

## Original Article

**Study of Soil Quality in the Commune Calarasi, Cluj County****GHEAJA Dorina<sup>\*</sup>, Mircea CRIȘAN, Livia MIRON, Corina FERENȚ***Office of Pedological and Agrochemical Studies Cluj, Fagului St.no. 1, Cluj-Napoca, Romania*

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**Abstract**

Scientific knowledge in the modern period highlights the importance of defining the type and properties of the soil, which in turn are closely related to the use of land. Thus, under the new conditions, soil quality becomes an inseparable term to sustainability (or sustainability) of natural systems is considered a key indicator of ecosystem functioning. The concept of quality in soils is related to a particular property, a function thereof, or a certain way of land use. To this end, we have proposed in this paper study of soil quality in the commune Calarasi, this being one of the communes of Cluj county where agriculture is the main activity of the inhabitants. Worth pointing out that due to intensive agriculture practice, even performance by some private firms, virtually no land area worked, left abandoned.

**Keywords:** sustainability, quality of the ground, agriculture, abandon.

**1. Introduction**

The concept of revitalizing agriculture in Transylvania was made from a comprehensive analysis of the current situation of the land, the economic situation in general, mechanization, chemical fertilizers insurance, irrigation systems, livestock, mainly to structure of plant and animal production. Current social context an increase in employment in agriculture, contrary to forecasts from the European Union. Strategic concept aims to ensure the growing needs of people for quality vegetable and animal products without residues, made in an unpolluted natural environment in which the objectives and priorities are consistent with the requirements of European integration of Romania's National Development Plan and Strategy development of Agriculture, Food, Forestry and Environmental Protection of each county.

Besides the idea of capitalizing on the complex natural resources, mainly land and water, it requires a diagnostic analysis of agriculture in the counties of Transylvania, the strengths and weaknesses of the duties of institutions and professionals involved in the development and application of technical solutions, short and long term. Analyzing the productive capacity of agricultural land in the county of Cluj, it was observed that there are resources for sustainable agriculture development. The complexity of the phenomena and processes that govern the evolution and pedogenesis processes related to growth and development of crops in this region Transylvania highlights the need to conduct studies as agrochemicals and soil depth.

To this end, we have proposed in this paper study of soil quality in the commune Calarasi, this being one of the communes of Cluj county where agriculture is the main activity of the inhabitants.

**2. Material and Method**

The village is located in the southern county of Calarasi Cluj and at a distance of about 50 km from Cluj-Napoca and Turda 10 km, ranging from a

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physical-geographical in the Transylvanian Basin, Plateau belonging Măhăcești Aries the lower colour.

Aries lower corridor is relatively sharp unit complexity and geographical potential high favorability, which drew the attention of the social - economic development since ancient times. Orographic are present classical steps of establishments in this category: floodplain, terraces and hilly strip well developed left Aries and Mures, while the right to Transylvania Plain and Plateau Târnavelor floodplain and terraces had a more modest training directly or above the obvious ridicădu slopes of marbles, located at 180-200 m above the floodplain of the two valleys.

The three steps in the corridor, add two units apart hills features respectively BILAG Hill and Hills Măhăcești considered to be morphological accidents in this area [4].

Climate, color is subject to Western influences all air masses that enter both along Mures,

Somes and gate, plus the foehn events very well highlighted in this space.

An important role in characterizing the relief they had morphometric and morphographical elements. Regarding the first element, the average altitude of 350-400 m, divided into sectors with higher elevations in the northern part, where the relief exceeding 400 m in this area is 100-150 m, increasing slightly to the north

In addition there homocline relief, Calarasi commune is characterized by reduced weight of landslides or other slope processes as a result of poor relief fragmented.

Current forms of relief and current dynamics of this area were highlighted by the structure of geological strata. They have a general north - west, south-east, and was responsible for the slope of the subsidence of the confluence of the river Mures with the river Aries and the old ways of the former lake water withdrawal Transylvanian south. [6]

**Table 1.** Distribution situation in the territory of the main forms of relief

No.	Main components of the forms of relief/forms of mezo and microrelief	Surface drainage of (ha)
1	Versan You've got your uniform long	987.3
2	Versan You've got your uniform shorts	261.1
3	Versan Seamless and flat bristled you	78.6
4	Versan Seamless and flat you long	284.8
5	Wide rocky pinnacles	431.2
6	Low Şesurile aluvial	153.6
7	Terrace	992.4
Total		3189

