

ORIGINAL SCIENTIFIC PAPER

## **Research concerning permanent pastures' ecological reconstruction in the South-Eastern part of Transylvania**

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### **Abstract**

In the natural conditions specific for Romania and in the existent situation of the agricultural land found where the human factor intervened irrationally, environment protection cannot be ensured in many areas without applying in an organized manner a complex of measures and works for soil protection and ecological reconstruction of heavily degraded soils.

In this context the present paper proposes the identification and application of the most important measures and methods for improvement and ecologic use of pastures in South Eastern Transylvania

Key words: pastoral, meadow, vegetation, reconstruction, ecological.

### **Introduction**

Regarding our integration in the European Union we must emphasize the role that must be offered to our professional, organizational, economic, cultural and aesthetic training in order to manage ecologically the national pastoral foundation, rightly considered the main supplier for ecosanogene animal produce of high quality and economic value that is capable of supplying raw material both for agrotouristical pensions, other turistic locations, the remaining population and for export, under licenses and trade marks.

In the given context, the ecologic management of meadows represents a certain premise for designing ecosanogene animal produce, generally for maintaining the biovariety and especially for increasing the landscape attractiveness.

We hold the great advantage that we did not intensify too much the production of mountain meadows through fertilization with chemical fertilizers in big dosages, the establishment of seeding meadows, access roads, constructions and tourism, which lead in many European countries to the decrease in biovariety and the destructiveness of formerly natural landscapes. A growing number of tourists from these countries come to visit our country for regaining what they have lost.

### **Material and methods**

The paper consists of research organized to determine the structure of meadows/pastures and to analyse their grass vegetation in order to determine the types of pastures, the degree of degradation, the methods and means for ecological reconstruction of degraded meadows.

The establishing of the floristic composition has been performed through the double metre method

For each of the identified vegetation groups the analysis of grassy vegetation by linear surveys of vegetation has been performed based on the method perfected by Daget and Poissonnet, or the double metre method.

The vegetation surveys have been performed in two different ways, using:

a. the contacts method – at every fifteen centimetres along the double metre, a metallic stem was pushed in the ground, passing afterwards to the identification and notation of all species reaching the stem. A species that touched the stem several times is recorded only once.

b. the volume method – just the same procedure as presented before, that is along the double metre, but here we are interested in a point at 5 centimetres.

For every point we estimate the side occupied by each of the species present on a surface in the shape of a 2 cm disk. Thus, every species on the before mentioned surface and evaluated within 5 to 5 cm is granted a mark till 6, so that in the end the sum of the marks in a point should be of 6.

The study has been conducted on the permanent meadows of the Cindrel mountains that fall from a typological viewpoint in the Northern area, the sub-area of spruce fir forest.

This is to be characterized by followings: altitudes between 1200-1600 (1300-1750) m, sedimentary rocks, crystalline schists, eruptive rocks, granites, andesites, temperature 0,5-4,5 °C, rainfall of 1000-1200 mm; soils: brown with iron in it.

The meadow that has been studied is to be found in the area of Săliște city and falls in the category of *Festuca rubra*, type *Festuca rubra ssp comutata*, *Nardus stricta*, sub-type *Juniperus comunis*.

The structure of vegetal carpet is heterogenous and made up of several vegetable associations, distributed according to microstational factors and the invasive and nitrophile. One can find definite associations of dominant species like: *Nardus stricta*, *Deschamsia caespitosa*, *Agrostis stolonifera*, whereas invasive species are represented by *Pinus mugo*, *Juniperus comunis*, *Vaccinium myrtillus*, *Pteridium aquilinum* and the nitrophile species, *Urtica dioica* și *Stevia*.

## Results and discussions

Following the performed study, the existence of the following meadows categories resulted:

Degraded meadows or in the process of degradation. In the latest years the alarming phenomenon in the decrease of animal force that graze in mountain and pre-mountain areas is to be observed.

Therefore appeared meadows occupied by plants having a reduced fodder value, hills, trees and bush vegetation that definitely leads to the invasion of the meadows. In some areas the arborescent vegetation turned into a forest with forest-cultural value, thus being necessary their inclusion in the forest planning.

