CONCEPTS OF AFFORESTED MEADOWS EXPLOITATION THROUGH SYLVOPASTORALISM

CONCEPTE DE EXPLOATARE PRIN SILVOPASTORALISM A PAJIŞTILOR ÎMPĂDURITE

I. SAMFIRA, Al. MOISUC, Luminița COJOCARIU

Agricultural and Veterinary University of the Banat, Timişoara, Romania
Corresponding author: Ionel SAMFIRA, e-mail: Aionel 1969@yahoo.de

Abstract: *In this paper we studied the possibilities of using slag from metallurgical industry as fertilizing resources, in row materials deficit and environmental protection context. Furnace slag and steel slag which result from steel obtaining process on metallurgic plants, were analyzed for establishing fertilizing capacities and for metal content determination.*

Rezumat: *În această lucrare este studiată posibilitatea utilizării zgurii din industria siderurgică ca resursă fertilizantă, în contextul deficitului de materie primă şi a protejării mediului. Au fost analizate zgurile de furnal şi de cuptor în vederea stabilirii conținutului de microelemente şi a capacității fertilizante.*

Key words**:** *afforested meadow, arbores, exploitation, sylvopastoralism.*
Cuvinte cheie: *pajişte împădurită, arbori, exploatare, silvopastoralism.*

INTRODUCTION

What is a semi-afforested meadow?

The forest meadow or the agrisylviculture is a system which includes plant growing or animal husbandry, depending on the situation, in the presence of trees and shrubs. The result is a biological interaction which brings many advantages, multiple income sources, bettering of both the habitat and the wild fauna (KEITH, 1997).

The afforested meadow is, according to QUELCH (2001), a type of very open forest, with more grasses than trees, a crossing between forest and meadow. In the same way as the meadow is part of the ecosystem of afforested meadow, the animal grazing is integrated to this habitat too (READ, 2000). The same author states that on the afforested meadows one can find trees of all ages, and defines it finally as being an open land meadow with trees.

After HOLL (2002), one can classify the afforested meadows into:

-afforested or abandoned meadows; they are still being grazed and have an open character and a tree covering of 80-100%.

-planted or lands or orchards; this type of meadow is associated with low lands, which have been intensively exploited. As result of the abandonment there have naturally appeared here niches which permitted the apparition and development of tree species.

-afforested pastures, where the meadow element has been bettered

-afforested meadows with a semi natural flora; they are to be found on high lands building a mosaic together with other semi natural habitats

-unused meadows and meadows with trees, where the pasture element is missing and the grassy vegetation develops permitting the forestation

-afforested meadows appeared on tillable lands; these have done the transition from the tillable land (sometimes even urban land) to the forest habitat

In 1992 there has been defined the term afforested land (woodland), which has been assimilated to a land dominated by a woody and bushy vegetation higher than 5 m (at maturity), but which still offers the land opening to the sky. The woodland contains a

vegetation of different rang, but through which the sun rays reach the ground and in this way the flora and fauna diversity are higher.

DISCUSSIONS

Concepts of Afforested Meadows Exploitation by Sylvopastoralism

1. The use of the habitat – woodland network

The aim of the habitat network is to develop the connectivity of the habitat forms in order to conserve it, to use it correctly and to grow the biodiversity. The afforested meadows may bind the arbour and vegetal communities together, being an agglomeration of semi natural habitats on a given territory (JEFFERSON, 1999), (figure 1).

The management of an afforested meadow generally supposes the following: maintaining it in good conditions, restoration, and expansion if the creation of new territories is wanted. Under these circumstances a long time vision is needed, in most of the cases of afforested meadows the aim of the management being the pasture maintenance (RODWELL, 1999).

In the case of afforested meadows, the management may be split into two categories: the wooden resources management and the meadow element management (READ, 1999). The arbour resources management includes the arbour maintaining and the regeneration promotion through plantings. After the same author it is approximated that 100 arbours / hectare are sufficient in order to maintain the territory, and the controlled grazing may create opportunities for the regeneration and may maintain a balance between the pasture pressure and arbour regeneration. The meadow resources management is grounded on the fact that pasture (establishing the pasture season and the animal density) is the main tool of the conservation management and maintains the vegetation and its biodiversity.

