SUSTAINABLE USE OF SOIL AND WATER RESOURCES IN ZÁVOI MUNICIPALITY, CARAȘ SEVERIN COUNTY IN THE CURRENT CONTEXT

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Abstract. *Soil and water resources represent some of the great wealth with which nature has endowed our planet. The purpose of the paper is the study of these resources (soil and water), from Zăvoi commune, Caraș Severin county, considering the recent climate changes, which tend to negatively influence this area as well, with repercussions on the entire evolution plant development. The health of the soil and the purity of the water are essential to be able to talk about the quality of life, environmental factors (soil, water, climate, air, etc.) can influence the well-being and health of people. For the preparation of the paper, data obtained both from observations in the field and data taken from previous researches, including OSPA Caraș Severin, were used. The town of Zăvoi has a total area of 39600 ha, of which 53.66% (21249 ha) are agricultural land and 43.30%, i.e. 17145 ha, is forest. The diversity of the relief units made the area divided: the area of the hills, where luvosol and eutricambosol soils are found and which offer the possibility of a more varied agriculture and obtaining large productions; the hilly floor, which includes a mixed agricultural area, thanks to various soils, represented by regosols, lithosols, districambosols, prepodzols and antrosols, here the largest area of land is forested and the meadow area, where we find alluvial soils, along with stagnosols and gleosols , the most common being soils with excess phreatic moisture and requiring drainage improvement works. In this area, a number of plants are cultivated such as: wheat, corn, sunflower, oats, orzoaica, up to vegetables, potatoes and beets. The general capacity of these soils in terms of agricultural production capacity is medium.*

Key words: *soil resources, water resources, sustainable use, climate change*

INTRODUCTION

Agricultural production is carried out under the influence of various environmental factors, modifies more or less, in relation to man's ever-increasing ability to change them. One of the long-standing concerns of researchers and practitioners has been to find the best indicators of environmental factors and conditions that most accurately express the favorability of plant growth and fruiting (ȘMULEAC, L., ET AL., 2021). All environmental factors have a very different spatio-temporal manifestation (PASCU, R., M., 1983). The criteria and indicators for the characterization and division of homogeneous territorial areas must be distinct for each individual factor, condition or attribute, attributes that manifest themselves in a certain form and in a range of manifestation of the phenomenon both for the entire surface of the Earth and and for the given geographical space (DAVID, G., ET. AL., 2018; RĂUȚĂ, C., 1995).

Knowing the relief is necessary to be able to appreciate the land as a whole, as an element that influences production, as well as to make possible correlations with other environmental factors related to the relief (in general, pedoclimatic and water conditions) (SOFO, A., ZANELLA, A., PONGE, J.-F., 2019).

The lithological complexity of Caraș Severin county has made solutions evolve here on extremely varied rocks and parent materials (from clays to sands, from rich and complex rocks from a geochemical point of view to poor materials). This geological feature, cooking the dynamic side of the environmental condition, which it transforms into a vegetation factor (IANOȘ, GH., ET. AL., 1992, 1997). Some observations regarding the role of rock in the qualitative assessment of land can be made on the total native phosphorus or potassium content

of parent materials and trace elements, especially if the additional input of chemical fertilizers is insufficient (DUMA COPCEA ET AL., 2021; ŢĂRĂU, D., ET AL., 2005, 2020).

In approximately the same way, the influence of groundwater is treated in the process of qualitative assessment of land (VRÎNCEANU, CALCIU I., 2000). In a first phase, the presence of this source in the control section is penalized by means of an indicator that specifies the depth at which the restrictive factor is located. Both in the case of glazing and that of stagnoglazing, the sources that generated the phenomenon may be missing for longer or shorter periods of time (OKROS, A., ET. AL., 2019; POSEA, GR., ET. AL., 1976).

The interaction of environmental and soil factors results in two trends, two approaches to the problem (NIŢĂ, L., ET AL., 2018). On the one hand, the totality of the soil characteristics generates the interaction in time and in a defined space the notion of fertility, and on the other hand the way in which all environmental factors are interconnected, to create an optimal state of vegetation, defines the notion of favorability (MIHUŢ, C., NIŢĂ L., 2018; MIRCOV, V. D., ET AL., 2021).

