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DEGRADATION OF VEGETAL COVER THROUGH INAPPROPRIATE GRAZING ON LANDS ARRANGED WITH DRAINAGE WORKS

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Abstract

The improvement of the conditions of plant growth and development and raising the productive capacity of soils following the application of hydro and agropedoameliorative works, allowed the cultivation of large areas of land with grazing and hay fields and the possibility of cultivating a wide range of agricultural plants. This paper presents a study carried out on a surface arranged with drainage works with the current use of grazing field and exploited as arable between 1978 and 1992. Repeated and uncontrolled passing of the animals over the channel network through unarranged areas led to the acceleration of the bank erosion and the strong clogging of the channels with negative influence on the functional efficiency of the drainage network. The non-rational grazing, both on the overwet soil and over the periods affected by water deficiency, caused the destruction of the vegetal cover. The prolongation of humidity excess and water stagnation in microdepressions formed on the drained surface favoured the installation of low-quality hygrophilous vegetation.

Key words: *clogging channel, drainage works, inadequate grazing, vegetal cover.*

INTRODUCTION

Soil resources, together with the other environmental components, are directly or indirectly involved in all the aspects of the development process, and play an important role in the economic power of any country, at all levels of development (Rauta C. et al., 1998).
Increasing food demand in direct proportion to population growth has imposed either the expansion of cultivated areas or the modernization and intensification of agriculture.
The problem of increasing the productive potential of the soil lies mainly in regions where it is very low, namely in areas either with shortage of humidity or those with excess, regions in which, unfortunately, it is recorded in most cases severe shortage of food.
Excessive humidity is one of the major soil fertilities limiting factors, as it is able to diminish considerably and sometimes even completely destroy the productive capacity of the land.
The grassland is the major resource of the biosphere that sustains the life of around one billion people around the world. With the development of agriculture and means of production, human intervention in natural grasslands ecosystems has progressively increased (Schnyder H. et al., 2010).
In Romania, grasslands cover about 33% of the agricultural area (Statistical Yearbook, 2017) and form the basis of a strong growing sector of ruminants and are an essential element of sustainable farming systems that meet the demands of healthy and high-quality food.
The quantity and quality of feed is largely influenced by soil nutrients and the amount of precipitation and their distribution. The creation of anaerobic conditions in wet soils leads to the production of toxic gases such as hydrogen sulphide and carbon dioxide that drastically affect the growth of roots (Van Der Woude B.J. et al., 1994).
By the roots of grasslands feeding plants, which act as a binder in the presence of organic matter, the process of destroying the granular soil structure is stopped, in most cases leading to their improvement (Mocanu V. et al., 2013; Marusca T. et al., 2013; Simtea N. et al., 1990).

MATERIALS AND METHODS

The investigations were carried out in the middle part of Moldova watershed, Suceava County, located in the NE of the Oriental Carpathians and NV of the Moldavian Plateau.
The watershed of Moldova River is framed by the meridians 25°08'37" - 26°58'35" East longitude and the parallel 46°55'37" - 47°43'38" Northern latitude.
The studied area is crossed by the 8.2°C isotherm. The medium annual rainfall is 625.6 mm. The precipitations are characterized by an uneven distribution for months and seasons, and by large amounts recorded in 24 hours and 1-5 consecutive days.
Natural conditions favour the appearance and maintenance of excess moisture in the soil and the water stagnation on the surface of land. The flood plain of Moldova river and the terraces with width of 1.5 km, small slopes ranging from 1-5%, with flat areas and many microdepressions, facilitate the moisture excess in the soil and water stagnation on the land (Moca V. et al., 1977).

