LIMITING FACTORS OF AGRICULTURAL LAND IN CUCUTENI ADMINISTRATIVE TERRITORY, IASI COUNTY

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Abstract

The soil is the result of the action of different processes determined by environmental factors, continuously adapting to natural and / or artificial changes in the environment, recording and memorizing through certain phenomena, processes and characteristics, the main moments of evolution. From the analysis of the geomorphological indicators, of the Cucuteni territorial administrative unit, regarding the slope of the lands, landslides, deep erosion (ravenation) and pedological indicators on organic matter content, soil reaction, soil texture, siltation / stagnation, salinization and alkalization, result that the soils in the studied territory have a high degree of degradation. Among the limiting factors of agricultural production, in descending order of affected areas, are: surface erosion (560.58 ha), landslides (506.53 ha), pseudogleization (367.46 ha), acidification (318.05 ha), siltation (168.70 ha), salting (86.87 ha) and deep erosion (71.18 ha). Frequently, on the territory of Cucuteni commune, the limiting factors are associated on most of the lands, so that their control requires a set of agro-improvement and special measures.

Keywords: soil erosion, siltation, stagnation, landslides, soil acidification

Soil, as its main natural resource for agriculture, is a key factor in the sustainability and prosperity of the rural population, with major reflection on the prosperity of the entire nation, which requires the conservation and capitalization of this natural capital. Soils are the most precious wealth, the most valuable dowry to be known and recognized, preserved and exploited to its true potential (Hera C., 2008).

Rational use of soil resources requires in-depth knowledge of soil properties and the whole set of environmental factors.

Fertility is the most important property of the soil and is defined by all the physical, chemical and biological properties that provide the plants with the quantities of nutrients during the growing season.

Soil fertility is affected to a lesser or greater extent by one or more restrictions, caused by natural factors and / or anthropogenic agricultural and industrial actions, which can often act synergistically in a negative way (Lukianas A. *et al*, 2006; Hornbuckle J.W. et al. 2007; Burja C. *et al*, 2013). Their harmful effects are reflected in the deterioration of soil characteristics and functions, respectively in their bioproductive capacity, with consequences for the quality of agricultural products and food security.

Harmful effect of soil quality due to the negative influence of climatic factors, relief, hydrology, edaphic characteristics was estimated under different intensities on 7.5 million ha of arable land, which represents about 80% of the arable area of Romania (Dumitru M. *et al*, 2006).

MATERIAL AND METHOD

From an administrative point of view, the territory of Cucuteni belongs to Iasi county, being located in its western part, approximately 12 km NW of the city of Targu-Frumos and 56 km of the municipality of Iasi (*figure 1*). The communal territory includes the villages of Cucuteni (commune residence), Baiceni, Barbatesti and Sacaresti.

The total area of Cucuteni commune is 2832 ha, of which 2196 ha are agricultural land and 636 ha are non-agricultural land. The situation of the agricultural area, by categories of use, is as follows: 1382 ha of arable land, 514 ha of pasture, 104 ha of hay, 160 ha of vines and 36 ha of orchards.

The pedological study, conducted by the O.S.P.A. Iasi, for the identification of the limiting factors of the agricultural lands, included the surface of 2225 ha (2196 ha of agricultural land and 29 ha of non-productive land).

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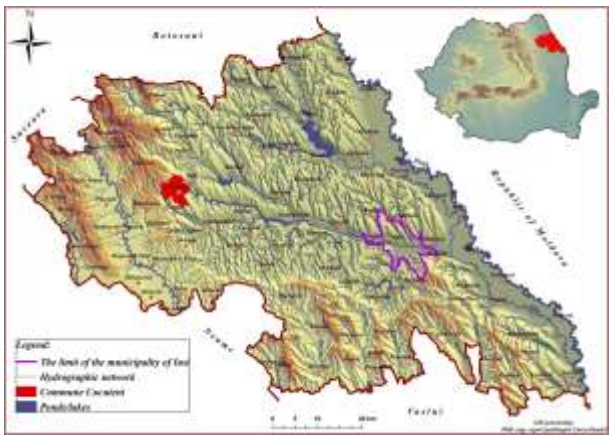

Figure 1 **Geographical and Administrative Position of Cucuteni Commune**

The peculiarities and geomorphological processes in the territory of Cucuteni commune were identified both by traditional research methods (field observations and measurements, geomorphological mapping, statistical-mathematical processing, analysis, synthesis) and by modern methods based on GIS software.