In terms of lithology surface deposits, Calarasi commune is dominated by Miocene formations, respectively Sarmatian floors, Volhinianului and Bessarabian and those of the Quaternary. According to the Romanian System of Soil Taxonomy both geological formations fall within silicate rocks unconsolidated or poorly consolidated preholocene. These are rocks eubazice

(carbonate) and the marl (soft) and predominantly carbonate gravel. The texture of these stones is a thin medium, in particular in the 150 cm, which deterioration prevailing deposits, while in the case of gravel carbonate, which have a rough texture, and which were formed Fluvisols iron. Quaternary formations are present mainly in the floodplains Morii village creek and its tributaries.

**Table 2.** Territorial distribution of coating material or parental material

No.	Soil parent materia	The surface (ha)
1	Sp-material alteration of slope disaggregation medium-fine (silty clay)	3015.4
3	Tf-fluvial deposits, proluvial and fluviolacustre, fine	173.6
Total		3189

The commune's Calarasi territory belongs entirely the hydrographic basin of Aries, the river that borders the eastern territory. Most rivers have a flow direction from north west to south east, imposed by the subsidence of the confluence of Aries and Mures. Main feature of this area is the low density of the river network and the lack of lake surface. The main rivers are the stream and brook Lengeş and Grind. Both rivers are characterized by multi-flow low and frequent dry periods are reduced drastically or dry

[6]. In terms of climate, the territory of Calarasi was characterized by studying data from weather station Turda. Thus, this region is part of the air interface to the northwest.

In terms of climatic microzones, Calarasi commune is denoted by formula IIO-C1 (39/1), that is located in rugged terrain and a weak pedological casing soils dominated by cernisulurilor class. In the pool terrace sector which color belongs Aries during winter temperature inversions occur frequently,

which is manifested by cold air quartering the main of the river floodplain terrace and a stationary hot air from the peaks interfluvial.

This phenomenon is a result of a prolongation of the frost on the ground and a flat onset of the growing season in the spring.

**Table 3.** Distribution situation in the territory of groundwater depths

No.	Groundwater Depth (m)	Surface drainage of (ha)
1	>10 M	509.8
2	5.01 -10.0	1533.2
5	1.01 -2.00	1146
Total		3189

One aspect of how the anthropogenic influence influenced the soil and generally cover the landscape of this area has been drastically reduced areas under forest. The areas covered by forests occupy only 5-10% of the total, which is an additional element in supporting the idea of similarity in terms fitopedologic between Transylvanian Plain and Plateau Măhăceni. This process was characteristic entire territory of Măhăceni Plateau. Removal of woody vegetation on slopes was strongly inclined the onset of large landslides. Most strongly inclined slopes are heavily affected by erosion processes, including landslides and deep forms of erosion (gullies and ravines), without being a danger to human settlements.

Working long soil where there was a memorial to the surface horizon of clay accumulation (Bt), led to a sharp increase in clay content in the A horizon, and high costs due to high resistance to plowing. Applying lime amendments was made to correct the typical luvisols acid reaction. With the end of amending these soils, the pH returned to baseline. Furthermore, sandy loam texture and irrational mode are the elements that favored erosion depth.

Perform under pedogenesis have been presented in this paper, in the commune Calarasi pedological cover is characterized by a certain specificity. This specificity is required and the position of geographical, or geographical discontinuity between Măhăceni and Transylvanian Plain Plateau is located between the middle river corridor. This complexity is added and the presence of certain local pedogenesis factors that have influenced the course of time, the evolution of soils in this geographical area [6].

Types, subtypes that make up the quilt in the studied soil quality within the following classes of soils: protisoluri, cernisoluri, Cambisols, Luvisols, and antrisoluri hidrisoluri [6].

Principles of evaluate and indicators used in the studied evaluation marks land are complex operation knowledge of the conditions for growth and fruiting of plants and determining the degree of suitability of these conditions for different uses and

culture through an index system of evaluation techniques and notes [1].

Through the work of evaluation is determined relative value of land, land use and crops best suited, the most profitable. Following these works, which can determine the current level of production and economic efficiency, results and data necessary to substantiate technologies, investment, labor remuneration in agriculture etc.

Although growth and fruiting plant depends on the entire set of environmental conditions for land evaluation marks were chosen the most significant, namely relief conditions, hydrological conditions, climatic conditions, the main characteristics of the soil and human activity [7].

