

## PEDOLOGICAL STUDY REGARDING THE ECOLOGICAL RECONSTRUCTION OF PASTURES SOILS FROM THE LOWER CHINEJA BASIN, GALAȚI COUNTY

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### Abstract

The present paper aims the assessment of the edaphic potential of the pastures soils located in the lower basin of the Chineja river, in the out-of-town of Tulucești commune, thus emphasizing the factors that led to their degradation, the current productive potential of the soils and several ecological rehabilitation measures of the pastures to increase their productivity.

For each sample, the following parameters were determined: pH, CaCO<sub>3</sub> content (%), total content of soluble salts; humus content (%); total nitrogen concentration (%); mobile phosphorus and mobile potassium content (ppm); soil texture; base cations sum, hydrolytic acidity; the degree of basic cations saturation; volumetric weight and nitrogen index (NI%).

The processed data that were included in the soil analysis reports consisted of a physical and chemical assessment of the mentioned ecopedological and agrochemical indicators values, the delimitation of land units, the land classification and the reliability classes concerning the pasture use. After the results were obtained, a series of recommendations were proposed on the ecological improvement of pastures.

In the studied area, there is a chernozems predominance with different degrees of surface erosion and also affected by current geomorphological processes, erodic anthrosols and aluviosols. Overall, the areas occupied by pasture in the out-of-town of Tulucești commune are characterized by a quality class and a suitability with severe limitations, which leads to appreciable systematic decreases of production, hence requiring intensive improvement and amelioration measures.

From an ecological and economical point of view, in order to obtain a rich vegetation that provides the farmer with the right amount of animal fodder and at the same time to improve the geographic landscape, through the applied measures, it is necessary to raise the awareness of the pasture users concerning the sustainable management of natural pastures.

**Key words:** degradation, pasture, ecological reconstruction

Considering the fact that pastures have been exploited in an unreasonable manner in the past years, without applying the specific agrotechnical methods for their maintenance and without observing the grazing regulation, they will be in a state of advanced degradation, with a poor vegetal carpet regarding valuable species from the feed point of view, and soils that will be extensively subjected to an accelerated process of anthropogenic erosion.

Under these conditions, the present paper aims the assessment of the edificial potential of the soils related to the pastures in the lower basin of the Chineja River, in the out-of-town of Tulucești commune, by emphasizing the factors that led to their degradation, the current productive potential of the soils and the reconstruction measures of the pastures in order to increase their productivity.

### MATERIALS AND METHODS

**Working material.** To elaborate this work, a 1:10000 scale cadastral plan was used from the Galati OJSPA archive (2003) and the aerophotograms from the GoogleEarth software.

**Working methods.** The pedological and agrochemical information, necessary for the elaboration of this work, were taken from the Galati OJSPA archive;

Depending on the territorial distribution, the area of 199.50 ha of pasture that is on the administrative territory of Tulucești was divided into seven pastures as follows: North East Șivița (7.30 ha); South-East Șivița (15.40 ha); Tâtarca - Tulucești (24.00 ha); Southern Tulucești Village (9.70 ha); Southern Garboavele Forest (5.10 ha); Northern Gârboavele Forest (123.10 ha); Frumușița Border (14.90 ha).

For each pasture, the data regarding a main soil profile and of an agrochemical sample

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(0-20 cm depth) were taken into account and processed. Due to a greater soil variation, five main soil profiles and 23 agrochemical samples have been studied for the Northern Gârboavele Forest, which has a larger area and is distributed on both sides of the Gârboavele Valley.

For all the samples, the following indicators were analyzed: pH, CaCO<sub>3</sub> content (%), total content of soluble salts; humus content (%); total nitrogen concentration (%); mobile phosphorus and mobile potassium content (ppm); soil texture; base cations sum, hydrolytic acidity; the degree of basic cations saturation; volumetric weight and nitrogen index (NI%).

The processing of the data included in the soil analysis reports consisted of a physico-chemical analysis of the mentioned pedological and agrochemical indicators values, the delimitation of ground units, the results being centralized for the calculation of the land classification marks and the suitability classes for the pasture use.

Based on the obtained results, a series of recommendations were made regarding the ecological improvement of pastures.