The cartographic materials were obtained using TNTmips v.6.9, and ArcGIS v.10.1. An important step in spatial modeling was the development of the Numerical Terrain Model (MNT), by vectorizing the level curves on the topographic planes at a scale of 1:25 000, and by processing the vectorized level curves, thematic maps were drawn up.

RESULTS AND DISCUSSIONS

The territory of Cucuteni commune is located in the hilly area, at the interference of the Moldavian Plain with the Suceava Plateau, so that the altitudes decrease from V to E (*figure 2*).

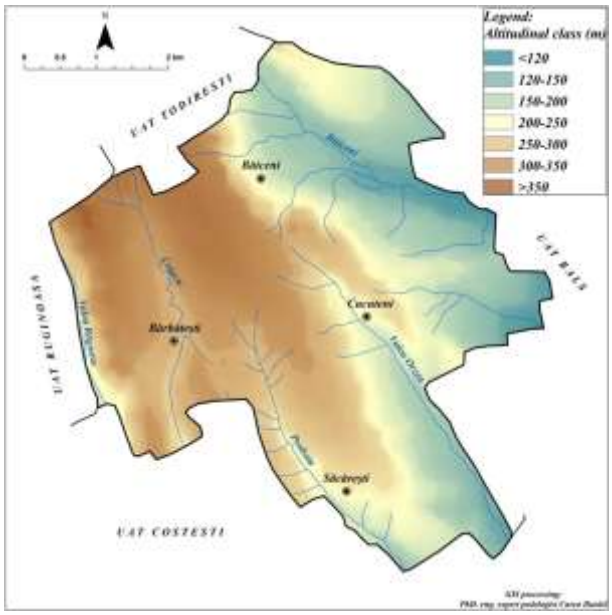

Figure 2 **Altitude Distribution**

The maximum altitude of 353 m is found in the NE of the territory. Over 95% of the commune's surface has altitudes between 150 and 350 m, the share of surfaces on altitude ranges, from 50 to 50 m, being approximately equal.

The passage between the two relief units, the Suceava Plateau and the Moldavian Plain, at the contact of which is located the territory of Cucuteni commune, it is made by a transition coast, characterized by strong unevenness, accentuated slopes and intense geomorphological processes.

As a result of the slope geomorphological processes, the hydrological conditions, the nature of the solification rock and the evolution of the soils on the studied territory, Cucuteni, there are a number of limiting factors of agricultural production.

The surface erosion occupies 560.58 ha, representing 25.19% of the pedologically mapped surface (*figure 3*). This surface does not include eroded soils within sloping soil complexes and landslide areas. Surface erosion affects valley slopes and plateau and ridge edges.

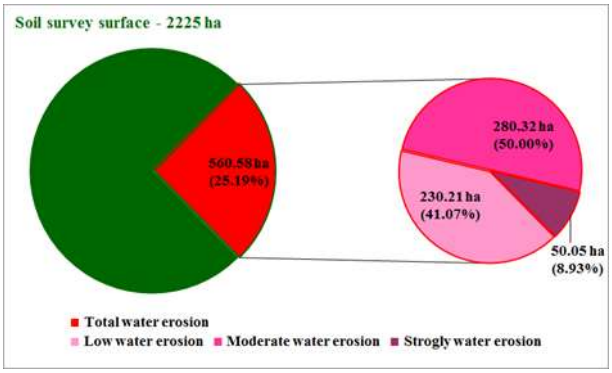

Figure 3 **Surface Erosion**

By degrees of erosion, the situation is as follows:

- the weak surface erosion affects 230.21 ha, representing 41.07% of the surface affected by erosion and is found on the slopes with small and medium slopes, the more inclined parts of the plateaus and peaks;
- the moderate surface erosion affects 280.32 ha, which represents 50% of the eroded surface, being found, in particular, in the Sacaresti and Cucuteni brook basin;
- the strong surface erosion is manifested on 50.05 ha, representing 8.93% of the surface occupied by the surface erosion and it is found in the form of narrow strips on the edge of the ravines and small portions on the narrow peaks.