In order to increase the productive capacity of the lands, the surface and subsurface drainage system Rotopanesti-Radaseni-Fantana Mare was laid out, between 1978 and 1980, with an area of 5527 ha of which 1806 ha with underground drainage works (Figure 1).
The studied area is located in the north-eastern part of the Rotopanesti-Radaseni-Fantana Mare drainage system and is lenghtwise crossed by the main collector Somuzel (Figure 2).
The land laid out with underground drainage works is relatively flat and has been exploited as arable from the setting up (1980) until 1992. Since then, the studied area went to the use prior to the layout, namely the grassland one.
In order to reveal the degradation of the vegetal cover, observations were made on the laid-out surface and on the channel network, and topographical measurements were made on which transverse and longitudinal profiles were made.
The process of identifying grassland areas affected by excess humidity was conducted through observations on the floral composition.

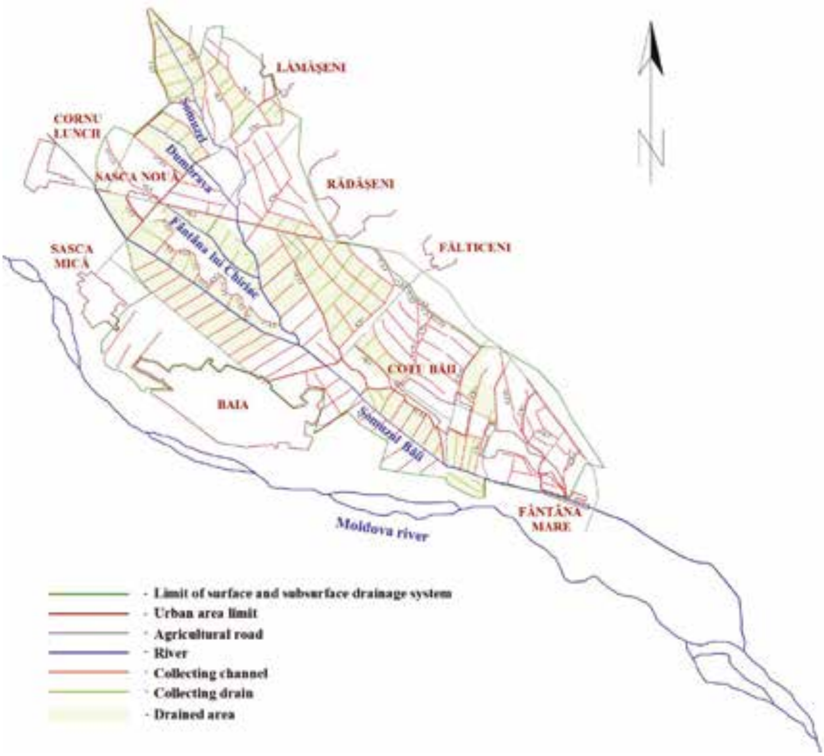

Figure 1. Surface and subsurface drainage system Rotopanesti-Radaseni-Fantana Mare