Afforested meadows or in the process of afforestation. The lack of meadows' maintenance works in the mountain area, the insufficient loading of animals on surface unity and the desertion have lead to the installation of the afforestation process or in the process of afforestation of mountain meadows.

Meadows with humidity excess. One of the limitative factors of production and meadows' quality is the excess of humidity.

The identification process of meadows affected by humidity excess has been conducted through observations on the floristic composition. There could be identified invaluable

species from the families *Cyperaceae* si *Juncaceae* ( rogozuri), *Phragmites australis* (trestia), *Typha sp.* (papura) and several other hydrophytic or even hydrophyte species.

Meadows on which ground falls happen. In most cases the ground falls are caused by the existence of clay masses or clayey rocks that carry the role of sliding surfaces, either for them or for other rocks on their surface. Beside the slope this can be one of the factors that can be the cause of ground falls.

The factors causing these falls are the following: water, clearing, earthquakes, a.s.o. The time period for preparing ground falls can vary, sometimes it can be very long, other times it can be very short. The most frequent ground falls happen in spring, when rainfall quantity is bigger, and there is also the phenomenon of snow melting; in autumn as well are happening several ground falls because of pouring rain.

Meadows on which weeds, toxic or noxiousness plants are to be found. There are several causes for this phenomenon and they are specific for maintained or improper exploited meadows.

Thus, the overloading of some meadows with animals or even the desertion led to the appearance of unproductive or even noxiousness plant species. These meadows are dominated by *taposica* (*Nardus stricta*), *tarsa* (*Deschampsia caespitosa*), *Rumex alpinus*, *Colchicum autumnale*, *Prunella vulgaris*, *Alliaria officinalis* (Jack-by-the-hedge) , species of *Taraxacum*, *Polygonum* and *Potentilla*, *Thlaspi arvense* (penny grass), *Xanthium*; *Lepidium ruderalis*. *Equisetum arvense*, *Equisetum hyemale* (Dutch rush), *Equisetum palustre*, *Equisetum pratense*, *Equisetum sylvaticum*, *Equisetum telmateia*, *Equisetum variegatum* (shave grass); *Lycopodium alpinum* (toadpipe), *Lycopodium annotinum* (clubmoss), *Lycopodium clavatum* (wolf's claw), *Lycopodium selago* (species of clubmoss).

On some improperly administered meadows there have grown some noxiousness plants, like: *Ricinus communis* (castor-oil plant), *Robinia pseudacacia* (acacia), *Amanita phalloides* (white mushroom), *Viscum album* (mistletoe, polypeptide phyto-toxins), *Amanita muscaria* (*Amanita*, amine and amide phyto-toxins).

#### Suggestions on the ecological reconstruction of permanent meadows

For reviving the studied areas with permanent meadows belonging to Cisnadie city, following works are necessary:

- fern control
- removing the wooden vegetation
- removing the grassy vegetable remains
- the main fertilization (in autumn)
- overseeding
- spring fertilization (annual)
- observing a set of works in the conclusion of grazing

Covering with fern. Among grassy invaders species the biggest problem is represented by *Pteridium aquilinum*. The covering with fern is characterized by its domination in certain areas ranging between 45-90%, interspersed by areas invaded by juniper trees thus influencing negatively the good vegetation on this meadow.

Fern control. One recommends for the fern control, the use of herbicide in the period when the fern has the biggest foliaceous surface, whereas in the interior of the plant there takes place the transit of the resulted sap from leaf to rhizomes.

Covering with shrub. The meadow subject to analysis holds surfaces that are covered by juniper tree interspersed with areas covered by juniper tree, bilberry bush and other invasive species, thus determining the quality of vegetable carpet to be affected by the presence of wooden species that have a large covering.

In order to recover the graze, the surfaces invaded by juniper trees and bilberry bush have to be cleared.

The autumn fertilization (or early spring). On pastures are used fertilizers with nitrogen, phosphorus, potassium and microelements. The optimal rate on our meadows is 2:1:1 where the average nitrogen level is 90-150 kg/ha, the average for phosphorus and potassium being at half, 45-75 kg/ha yearly.