The landslides within Cucuteni commune occupy the surface of 506.53 ha (*figure 4*),

representing 22.76% of the pedologically mapped surface.

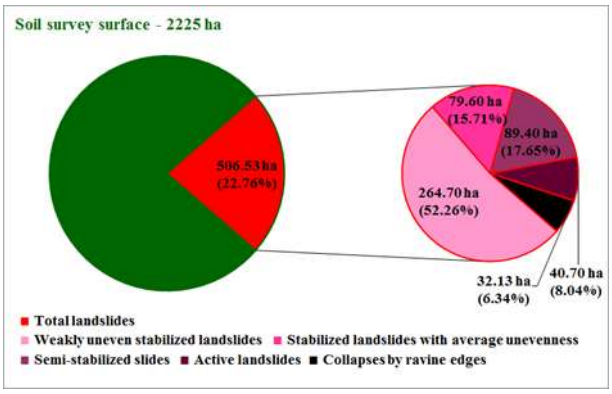

Figure 4 **Landslides**

Depending on the stage of evolution, the following differ:

- stabilized, slightly uneven landslides occupying the area of 264.70 ha, representing 52.26% of the area affected by landslides. These lands are located in the area of the transition coast, east of the village of Cucuteni and Baiceni, in the lower part of the slopes;
- stabilized landslides, with average elevation differences on 79.60 ha, representing 15.71% of the total affected area. It occupies the middle and upper part of the slopes within the transition coast, in the middle and upper basin of the Baiceni brook;
- semi-active landslides, with an area of 89.40 ha, representing 17.65%. It occupies relatively small areas in the upper part of the slopes, including in the central and western part of the territory;
- active landslides, covering an area of 40.70 ha, representing 8.04% of the total. They are grouped at the edge of the ravines that flank the Sacaresti valley;
- collapses on the edges of the ravine in an area of 32.13 ha, respectively 6.34%. They accompany the upper, torrential-looking valleys of the main streams.

The gleyzation affects on the territory of Cucuteni commune the surface of 168.70 ha, representing 7.58% of the surface of 2225 ha mapped pedologically (*figure 5*). Depending on the intensity of the gleyzation, there are:

- weak gleyzation: 49.30 ha, representing 29.22% of the surface with gleyzation soils;
- moderate gleyzation: 6.50 ha representing 3.85% of the surface with gleyzation soils;
- strong gleyzation: 70.52 ha representing 41.80% of the surface with gleyzation soils;
- very strong and excessive gleyzation: 42.38 ha representing 25.13% of the surface with gleyzation soils.

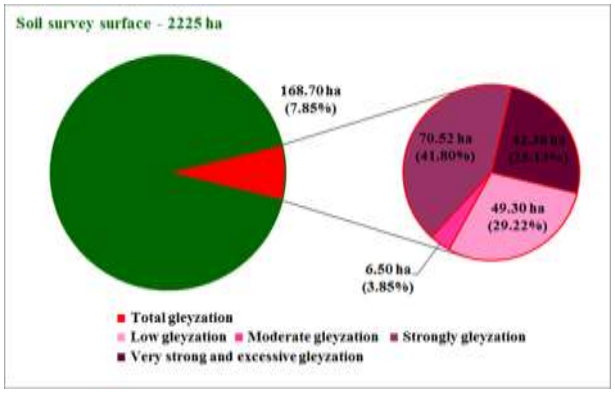

Figure 5 **Soil Gleyzation**

Most of the surface of the gleyzation soils is located on the valleys of the streams that drain the territory. The main cause is the presence of the groundwater horizon close to the soil surface, in conditions of a weakly deep minor bed and a poorly permeable substrate.

Pseudogleyzation affects within the commune an area of 367.46 ha (*figure 6*), predominating the weak pseudogleyzation with 350.09 ha, respectively 95.27%, followed by moderate (13.70 ha - 3.73%) and strong (3.67 ha - 1.00%).