The agrochemical samples were interpreted according to the ranges shown in the State Agricultural Business Bulletin tables (1983) for both soil and nitrogen supply, mobile phosphorus and mobile potassium.

## RESULTS AND DISCUSSIONS

The studied area is located in the Covurlui River's high plain, the microdistrict of the Baleni-Tulucești Plateau (V. Sficlea, 1980) with a relief characterized by an accentuated degree of northern-southern orientation, the pastures being distributed both on the inter-rivers with moderate (10-20%) and strongly inclined (25-50%) versants.

Furthermore, it has different exhibits that reflect the influence of the geological structure, consisting of intercalations of sandstone, limestone with a higher resistance to erosion, thus preserving the long inter-rivers, and the valleys, very representative being the Gârboavele Valley, which has a symmetrical cross-section and northern-southern orientation.

The soils were formed and evolved on fragile materials (loess and carbonate loess deposits on the inter-rivers) and carbonate river materials in the alluvial plain area of the streams that drain the analyzed area.

From the climatic point of view, the mentioned area is situated in a temperate-continental climate with an excessive character, with average annual temperatures of 10.7°C, with a high variability during the year, annual average

rainfall, usually of a torrential nature, summing 485.7 mm/year and winds with erosive potential.

The groundwater can be found at depths of over 10 m on the inter-rivers, without affecting the pedogenetic process, and at 1-6 m in the meadows of the main valleys. Sporadically, coastal springs appear, which supply water to the soil profiles.

The vegetation is represented by the heavily anthropic steppe, with steppe elements, predominantly grasses and legumes.

The interdependence and the continuous relationship between the pedogenetic factors have led to the formation and evolution of well-defined soils with deep profiles. Soils were determined to be from cernisols (caberic and cambic chernozems), antrosols (calcium and cambic erodic anthrosols) and protisols (saline mollic aluviosols).

The chernozems are predominant that have different surface erosion degrees, being affected by current geomorphological processes (landslides, drains, gullies) (*figure 1* and *figure 2*).

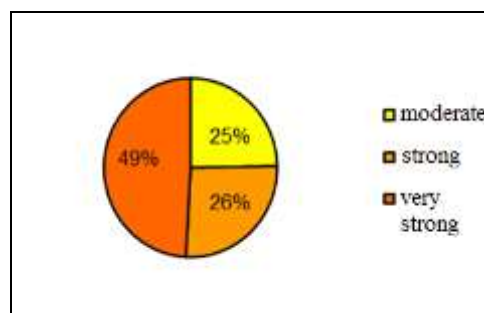


Figure 1 The ratio of water erosion

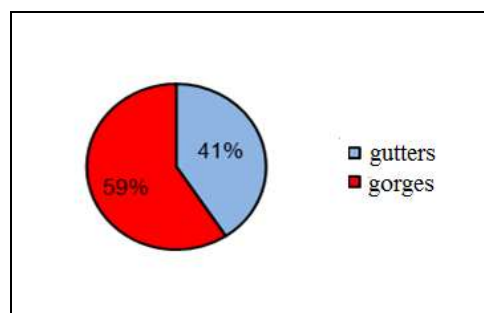


Figure 2 The ratio of deep erosion

Processing the data provided by O.J.S.P.A. Galați, led to the conclusion that 142 ha (71.18%) of the pasture area is affected by water erosion as follows: moderate (26.70 ha - 18.80%), strong (40 ha - 28.17%) and very strong (75.30 ha - 53.03% and 70.20 ha - 35.19%), by deep-erosion factors (gutters on 28.60 ha - 40.74% and gorges on a surface area of 41.60 ha - 59.26%).

In terms of humus supply, the soils are poorly supplied on an area of 106.10 ha, average

on 46.70 ha and good on 46.70 ha. The nitrogen content is average on 135.0 ha, high on 17.00 and very high on 46.70 ha.

Generally, high humus and nitrogen values were found on areas where the animal feces fertilization was carried out over a longer period of time, without respecting the grazing timetable, the livestock ratio per green mass / ha and the legislation on the protection of waters against pollution by nitrates (figure 3 and figure 4).