Experiments conducted by Ciorte et al., (2001, 2002, 2004) on mountain pastures show that fertilizing improves production both for grazing and haying.

Oversowing. Generally it is recommended to use a mixture of fodder plants that are good for mixed exploitation, through grazing and haymaking.

The oversowing is to be conducted on areas without vegetation (that appeared as a consequence of herbicide actions, destruction of grassy or shrub bush).

The mixture recommended for the area of Cindrel mountains is made up of following species: *Lolium perenne*, *Poa pratensis*, *Festuca pratensis*, *Trifolium repens*, *Lotus corniculatus*.

The seed standard/hectare is of 40 kg, whereas the weight of species in mixture is as follows:

- *Lolium perenne* – (40 kg/ha) x 40% participation = 16 kg/ha
- *Poa pratensis* – (40 kg/ha) x 20% participation = 8 kg/ha
- *Festuca pratensis* – (40 kg/ha) x 20 % participation = 8 kg/ha
- *Trifolium repens* – (40 kg/ha) x 15% participation = 6 kg/ha
- *Lotus corniculatus* – (40 kg/ha) x 0,05 participation = 2 kg/ha

Spring fertilization. In spring one has to apply 50 kg nitrogen s.a/hectare that represents 160-170 kg commercial product (ammonium nitrate) or 110-120 kg urea.

Exploitation protocol. In case of herbicided surfaces (fern) or cleaned surfaces (manually or with MCP) is mandatory the exploitation through haymaking until the end of August. Beginning with the 1<sup>st</sup> of August one can also graze these surfaces. After each graze one has to perform some cleaning haymaking of ungrazed vegetal remains, at the end of every grazing cycle, but also performing actions with the haypole for spreading animal dejections.

Performing a rational grazing. Determining the actual production and the load with animals. The level of actual production for green mass regarding grazing surfaces falls between 10-12 t m. v./hectare.

Under the given conditions, the load with animals is as follows:

$$CP (\text{nr of animals for grazing}) = \frac{Pr}{N}$$

Pr – production of green mass per ha

N - 150 days for grazing x 50 kg m.v./ha = 7.500 kg m.v.

$$CP(\text{UVM/ha}) = \frac{1200C}{7500} = 1,6 \text{ UVM/ha}$$

After executing the maintenance and improvement works described before, the production level is expected to reach 32-40 t m.v./ha.

This fact signifies the increase in animal load (UVM/ha) as follows:

$$CP = \frac{3500C}{7500} = 4,6 \text{ UVM/ha}$$

The possible increase in production from 10-12 t m.v./ha to 32-40 t m.v./ha signifies the increase in animals load from 1,5 UVM/ha to 4,6 UVM/ha.

The development of a rich and well structured grass carpet, its maintenance through rational fertilization and its protection through elimination on appearance of rival elements:

shrubs, hills, weeds etc., as well as the normal animal load, pasturing on fields, stopping when it rains or the ground is moist and the field- meadow rotation constitute the most appropriate way to protect the formed grass layer, to protect the soil respectively (Cernelea and Bistriceanu, 1977).

### Conclusions

Given the natural conditions in Romania and the present situation regarding the agricultural land fund, in which the human being intervened irrationally, the environmental protection can only be assured in several areas by adopting in an organized manner a complex set of measures and works, which are to assure the protection of soil and the ecological reconstruction of strongly degraded soils.

The protection of soil and the ecological reconstruction of strongly degraded soils represent a highly important preoccupation on international level, including the EU, where we want to integrate.

As result of improvement works and the rational use of the studied permanent pastures important changes have been registered in the floristic composition of the grass carpet.

After execution of maintenance and improvement works described above a level of production of 32-40 t m.v./ha is expected.

Constituting improved pastures enclaves in the Cindrel Mountains with a 4 times bigger animal load and production would reduce existing pressure and would allow a normal load on the other pasture areas in order to apply durable prato-techniques or their sheltering for biodiversity protection.

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