MATERIAL AND METHODS

The aim of the work is the study of the soil and water resources in the Măru area, Caraș Severin county, in the current context in which we find ourselves, given the climate changes that increasingly influence the soil and water resources available in the studied area with repercussions on the entire evolution of plant development. Both soil and water are vital to our life and to the entire planet. If the two resources are insufficient, an imbalance of life on Earth would occur (ROGOBETE, GH., IANOS, GH., 2012).

The health of the soil and the purity of the water are essential to be able to talk about the quality of life, environmental factors (soil, water, climate, air, etc.) can influence the well-being and health of people (RĂUŢĂ, C., CÂRSTEA, S., 1993.

For the preparation of the paper, data obtained both from field observations and data taken from previous researches, OSPA Caraș Severin and Zăvoi City Hall were used.

This paper is based on the selective evaluation of data from the specialized literature on the general and particular fundamental aspects regarding the formation, spread and use of soil and water resources in the studied area, in the current context in which we find ourselves.

Research methods were:

1. Regarding soil resources. I made a series of trips to the field, I made a series of observations on the area and compared them with previous studies carried out by various researchers and with those provided by OSPA Caraș Severin and Zăvoi City Hall, as well as from local residents.

2. Regarding water resources. I studied the specialized bibliography, a series of maps, descriptions and information related to the Bistra River, the main water course in the studied area and the influence and importance it has on the soils.

RESULTS AND DISCUSSIONS

1. RESEARCH ON THE USE OF SOIL RESOURCES

Zăvoi commune is located in the N-E part of Caraș Severin county, along with 5 other localities, namely: Zăvoi, Măgura, Poiana Mărului, Valea Bistrei and Voislova (ŢĂRĂU, D., LUCA, M., 2002) (figure 1.).

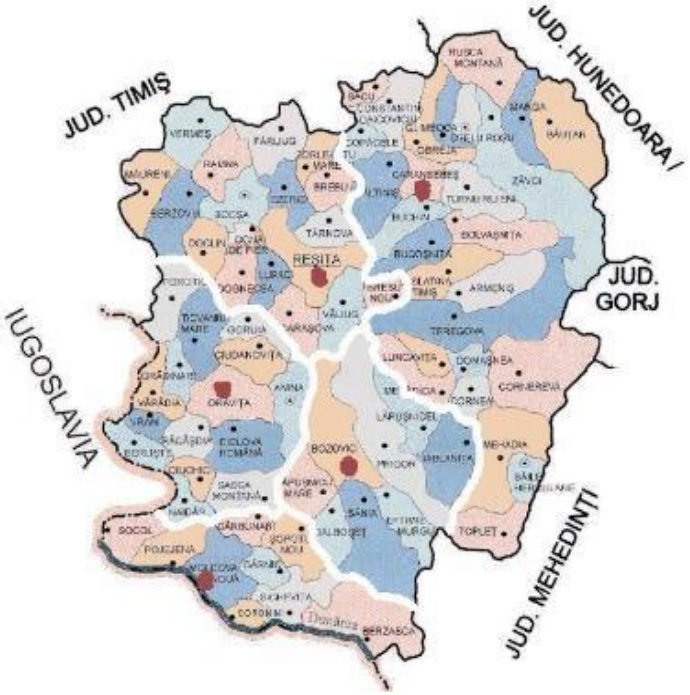

Figure 1. Geographical location of Zăvoi commune
(http://www.hartaromanieionline.ro/harta-judet-Caras-Severin)

Regarding the soil resources in the studied area, they are (according to OSPA, 1996):

- From the class Protisols: alluviosol;
- From the class Cambisols: eutricambosol and districambosol;
- From the class Luvisols: luvosol;
- From the Hydrosols class: stagnosol and gleosol;
- Associations of soils.

Due to the varied relief (hill, meadow, terrace, mountain area), the soils in this area are very diverse, having different properties.

The total area at the level of the commune is 39600 ha, of which 53.66%, i.e. 21249 ha are agricultural land and 43.30%, i.e. 17145 ha is forest.