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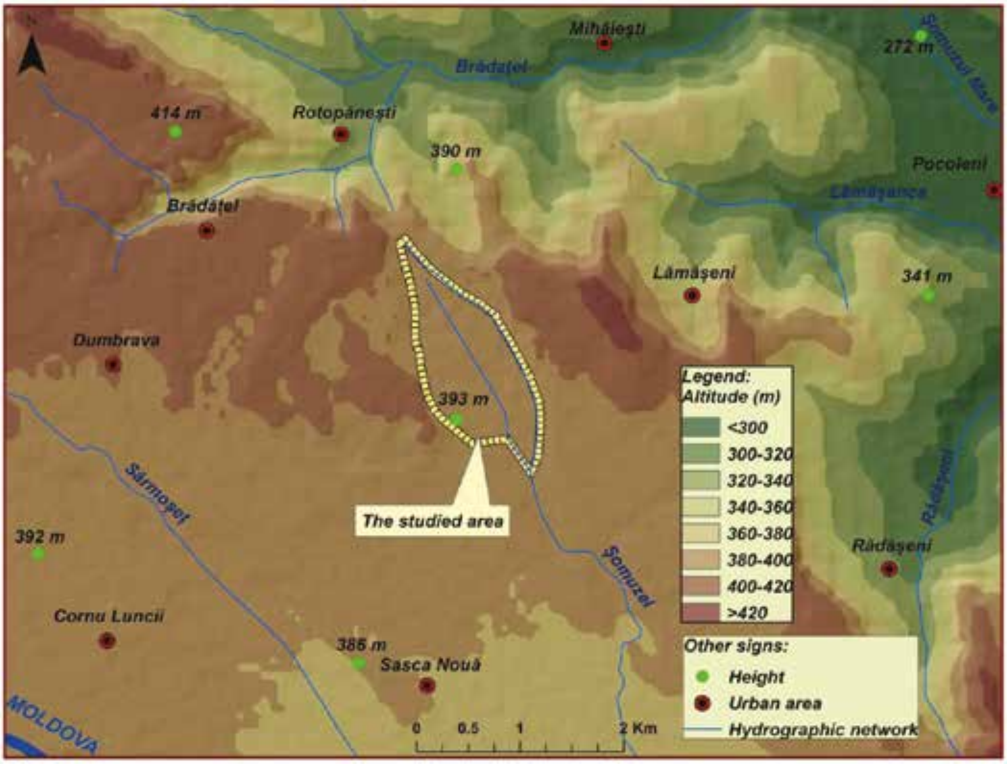

Figure 2. Location of the studied area

RESULTS AND DISCUSSIONS

Rational grazing on laid-out areas with draining works requires the observance of grazing rules related to the optimal beginning of grazing and the layout of special constructions.

On the passing of the drained surface from arable use to pasture use, no layout was made for the animals crossing the Somuzel collector channel and the two belt channels, protecting the drained surface by intercepting leaks in the higher boundary areas.

Successive crossings and grazing on the channel section with moist soil accelerated shore erosion and clogging the drainage network (Figure 3).

The clogging of belt channels of approximately 75% does no longer ensure the interception and transport of water coming from the higher perimeter areas. In the spring, on the melting of snow and over periods of abundant precipitations fallen within 1-5 consecutive days, the accumulated waters overflow, flooding the drained surfaces (Figure 4).

The clogging of the Somuzel collector channel has led to the clogging of the discharge outlet of the collector drains and their decommissioning (Figure 5). The repetitive and uncontrolled passage of animals over the channel network through unscheduled places led to clogging on the sections and the creation of back slopes that favoured water stagnation and sedimentation of alluvium.

The layout of a dam on the Somuzel collector channel for the accumulation of water for watering the animals accelerates the erosion and clogging of the channel and favours the prolongation of the excess moisture in the adjacent area (Figure 6).