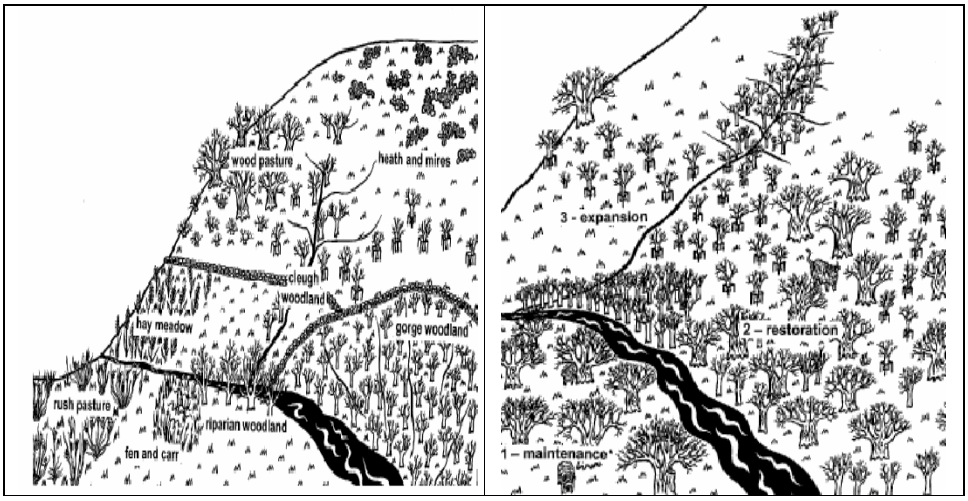

Figure 1 Maintaining of a habitat network (after RODWELL, 1999)

The farmers adopt the sylvopastoralism out of two reasons: the first one is the economic stability growing, and the second one is the natural resources management improvement (GODSEY, 2000).

The Sylvopastoralism represents the combination between arbours and meadow. The forest species are planted in rows, the animals grazing between the rows. If the conversion of an existing wood is done, some of the existing arbour rows are to be cleared, building in this way alleys. The aim is to produce quality wood, protected against the animals up to their third life year by using an electric fence or tubes for each arbour (AUCLAIR, 1999).

The animal husbandry in this system eliminates the costs of maintaining and gathering arbours. By practising a correct pasture it is also eliminated the necessity of using herbicides, and the circulation of nutritive elements is stimulated, the animal inputs being a valuable contribution to the development of the forest vegetation (FERGUS, 1995).

The pasture practise may raise the quantity of organic matter in the soil and improve in this way its characteristics. In all the cases the animal density and the number of days during which the animals remain on the meadow must be controlled in order to avoid compacting. In many cases there is to be notices the competition for water between the forest and herbal vegetation, especially in cases of drought (figure 2).

Figure 2 Pasture practise in sylvopastoralism (FERGUS, 1995)

In a sylvopastoralism system on a hazel bush plantation the absence of water during summer may affect the fruits' content but also the forming of the fructiferous gemma for the next year (FERGUS, 1995).

2. The Management of the Semi-afforested Meadows

As long as these meadows are pastured with animals, these are kept alive. If not pastured, they degrade. In other words, the pasture maintains this habitat, in the same way in which the vegetation of the water meadows is maintained by mowing (SMONT, 1997).

There are three directions of semi-afforested meadows management:

-the maintenance of the afforested meadows in favourable conditions

-the restoration – rehabilitation of the semi-afforested meadows

-the expansion – the creation of new semi-afforested meadows (ARNOLD, 1964; BALDWIN, 1990).

The activities necessary in order to better the semi-afforested meadows

These have the goal of having a positive effect not only on the veteran arbours, but also on the grass carpet. It is good to avoid the use of artificial fertilizers, of mud and household compost. The soil liming is to be used where this practise is traditional and does not affect the richness of species. Generally it is not permitted to use pesticides on the semi-

afforested meadows. The pests must be controlled without using chemical products and there must be taken into consideration the mechanic works or the works which break up the soil. The drainage and the ensuring of the humidity level vary from one station to the other.

2.1. Arbours' Resources Control

One of the main aims consists in maintaining and increasing the population of veteran arbors and of their habitats. The survival of veteran arbors on a semi-afforested forest is insured by minimal interventions on the arbor populations and by taking care of the isolated or falling-off ones (READ, 1999).