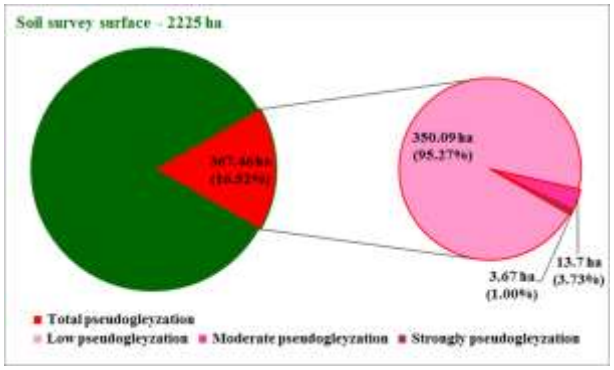

Figure 6 **Soil Pseudogleyzation**

Within the commune of Cucuteni, the acidity of the soil is manifested on the surface of 318.05 ha, representing 14.30% of the pedologically mapped surface of 2225 ha (*figure 7*).

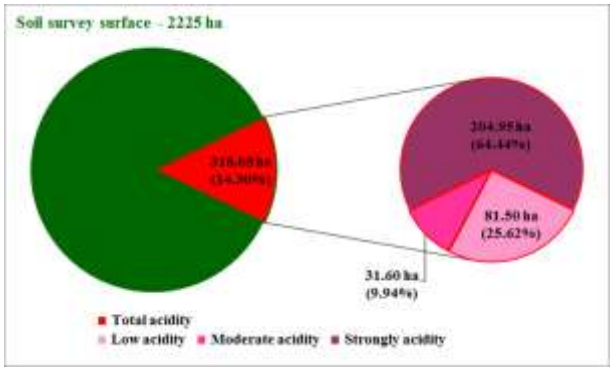

Figure 7 **Soil Acidity**

Soil acidity is characterized by low values of soil reaction, low values of saturation in bases and high values in exchangeable aluminum.

Depending on the intensity of the acidity, there are:

- weak acidity: 81.50 ha - 25.62%;
- moderate acidity: 31.60 ha - 9.94%;
- strong acidity: 204.95 ha - 64.44%.

The salinization and alkalization of the soil is found on the surface of 86.87 ha, representing 3.90% of the pedologically mapped surface (*figure 8*).

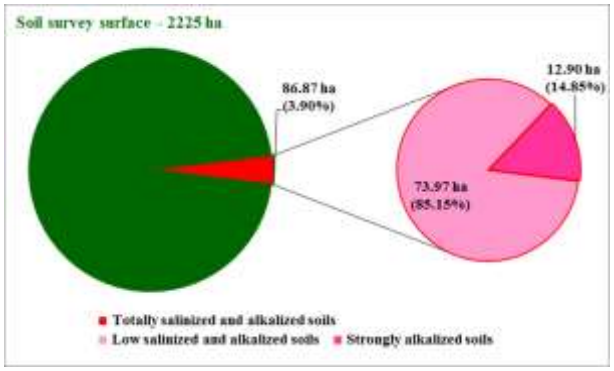

Figure 8 **Salinization and Alkalization Soils**

The salinization and alkalization of the soil is found in the plains, as well as in the mesh of the marshy and on the gleyzation chernozems on the slopes.

Depending on the intensity of salting, within the territory studied, the following are different:

- poorly salinized and alkalized soils, which occupy 73.97 ha, representing 85.15% of the total surface with salinized soils;
- strongly alkalized soils (solonets) with an area of 12.90 ha (14.85%), located on slopes in the complex with other soils.

CONCLUSIONS

The pedo-climatic and pedo-geomorphological constraint in the land use of Cucuteni commune, requires in-depth research into the fertility of soils and the identification of the main limiting factors of agricultural production in order to establish the agro-improvement measures necessary for the proper application of the Code of Good Agricultural Practice.

Among the limiting factors of agricultural production are, in descending order of affected areas: surface erosion (560.58 ha), landslides (506.53 ha), pseudogleyzation (367.46 ha), acidification (318.05 ha), gleyzation (168.70 ha), salting (86.87 ha) and deep erosion (71.18 ha).

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