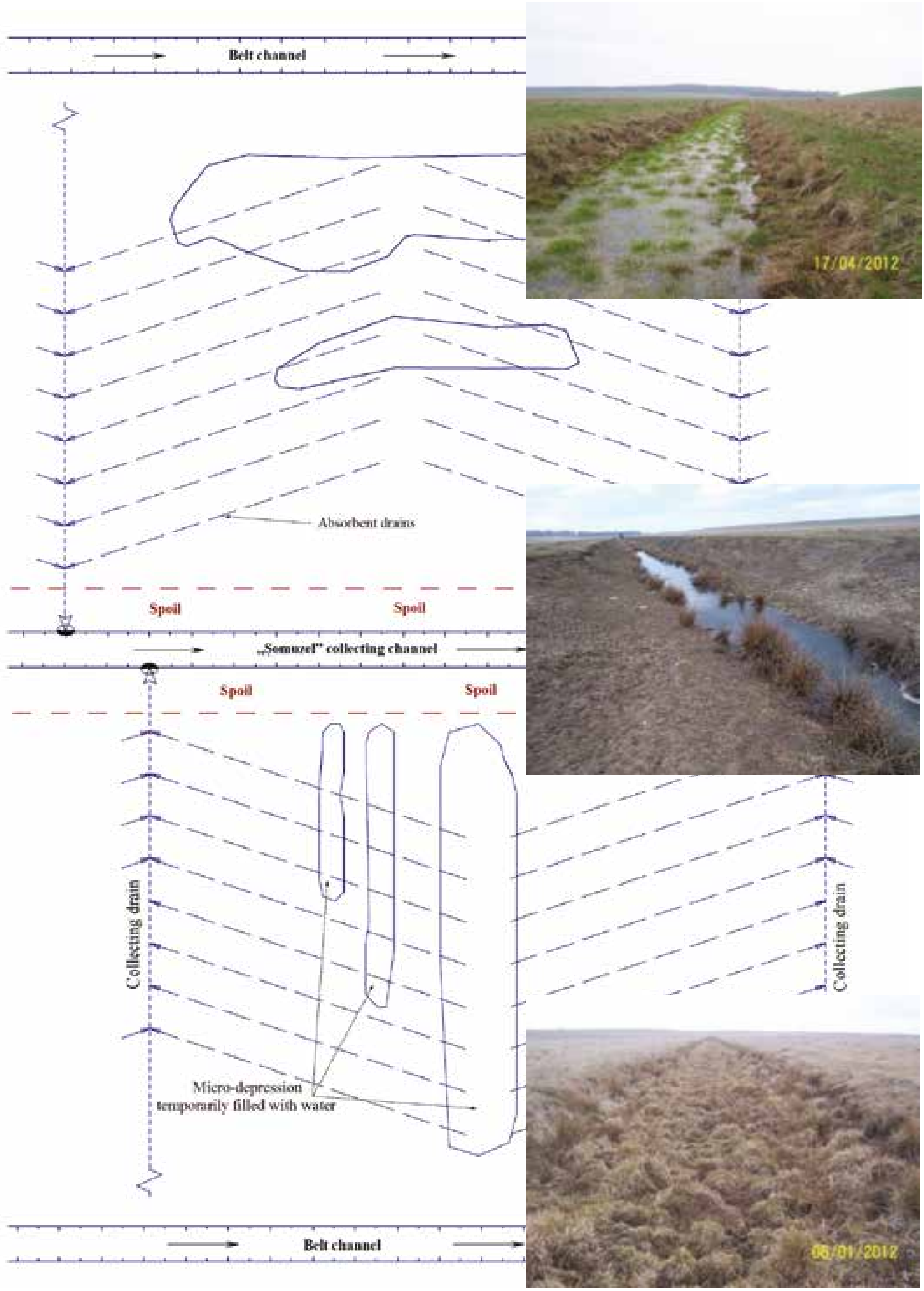

Figure 3. Draining layout scheme and current channel state

Figure 4. Water overflow on the drained surface

Figure 5. Drain holes to clogged

Figure 6. Arranging watering holes on the Somuzel collecting channel

The decommissioning of the drainage network through the clogging of the discharge outlets favoured water stagnation in the micro-depressions formed on the drained surface (Figure 7). These microdepressions formed during the exploitation period as arable land have expanded due to the stagnation of the water for a long time, the settling of the surface planted and the soil's kneading by animals during grazing. The gradual increase in water stagnation is due to greater susceptibility of soils to softening with excess moisture.

The flat lands situated at the base of the slopes between the two ring channels are most affected by the spring rains that coincide with the melting of snow. The water cannot leak to the surface of the soil and the drainage does not occur due to the discharge outlets of the destroyed and clogged collector drains.

Water stagnation is also favored by the landfill sites resulted from the excavation of the channels that have been leveled along the canals over a width of about 20 m, the resulting platforms having a height of up to 0.50 m (Figure 8).

Figure 7. Water stagnation in microdepressions

Figure 8. Landfill sites modelling along channels

According to the Methodological Norms for the application of the provisions of Government Emergency Ordinance no. 34/2013 on the organization, management and exploitation of permanent grasslands and amendment and supplement of the Land Fund Law no. 18/1991, article 6, paragraph 1 - the introduction of animals into grasslands is allowed only during the grazing period provided for in the pastoral arrangement, and paragraph 2 stipulates that: "grazing is forbidden in the case of excess humidity of the grassland" (Vintu V. et al., 2017).