The promotion of the vegetative regeneration is important from the point of view of the biodiversity. There is continuity between the veteran arbores and the afforested meadow habitat (EVANS, 1994).

The promotion of the natural regeneration is also necessary in order to maintain the arbour populations and pays an important role in the creation of following arbour generations which should ensure the habitat continuity.

The planting of new arbour generations; in many cases the number of arbores is no little, that the natural regeneration does not give any results. In such cases the most adequate method to be used is to plant solitary arbours in order to create a semi-afforested open meadow. The planting will be done in small groups (3x3m), the space between the seedlings being of 5-15m, or in groups so that the ensured density should be of ca. 100 arbours/ha (DAJOS, 1975; DISSESCU, 1968).

Many times the planting of these arbours is recommended to be done in order to create protection curtains or „living fences", which play an important role as barrier against the wild animals, protect the soil against erosion, create a shelter for animals, lead to a increase of the ecosystem biodiversity, ensure a production of firewood and a pleasant landscape.

The classification (REIF, 2001) of arbour and bushes according to the height they may reach, shows the following: the arbours are part of the category of trees having a height of over 20 m, the shrubs have a height of 5-12m, and the bushes of 1.5-5m.

The planting of these protection curtains is done on one row (1m between plants) in Denmark and Italy (HEDELSKABET, 1998; MEZZELIRA 1999), on three rows in Germany (TENBERGEN, 1993) and on four rows in Great Britain (DEFRA, 1999).

Important to be taken into consideration are also the shrub species which invade the meadows, especially the high altitude meadows. From the species of shrubs having an important contribution we would like to mention: *Pistacia lentiscus, Arbutus unedo, Phillyrea sp., Myrtus communis, Myrtus mortelle, Spartium junceum, Spartium ginestra, Erica multiflora, Erica ascopa, Prunus dulcius, Robinia pseudo-acacia, Acer negundo, Morus alba, Tilia cordata, Celtis australis, Ostrya carpinifolia, Opuntia ficus-indica*. Besides the energetic contribution (solid fuel, these species also have good fruits consumed by the animals in the fall and in winter (BAUDRY, 1982).

The forest species invasion of meadows is most of the time very slow until the forest arbours strike roots. After this a part of the grass vegetation is quickly removed (BROGG, 1976). The seeds of the local species present in the soil of the meadows accelerate the invasion of the forest species (ARCHER, 1988). In these cases the growing rate of the wooden species is a success both because of the seeds germination and because of the vegetative development (CONNELL, 1977; WILSON, 1998).

The shrubs and arbours which invade the meadows reduce the access to the source of photosynthesis of the herbal species (SCHOLES, 1997). For example in the vegetal carpet dominated by *Sapium* arbours (14 years old) the decrease of light at the level of the vegetal carpet is up to 70-80% (SIEMANN and ROGERS – unpublished data).

The meadow and forest vegetation are competitive, both of them influencing the natural soil resources and its structure (PELTZER, 2001). So there have been planted two species, one of then herbaceous (*Bouteloua gracilis*) and one shrub-like (*Eleagnus commutate*). Both of them have been suppressed in the competition with the meadow vegetation, but in the forest the shrub-like species has resisted. This shows an interaction between the environment and the capacity of competition.

But the land use has a decisive impact on the biologic invasion and on the changes in the dynamics of the ecosystem (DRAKE and col., 1980). The human activity brings exotic ornamental species or species cultivated in a new environment. After a time this environment might be abandoned becoming an invaded area (MCINTRE and LAVOREL, 1994).

In the same time, the slope and the altitude influence the air temperature, the soil humidity, the light, influencing the composition of the vegetal communities (ARAGON and MORALES, 2003). The ability of the species differs regarding the survival and the competition capacity (PRIMARK and MIAO, 1992).

2.2. Meadow Resource Control

The pasture is the basic method of meadow managing and conserving. In order to maintain the biodiversity it is necessary to use an equilibrated pasture. So it must be taken into consideration the following factors: -the pasture season; the pasture duration; the animal that graze (LOISSEAU, 1982; DE MONTARD, 1997).