The general capacity of these soils in terms of agricultural production capacity is medium. This fact is due to the high proportion of certain types of soil that have a low natural fertility or due to soils affected by excess moisture, as is the case with those of the type: eutricambosols, gleosols, stagnosols, alluviosols.

Regarding the agricultural lands, a great diversity of the soil cover is highlighted in relation to the conditions due to the presence of the slope. Due to the fragmentation of the land as a result of the large number of owners, the agricultural areas are highly diversified by: arable land, pastures, hayfields, vineyards and orchards or mixed use. The distribution of these lands according to the landforms determined a real "soil mosaic" with an uneven distribution, especially on the slopes.

2. RESEARCH ON THE USE OF WATER RESOURCES

Considering the fact that the town of Măru is located along the Bistra valley, as can be seen from the presentation of Caraș Severin county, the Bistra river is the most important water resource in the area (figure 2.).

The main water course, which crosses the commune of Zăvoi from east to west, is the Bistra river, the main tributary of the Timiș river.

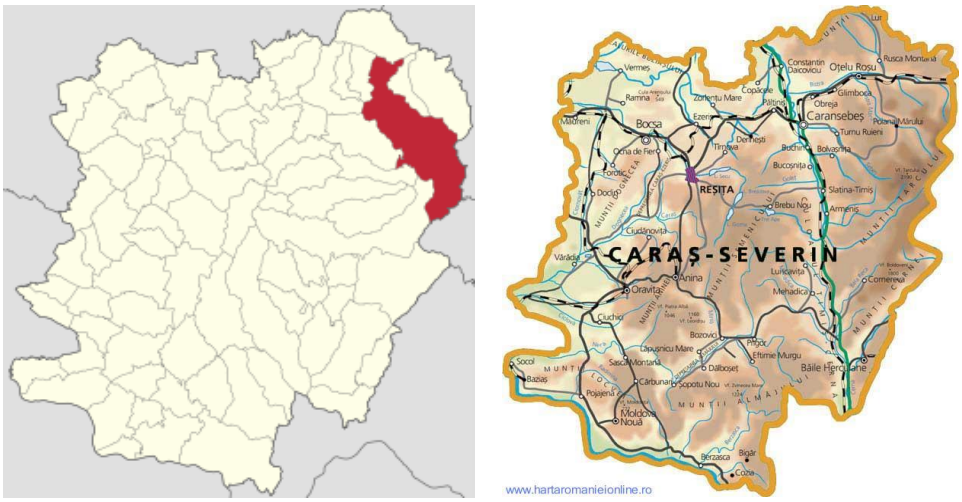

Figure 2. Presentation of Zăvoi commune and Caraș Severin county (http://www.hartaromanieionline.ro/harta-judet-Caras-Severin)

The Bistra River consists of two important courses: Bistra Ardealului and Bistra Mărului, having a reception area of 879 km2, distributed along a 57 km water course.

The village of Măru, which belongs to the commune of Zăvoi, is crossed lengthwise by the Bistra river, having on the left side as well as the more important tributaries: the Balota and Bratonea Streams, which spring from under the Mic Mountain and the Șasa, which springs from the Bătrânu Peak and Măgulice and as tributaries to the right: the Priboaieler and Pietrișor streams, which spring from under the Várticele; Sălătruc stream that springs from Preluca longa and Várticele; Bolvaşniţa Mare Stream, which springs from Preluca, and Hodinţ Stream, which springs from Poiana Tâlvelor and Moga Hill.

In the corridor of Bistra, there are rich aquifer horizons. Most of the layers represented by the water table located at shallow depths are those located in the meadows and terraces of Bistra. Large reserves of phreatic water are found in the discharge cone of the Bistra river.

The density of the hydrographic network varies depending on the relief, rainfall regime, soils, vegetation and anthropogenic influence. The maximum water discharge is recorded in the spring (approx. 40% of the average annual discharge). After the spring rains, there is a series of floods caused by the rains that fall in the early summer, the next increase in flows occurs in the autumn.

