sibiu county and is based on the fact that renewable biological productions within practical ecosystems and the diversity of plants that make up the grass carpet are different from one location to another mainly due to differences in availability of resources and how to capitalize.

The plant species that make up the grassy carpet attest that the meadow belongs to the series and implicitly to the type Agrostis tenuis sibth - Festuca rupicola heuff. The floristic relief of the studied meadow is different depending on the location and the mode of exploitation.

The description of the analyzed meadow vegetation and the appreciation of the pastoral value as a means to good requires the application of improvement works that are the object of the arrangement constituted for this purpose and include a set of technical-cultural works adapted to the specifics of the meadow. good practices.

The application of specific improvement measures as well as the promotion of a rational capitalization lead to the increase of the grazing capacity by improving the utilization coefficient, respectively to the increase of the pasture load from 0.67 to over 1.5 LU/ha.

## ACKNOWLEDGEMENTS

This paper was supported by the Research Center for Agricultural Sciences and Environmental Protection of the University Lucian Blaga from Sibiu.

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