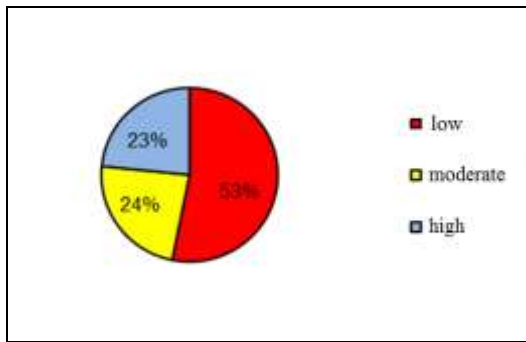


Figure 3 The soils supply with humus (%)

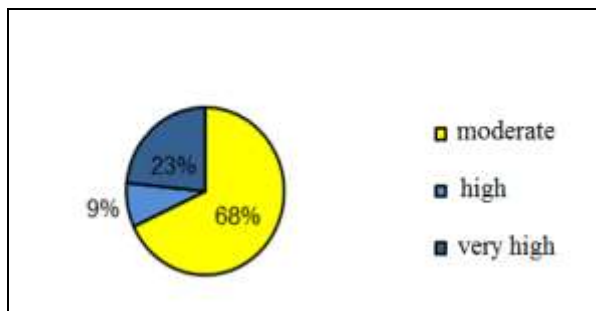


Figure 4 The soils supply with nitrogen (%)

Regarding the supply of mobile phosphorous in soils (figure 5), a very low content was found for 57.70 ha, low on 56.80 ha, medium on 28.60 ha, high on 46.70 ha and very high on 9.70 ha. The content of mobile potassium (figure 6) is low on 14.90 ha, average on 121.10 ha, high on 53.80 ha and very high on 9.70 ha.

High values of these elements are found where large nitrogen-consuming plants have developed, to the detriment of those who prefer a balanced consumption of nutrients, so that potassium and phosphorus remain in excessive amounts on certain surfaces, the excess leading to the inactivation or deficiency of important microelements for the optimal development of plants with feed potential.

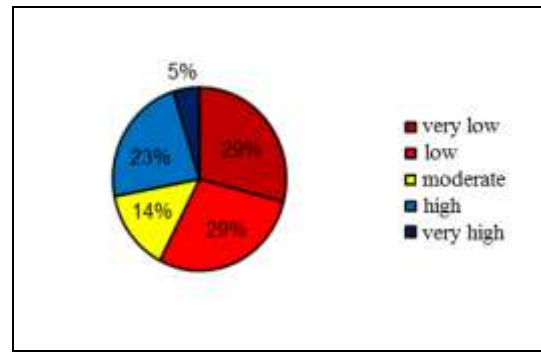


Figure 5 The soils supply with mobile phosphorus (ppm)

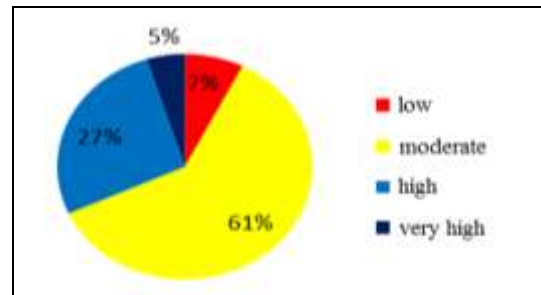


Figure 6 The soils supply with mobile potassium (ppm)

In terms of soil pH (figure 7), it is neutral on 17.00 ha and slightly alkaline on 182.50 ha, being at the optimum intervals preferred by fodder plants.

The rational management of soil resources with the purpose to ensure their protection and amelioration implies knowing all their characteristics very well. So that, these types of attributes are influenced by the convergence of the involved ecopedological factors (pH, humus supply, texture, salt content etc.) and based on them the production capacity of the land can be assessed (Țărau D., 2003). The quality value regarding the pasture use (figure 8), under natural conditions, was calculated based on the following results:

Class III quality - grade 51 (11.20 ha)

Class IV quality - grade 30 (120.20 ha)

Class V quality - grade 13 (51.30 ha)

The quality class that was determined for the whole surface was class IV – grade 30 (199.50 ha).