Figure 3 shows the frequency of floods that affected most localities in Caraș Severin county, the greatest influence was the floods present in the period 1997-2007, which caused significant damage, Zăvoi commune being one of the localities affected by these floods but in a lower proportion compared to other localities in the county (the frequency at the commune level was 1-5).

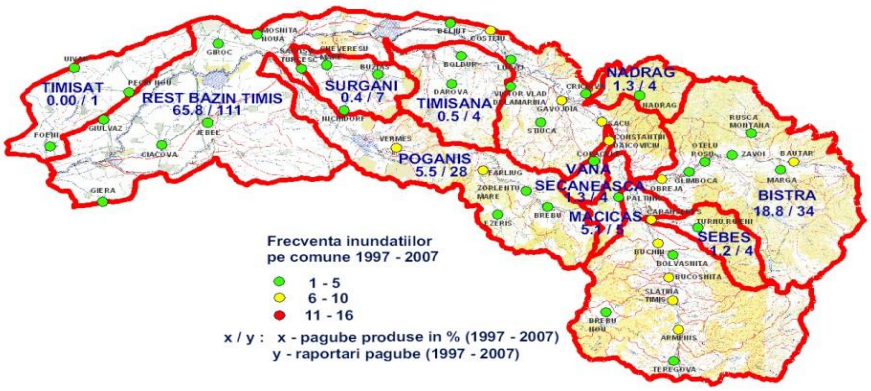

Figure 3. Frequency of floods in the period 1997-2007
http://www.hartaromanieionline.ro/harta-judet-Caras-Severin

On the Bistra river, in June 1966, a flood of 250 m3/s was recorded, which affected 1730 ha of land, 450 households and 9 km of national road (DN).

Most of the floods were reported in the months of March - May, a period when, as a rule, heavy rains overlap the snow cover.

CONCLUSIONS

Soil and water resources represent some of the great wealth with which nature has endowed our planet. These resources were created over millions of years, through the interaction between the atmosphere, hydrosphere and lithosphere in nature's wonderful laboratory. They have become, during the evolution of the planet, a complex covering which, through its qualities, ensures the possibility of vegetation development - the base of the trophic pyramid in any ecosystem.

On the territory of the commune of Zăvoi, the soils are arranged in altitude steps, depending on the relief and the climate, which determines the zonal character.

In the high area of the territory, in the mountainous area, we find districambosols that ensure the development of beech forests and in forests mixed with beech and other species, below we find eutricambosols and luvosols, and in the Bistra valley alluviosols.

Due to the elevation of the relief, the climate and the vegetation, the soils of the Bistra Valley show a zonal distribution with types characteristic of the steppe, silvosteppe, forest and meadow regions.

The alluvial soils are used for agriculture, they are the most fertile soils of the Zăvoi commune, they are cultivated with most crops: corn, wheat, beets, vegetables.

Eutricambosols have a medium natural fertility and are cultivated with cereals, maize, fruit trees, vines.

Districambosols, are the least fertile soils of the commune, in general they are occupied by forests, pastures and hayfields of low productivity, as well as cultivated with potatoes.

Luvosols, have a low to medium fertility, are occupied by trees, especially plums and apple trees, hayfields and pastures and a part with forests.

Today's appearance of the Bistra Valley is due both to fluvial erosions and to successive captures, which took place in the first part of the Quaternary. The area has a rocky foundation, generally built of crystalline schist, mica schist and volcanic and sedimentary

formations, i.e. a mixture of metamorphic, sedimentary, precipitation rocks along the Bistra valley and metamorphic, higher up in the alpine and subalpine floor.

They are covered by landslides on the slopes and terraces and by coarse alluvium (boulders), and in the valley they are mostly covered by a thin blanket of dusty clay.

The wind regime is in turn influenced by the landforms and the climate of each area, characteristic being the Coşava wind, particularly intense in the western sector of the Danube gorge.

The climate is characterized by average annual temperatures varying between 11° - 12°C, the amount of multiannual average precipitation is around 600 - 750 mm, according to the Caransebeș Meteorological Station.

The average thickness of the snow layer is 40.5 cm in the area of the settlements and 200 cm in the mountain area.

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