In the early phase of vegetation, the plants on the grazing fields have special organoleptic (taste, odour) attributes that increase the appetite of the animals and thus increase the degree of consumption of grass that can reach 85-95%. If grazing starts too early, when plants that are too young and the soil that is too wet destroy the celery layer, the soil is struck and soil air is getting worse. Pits and heaps are also formed (Figure 9), and young plants with reduced foliar surface use for their restoration reserve substances accumulated in the organs in the soil, which lead to their exhaustion.

Excessive grazing when soil is moist makes the vegetable cover be destroyed by clogging.

The wetter soil becomes, the lower the ability to withstand compaction and subsidence is, causing the asphyxiation of plants.

In addition, in areas whose celery layer is kneaded, over periods with shortage of water the vegetation suffers from the poorly developed root system and excessive grazing destroys the vegetal cover.

Figure 9. Destroyed vegetal cover

As a result of inadequate grazing in periods of the moist soil but also when the soil is dry, the clogging of the channel network and the discharge outlets of the collector drains, water stagnation in microdepressions, the interference of the surface water leakage by landfills deposited along the channels, the use of drainage channels as water troughs, the studied permanent grazing fields have made important changes in the floral composition of the vegetal cover.

Thus, valuable, more demanding species of water, air, and soil have disappeared from large areas and have been replaced by hydrophilic species with very low fodder value: *Carex caryophyllea, Carex praecox, Juncus trifidus, Juncus effuses, Agrostis stolonifera, Ranunculus repens, Ranunculus acris, Ranunculus sceleratus, Glyceria maxima, Glyceria fruitans, Galega officinalis* and *Trifolium fragiferum* (Figure 10).

The degradation of the grazing field is manifested both by destroying the vegetal cover and by changing its floral composition. The well finished and good-quality vegetal cover is only found in the higher areas, including the landfill area, unaffected by the presence of excess moisture.

Figure 10. Hydrophilic vegetation

Due to the inappropriate operation of the draining network, water from snow melting stagnates by up to 15-20 days longer, which has a negative effect on the growth of the grass cover. Excessive grazing until late autumn with sheep and the delay of spring plant growth does not allow the restoration of the vegetal cover. Repeating this cycle year after year has led to the degradation of large grazing fields. For the restoration of the vegetal cover, it is necessary to start grazing later, to interrupt the grazing by at least 3-4 weeks before the first frost and to perform the rehabilitation works of the draining network.

CONCLUSIONS

Repeated crossing of animals through unscheduled places, grazing and watering on the channel section accelerate shore erosion and clogging of the drainage network.

The clogging of channels and obstruction of discharge outlets leads to the decommissioning of drainage network, stagnation of water in microdepressions and prolongation of excess moisture, changing the floral composition of pastures by replacing valuable species with low-quality hydrophilic species.

Grazing over periods of moist soil causes the soil to knead and compact, and the vegetal cover is destroyed by clogging, causing asphyxiation of the plants. In addition, over periods with water scarcity, vegetation in the areas with kneaded soil suffers from the poorly developed root system.

The degradation of the vegetal cover due to soil kneading by grazing depends on factors such as soil physical properties, soil moisture content, animal number and size, grazing duration and grazing field coverage.

The measures necessary for the recovery of the grasslands with the destroyed vegetal cover consist in the rehabilitation of the draining systems, the upturning of the grazing fields and the sowing and the elaboration of a grazing arrangement. The widespread application of such large-scale measures is unlikely due to the lack of support and financial resources. In this situation, the authors recommend concentrating the efforts of local authorities to facilitate the leakage of water to the surface by making trenches, the unclogging of discharge outlets of collecting drains, banning grazing in moist soil areas and the interruption of grazing by at least 3-4 weeks before the first frost.

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