Grouping according to the suitability of land to different uses. Land suitability refers to grouping or classification into classes, subclasses and subdivisions within a particular purpose. Grouping classes pretabitate land for different uses and facilities shall be according to the "Methodology for Development of Soil Survey" published the second part of ICPA Bucharest in 1987.

Morphological description of soil profiles that are part of the territory pedological quilt was made based on the "Romanian system of soil taxonomy - SRTS 2003". Entry-level soil type, subtype was made by the Romanian system, Soil Taxonomy (SRTS-2003), the World Reference Base for Soil Resources (WRB-SR 1998) as well as American Soil Classification System (USDA-Soil Taxonomy, 1999). Soil sampling was conducted on the genetic pathways involved in the settlement modified natural (unmodified). Soil sampling in the amended settlement for physico-chemical, mineralogical and biological became a thickness of 10-15 cm; harvesting natural soil settlement (unchanged) to characterize the physical, hydro and micromorphological made in metal cylinders of known volume (100 cm<sup>2</sup>) momentary soil moisture.

**Physical properties.** The analysis granulometric -Particle sizes analysis was performed using the following methods: pipette method for fractions of less than 0.002 mm; method sifting wet and dry fractions from 0.002 to 0.2 mm fraction > 0.2 mm. Particle size analysis results are expressed as a

percentage of material remaining after pretreatment. The textural classification into classes and subclasses will use the system used in our country "Soil Survey Methodology Elaboration-ICPA, 1987" [7].

**Chemical properties.** Chemical properties of the soil were examined by the following method. Total organic carbon: wet oxidation after the change Walkley-Black donut, while the total nitrogen (N): Kjeldahl method, disaggregation of H<sub>2</sub>SO<sub>4</sub> to 350 ° C, a catalyst of potassium sulfate and copper sulfate. Calcium carbonate (CaCO<sub>3</sub>) Scheibler method. The reaction pH soil potentiometer, a combined glass and calomel electrode in an aqueous suspension to the soil / water of 1:2.5. Cations exchangeable, Ca<sup>2+</sup>, Mg<sup>2+</sup>, K<sup>+</sup>, Na<sup>+</sup>, were extracted by the method Schollenberger-Cernescu and dosage Ca<sup>2+</sup>, K<sup>+</sup>, Na<sup>+</sup>, was carried out by photometry flame, and the Mg<sup>2+</sup> + spectrometric atomic adsorption. The total acidity of parts (exchangeable hydrogen) by leaching with potassium acetate (or sodium acetate) at pH 8.3. The total cation exchange capacity (M) by adding the cations Ca<sup>2+</sup>, Mg<sup>2+</sup>, K<sup>+</sup>, Na<sup>+</sup>, and total acid exchange (H<sup>+</sup>), the samples with carbonate T = (ML + H). Phosphorus accessible (mobile) by the Egner-Riehm-Domingo and dosed colorimetric molybdenum blue. Potassium accessible (Mobile): extraction by the Egner-Riehm-Domingo and

determination by flame photometry. Cumulo-humic Index: by calculation. Data processing was performed using BDUST program conducted by ICPA Bucharest, elaborating on Soil Survey Methodology, Vol I, II, and III, ICPA Bucharest, 1987 [7].

### 3. Results and Discussion

Since the early centuries of human civilization, to agriculture, he felt the need to characterize and assess soil quality. In Roman times, Columella clear that "good soil management, proper humidity during tillage, plowing along the contour, applying organic fertilizers, leading to a fattening ground".

Scientific knowledge in the modern period highlights the importance of defining the type and properties of the soil, which in turn are closely related to the use of land. Thus, under the new conditions, soil quality becomes an inseparable term to sustainability (or sustainability) of natural systems is considered a key indicator of ecosystem functioning. The concept of quality in soils is related to a particular property, a function thereof, or a certain way of land use.

Quality and suitability soil of commune Calarasi are presented in tables 4 and 5.