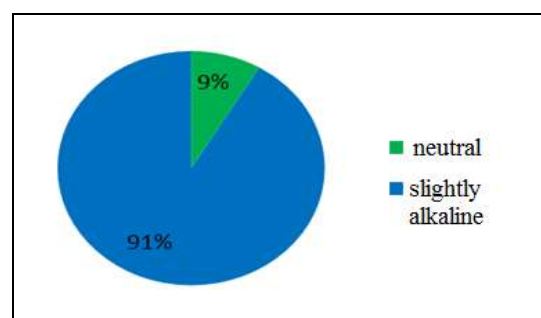


Figure 7 Soil Reaction

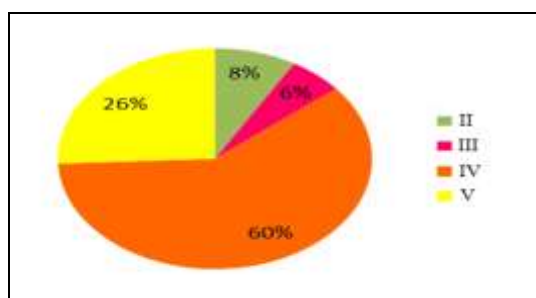


Figure 8 Quality Grades for Pasture Usage

Depending on the nature and intensity of the restrictive factors on the production of green meal for animal feed and for the accurate determination of the most appropriate agrotechnical measures to increase the fertility of the soil, preventing and combating its degradation, the suitability of the land, under natural condition (figure 9), for the use as pasture, was determined as follows:

Third class of suitability - 73.80 ha

Fourth class of suitability - 125.70 ha

Average suitability yield on the total area - fourth class (199.50 ha).

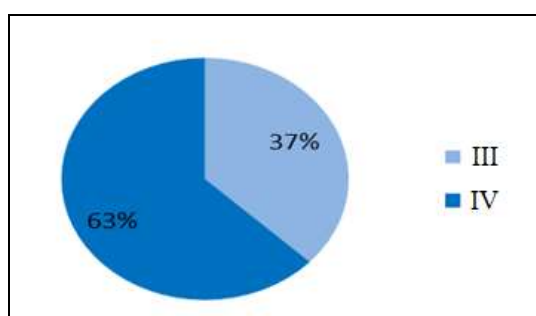


Figure 9 Suitability classes, under natural conditions, for pasture use

## CONCLUSIONS

The areas occupied by pasture in the out-of-town of Tuluțești commune are characterized by a quality and suitability class with severe limitations, which determines appreciable systematic decreases of production.

In this context, they require intensive improvement measures to increase their soil fertility potential to produce green meadows, under optimum environmental protection conditions and in correlation to the animal feed needs.

Based on the fertility potential of the land, for the surface taken into consideration, on 41.60 ha (20.85%) the value is low, average for the area of 101.30 ha (50.78%) and high for the area of 56.60 ha (28.37%).

Concerning each soil type, the green meadows yield that can be obtained per hectare

under natural conditions is as following: 19 t/ha for aluviosols; 7-17 t/ha for chernozems; 3-12 t/ha for anthrosols. The average natural mass production per hectare per UAT is 8 t/ha.

Under these conditions, a series of improvement measures have been proposed, whose effect on a medium and long term will be to improve soil quality by slowing down the degradation process, in correlation to the pasture enrichment with valuable species and increased production.

The main proposed measures are: radical fertilization (organic and chemical) on 121.10 ha (60.70%); surface drainage, deep drainage, leveling, setting up protection plantations on lands affected by landslides - 78.60 ha (39.40%); arranging the trenches - 41.60 ha (20.85%); cultivating/or re-cultivating the pasture areas with degraded vegetal carpet; destroying the heaps; grassing of meadows; combating weeds; collecting the fallen branches; mowing the meadows after each grazing cycle; combating pollution on surfaces where garbage was stored.

From an ecological and economical point of view, in order to obtain a rich vegetation that provides the farmer with the right amount of animal fodder and at the same time to improve the geographic landscape, through the applied measures, it is necessary to raise the awareness of the pasture users regarding the irrational management of natural pastures, with a negative impact on the area in which they operate, as well as on the entire community.

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