Original Article

Preliminary Study Regarding the Quality Status of Soil Resources in a Rural Environment

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Abstract

The problems of soil degradation and soil destruction are caused by the different forms of land use. In recent decades this problem poses a threat to agricultural production and terrestrial ecosystem. In the present study we examined soil morphology and soil physical and chemical properties of some meadow sites in Surdesti village (North-West Region, Romania). The existence of a soil having evident acidifying tendency due to the grazing process was noted. This fact generates a slowing down of the organic matter decomposition. Cation exchange capacity, sum of exchangeable bases and base saturation of soils are reduced. On the basis of morphological and physicochemical analysis, taking some remedial measures of the soil quality is aimed.

Keywords: Şurdeşti village, soil morphology, acidification, base saturation

1. Introduction

Soil is a three phase system which plays different roles in the biosphere, such as: i) regulation of biogeochemical cycles, ii) microorganism habitat and iii) medium for plant roots [4]. It is estimated that nearly 2 billion ha of soil resources in the world have been degraded, namely approximately 22% of the total cropland, pasture, forest, and woodland [1].

Soil environmental quality is the capacity of a soil to function, within ecosystem to sustain biological productivity, and promote plant, animal and human health. Rural areas experience a number of environmental problems.

As a natural process, soil degradation can be enhanced or dampened by a variety of human activities such as inappropriate agricultural management, overgrazing, deforestation, etc [1]. Degradation factors can generate negative consequences on the soil morphological and physico-chemical properties: organic matter decrease, compaction, acidification etc. The process of acidification is a natural process, which can be accelerated by certain plants and human activities or can be decreased by the management practices [9].

As a result of soil degradation, world-wide agricultural problems, changes in the natural habitats and climate change have arisen.

Agriculture has been based for a long time on the notion of the soil as an inexhaustible resource for continually increasing production [6]. Organic farming would have a smaller impact on the environment, but there is necessary to do maintenance work, starting from the ground.
2. Material and Method

Şurdeşti village from the Maramures County is located on the map at 47° 36' North, 23° 46' East. Rural population deals mainly with livestock (sheep and goats).

![Image of soil profiles](image_url)

**Figure 1.** Aspects of soil profiles (original)

3. Results and Discussions

Following the regular yearly grazing process, there was observed a degradation of the investigated area, an excessive soil compaction due to lack of ameliorative works, which lowers the nutritional value of the pasture.

The horizons sequence and also the texture and structure provide quick information about the soil properties (table 1).

Soil physical and chemical properties show variability as a result of dynamic interactions among environmental factors such as climate, parent material, topography and land cover/land use [2, 3].

Physical and chemical properties of the studied soils are presented in table 2.

Regarding the physical characteristics of the soil, particle size indicates a high level in fine sand and clay, no significantly textural differences in the three analyzed profiles.

The soil of all the experimental sites had sandy clay loam texture. But in addition in the case of strong acid soils there is a loss of soil structure due to loss of the fine clay [5] and the fact that the very low pH is maintained for at least 10 years [10].

The low pH levels observed in these soils is attributable to excessive grazing and lack of maintenance works.

This could be remedied by a controlled grazing system. According to Munns and Franco, 1982, decreasing soil reaction may result in the deficiencies of potassium, phosphorus, molybdenum, sulphur and zinc.

The strongly acid environment conditions lower the rate of organic matter decomposition. This explains the fact that the shallow layer of the profile have a higher percentage of organic matter (11.6%), but this value decreases with depth.

Cation exchange capacity can be a good indicator of soil productivity.

Sandy soils, humus poorer have lower values of $T$ (1-2 me) [8].

In the studied case the values vary between 9.15-17.4 (table 2) due to progressive soil acidification, loss of alkaline cations: $\text{Ca}^{2+}$, $\text{Mg}^{2+}$, $\text{K}^+$, $\text{Na}^+$, occupied by the acidic cations ($\text{H}^+$ and $\text{Al}^{3+}$).
This is also observable by the sum of exchangeable bases, \( S_b < T \) which means that there are base unsaturated soils. Base saturation (V, %) does not exceed 52% in Profile I at pH of 5.10, 68% at pH of 6.70 in Profile II and 63 % at pH of 6.60 in Profile III, at depths of 40 - 85 cm. In the superficial layers the base saturation level is below 50% in all the three soil profiles.

4. Conclusions

The objective of this study was to evaluate overgrazing influence on changes in soil physical-chemical properties in a rural environment. Physical soil characteristics indicate a clay loam texture, therefore there should be taken measures to minimize compaction.

Some soil chemical properties decreased in the order: \( V > T > S_b > \text{pH} \). In the superficial horizons in all three analyzed profiles pH is less than 5 and impregnation of profile by organic matter vary because decomposition processes are slow; thus the plant mass production will be diminished.

New perceptions and concepts for sustainable land use should be developed, which are in conformity with the constraints of nature. It is essential to combat soil degradation not only for food security and ecological health, but also for the guarantee of global sustainable development.
References


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