**Tabel 4.** Classification quality classes soils

No	Category use	Class the quality										Framing the average common		
		I		II		III		IV		V		ha	class	nota
		ha	nota	ha	nota	ha	nota	ha	nota	ha	nota			
1	Arable	203	87	734.8	69	739.8	51	304.4	28	105	8	2087	III	55
2	Pastures	0	0	49.6	67	232	52	510.9	30	27.5	14	820	IV	38
3	Hayfields	0	0	68.5	63	21.5	46	126	33	3	19	219	III	43
4	Vineyards	0	0	0	0	0	0	0	0	8	9	8	I	9
5	Orchards	0	0	5	62	10	51	6	32	34	13	55	IV	26
6	Total	208.6	87	745.3	69	951.3	51	664.4	28	619.4	8	3189	III	44

**Tabel 5.** Classification soil pretability classes

No	Category use	Class the suitability ( ha)						Framing the average common	
		I	II	III	IV	V	VI	ha	nota
1	Arable	0	140	1747.4	123.6	38	38	2087	III
2	Meadows	0	2.5	84	943	9.5	0	1039	IV
3	Vineyards	0	0	0	0	2	6	8	VI
4	Orchards	0	0	15	24	0	16	55	IV
5	Total	0	142	2180	405.1	247.9	214	3189	III

### 4. Conclusions

Agricultural land in the village Calarasi studied was 3189 ha. Geographic coordinates that fall within the study are given latitude 46 ° 29'56" and east longitude 23 ° 49'43" plus an average altitude of 400 m relief. From physico-geographical territory of Calarasi is divided between Plateau and color Măhăceni Aries. Geomorphology in this area were delineated following: long uniform slopes, slopes

uniform shorts, broad ridge, surface tilt below 1%, flat (terrace III of Aries) and alluvial plains below. Lithology surface deposits is dominated by Miocene formations, respectively Sarmatian floors, volhinianului and Bessarabian and those of the Quaternary. The commune's territory is entirely yours Calarasi Aries the hydrographic basin of, the river that borders this area to the east. In terms of climatic microzones, Calarasi commune is denoted by formula IIO-CI (39/1), that is located in a rugged and low

relief with a wrapper class pedological soils dominated by cernisoluril. In terms of classifying climates after Koppen system, part of the territory of Calarasi subprovincia Dfbx. Of the total agricultural area of the village Calarasi, which is 3189 ha arable land holding by far the largest share (2087ha-64.0%) have a much higher pastures reduced to arable land being (820 ha - 26%), while grasslands are much smaller in size (219 ha, 7.0%), orchards (55.0 ha, 0.5 ha) and vines (0.5 ha) are poorly represented in this region [6]. Types, subtypes that make up the quilt in the studied soil quality within the following classes of soils: protisoluri, cernisoluri, Cambisols, Luvisols, and Antrisoluri, Hidrisoluri.

Following assessment of soil qualityland we reached the following results.

**Soil quality.** At use of arable land, 203 ha falls in first class quality, 734.80 ha in grade II, 739.80 ha in grade III, 304.40 ha in the fourth grade and 105 ha in fifth grade. When pasture and grassland could not be determined areas of land to be included in the first class quality, while for Class II quality is 118.10 ha, 253.50 in Class III a, 638.90 ha in grade IV and 30.50 ha in the fifth grade. The land occupied by vines fall into grade 8.0 ha. The use of orchards, 5 ha in class II of the quality, 10 ha in grade III, 6 hectares in grade IV and 34 ha in the fifth class.

**Soil suitability.** For arable land, 140 ha falls in class II, 1747.40 ha rd grade, 112 in fourth grade, the grade 49,60 and 38 ha in the sixth grade of suitability. If pastures and meadows (meadows) were determined: 2.50 ha in grade II, 84 ha in grade III, 943 ha in the fourth grade and 9.50 in grade. The area occupied by vine was included in the grade of suitability, 2 hectares and 6 hectares in sixth grade suitability, while orchard was determined an area of 15 ha in Class III, 22 ha in grade IV, grade 2 ha and 16 ha in the sixth grade.

#### **Characterization of soil agrochemical.**

Regarding the situation of soil reaction is: weak-acid 1120.40 ha, 712.90 ha and weak neutral-alkaline 1355.70 ha. Humus content is very low on 66.50 ha

on small and medium 2278.10 - 844.40 ha. Included in the soil nitrogen is very small 9.50 ha on 79 ha small, medium and large 200.50 per 2900 ha. Phosphorus content was very low on 1361.60 ha, small and medium 1004.90 ha with 822.50 ha.

Mobile potassium content is low on 960.40 hectares, 489.20 hectares in the middle, large and very large 1531.90 - 207.50 ha.

Requirements change of use categories: of the arable land of 2087 ha, 2019 ha are suitable for the use of arable land and 68 ha are suitable for other uses of which 30 ha to 38 ha in the use of live and use of pastures.

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