All over the world the meadow ecosystems have suffered a major change regarding the growing form because of the wooden species domination which little by little took the place of the native species. In the meadows with C_4 type plants from North America the decrease of the fire number is the main cause of building and expansion of the wooden species. The experimental group of sub-alpine meadows constituted and subjected to fire in order to determine the way the wooden species evolution is prevented by fire has revealed the following: the shrubs have grown more in number when the fires had taken place with a frequency of 1 to 4 years. On the fields annually put on fire one has managed to prevent the apparition of new wooden species, and the number of shrubs on the surface has grown with only 3,7%/year (HEISLER and col., 2003).

In the last century the abundance of the wooden vegetation in the meadow ecosystems has grown significantly. This means a possible irreversible change o the growing forms and of the dominant vegetation (HOBBS and MOONEY, 1986).

These changes influence the ecosystem functionality, and the pasture practices reduced in intensity associated with the absence of fires, together with the CO_2 enrichment in the atmosphere are also possible causes of ecosystem functionality changes (ARCHER and col., 2001).

ARNO (1986) has studied the succession between a *Pseudotzuga menziesii* wood and a *Festuca rubra* meadow situated in slope in order to obtain ecologic information necessary for practicing an alternative management and in the same time, for ensuring the fodder for animals. He has noticed that the fires which took place after 1890 have favoured the development of the meadow preventing the development of shrubs and wooden vegetation.

Between 1945 and 1955 there have appeared shrubs which lowered the quality of the meadow. The author recommends to put on fire repeatedly the meadow lands and to gather the grass correctly in order to increase the quality of the fodder.

Most of the afforested meadows with semi natural origin from the sub-alpine floor (FREMSTEAD and EVEN, 1991) are used by pasturing and mowing, produce firewood, and the communities predominant in those ecosystems are the herbaceous ones.

The semi-natural semi-alpine meadows are potential lands for the *Betula pendula* invasion. The human activities carried on from prehistoric times have been major factors for

the control of the biodiversity, composition and dynamics of those communities and their future consists in the impact of the continuous human activity towards the prevention of forest advancement (AUSTRHEIM, 1998).

One of the characteristics of the sub-alpine meadows is the control of the diversity, composition and dynamics of these communities, their future consisting in the fact that the floristic structure – ca. 20% - is built up of species which originate in lower altitude areas (AUSTRHEIM, 1998). According to the same author, the species which form an afforested meadow from the sub-alpine region are classified as follows:

-alpine species unfavoured and favoured by the management of those meadows;

-common species for those type of meadow;

-common species for the lower areas found at higher altitudes.

The species and races of animals which pasture there are of a great importance for the management of the meadow. The traditional races are better suited in order to use this resource as efficient as possible. It is recommended to use the cyclic pasture, in order not to compact the soil around the leafy roofs, which leads to the premature arbours' aging.

Life fence and barriers planting is a method which reduces the animal standing on one place and favours the development of some invertebrates and mycorhiza.

CONCLUSIONS

Nowadays we witness a qualitative depreciation of the meadow lands. The semi-afforested meadows have the advantage, as alternative, that maintain the habitat even in case of biannual extensive pasture, and in the same time also produce firewood for their owners. There have been identified two main ways in which these semi-afforested meadows have appeared; the first refers to the artificial semi-afforesting of meadows in the mountain areas because of the decrease in the animal number associated with the decrease of the farmers number (the young generation does not take over the profession of the parents and grandparents and migrates towards the city).

The second category refers to the immense naturally existing semi-afforested meadow surfaces, even if sometimes the apparition of this meadows had anthropogenous influences (clearing, fires, *etc*.), and is correlated to the increase of the animal number and the constant maintaining of the old meadow surfaces.

LITERATURE

1. MOISUC AL., SAMFIRA I., CARRERE P., 2001, *Pajişti naturale şi exploataţii ecologice*, Editura Agroprint Timişoara.
2. MOISUC A., SAMFIRA I., 2005, *Producerea biologică a furajelor*, Editura Eurobit, Timisoara.
3. SAMFIRA I, 2004, *Pajisti naturale si exploatatii ecologice*, Editura Eurobit, Timisoara.
4. SAMFIRA I., 2007, *Ecopratotehnica*, in press.