Research Journal of Agricultural Science, 57 (2), 2025; ISSN: 2668-926X

http://doi.org/10.59463/RJAS.2025.2.29

CHARACTERIZATION OF SOILS IN ARAD COUNTY

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Abstract. *The purpose of this work is the collection, processing and accumulation of scientific data regarding environmental factors, geographical characteristics of the surface, soil resources, data regarding the nature and intensity of limiting factors, qualitative evaluation of lands. Arad County is located in the western part of the country and stretches from the heart of the Apuseni Mountains (to the east) to the subsidence and drainage plain formed by Crișul Alb and Mureș (to the west). As a result of the geographical location, the territory of Arad County presents various geological and physical-geographical conditions, which has conditioned the formation of a complex soil covering. The object of study is the land belonging to the territorial administrative unit of Arad County, in the area of 761352 ha, of which 497463 ha is agricultural land, respectively the soils identified in the mentioned territory. They are studied in relation to the environmental factors that condition their presence, together with them, forming homogeneous ecological territory units (UT or TEO) with specific suitability/favorability for different agricultural or forestry uses/for different cultivated plants and with specific current breeding or cultural requirements and technologies. They are studied in relation to the environmental factors that condition their presence, along with them, forming homogeneous ecological territory units (UT or TEO) with specific suitability/favorability for different agricultural or forestry uses/for different cultivated plants and with specific current breeding or cultural requirements and technologies.*

Keywords*: soil, environmental factors, quality*

INTRODUCTION

Formed over a period of thousands of years at the interference of the four shells of our planet (lithosphere, hydrosphere, atmosphere and biosphere), soil is a strategic resource that, scientifically exploited, is renewable, being able to guarantee the food security of humanity and the physical-geographical space necessary for the development of human society. The soil constitutes a significant part of the national wealth and at the same time, the fundamental condition of our existence as an independent nation.

The land of the country is the most precious natural asset of the entire nation and of future generations, it is eternal and constitutes the material condition for the existence of any production.

The soil, as an open ecological system, is linked to the environment by a continuous flow of matter and energy, and its evolution over time is under the action of natural and anthropogenic factors. It tends towards a state of equilibrium through tendencies of equalization of imports and exports of energy and substances.

Soil in the concept of the Romanian school of pedology is understood as a natural body with its own organization, modified or not by human activity, which is formed and evolves over time, on the surface of the earth's crust, under the action of bioclimatic factors on the material or of the parent rock, characterized by: specific three-phase composition (solid, liquid or gaseous), polydesperate porous composition of the solid phase, differentiation of composition on the vertical, the presence of the living component, the uninterrupted and complex dynamics, the

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quality of being fertile, etc., and which, in addition to its characteristic of a historical-natural body, represents the environment in which food is produced for everything that lives on our planet.

MATERIAL AND METHODS

The process of soil research at regional level, such as the area of a county, is particularly laborious, during which teams of specialists with great experience in identifying landforms, geomorphology, lithology, hydrology, vegetation and soils are involved.

From a geomorphological point of view, Arad County has a total area of 775409 ha, of which: arable land 349290 ha, pastures 127123 ha, hayland 25664 ha, vineyards 3603 ha, orchards 5578 ha, agricultural 511258 ha, forests 212037 ha, others 52114 ha.

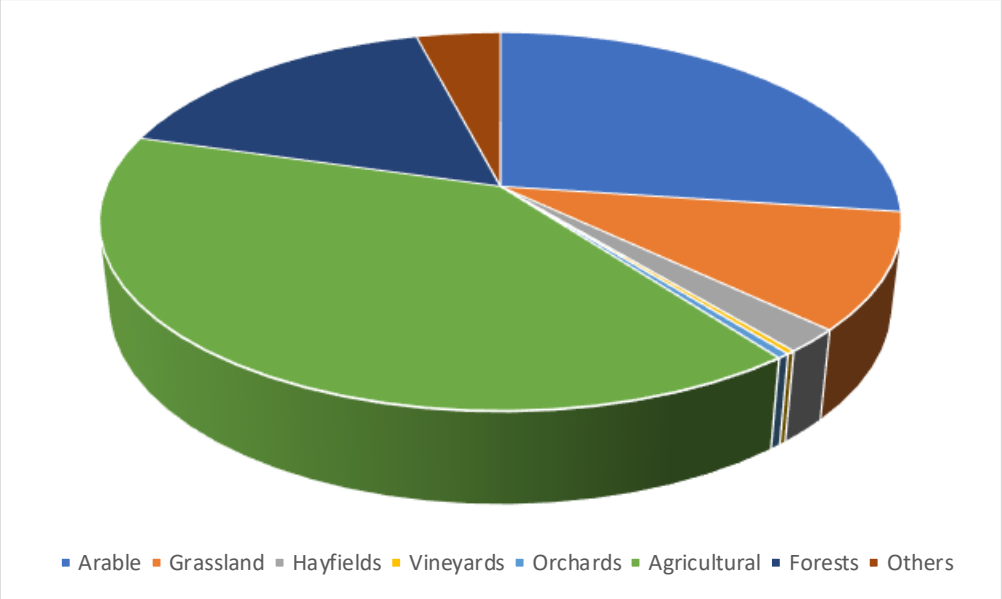

Figure 1. Surface structure for the main use categories in Arad County

Within the main landforms, the arable area occupies the following proportions (of the agricultural area): 72.3% in the low plains and meadows, 17.7% in the high plains and terraces, 9.8% in the hills and 0.2% in the mountains.

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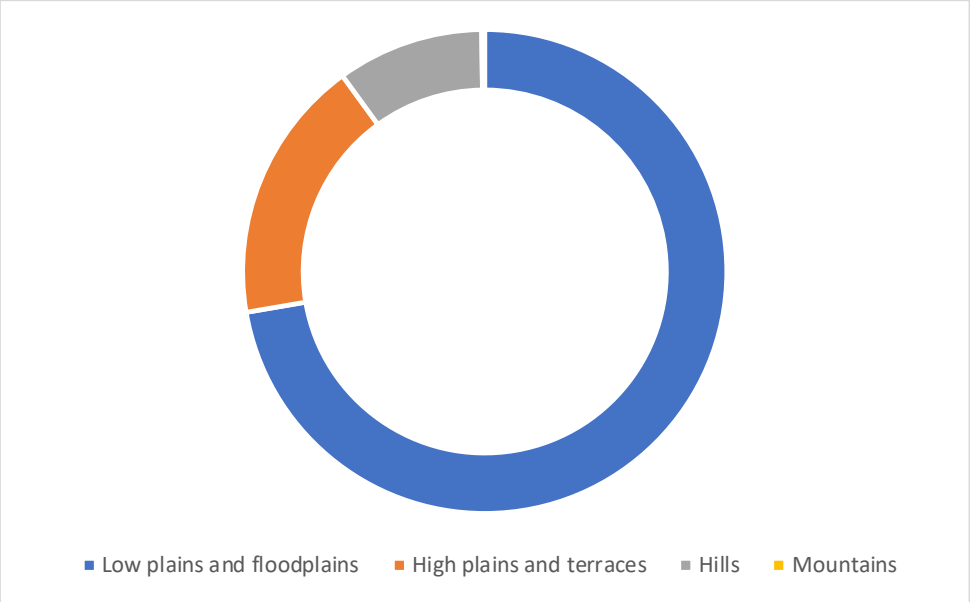

Figure 2. Distribution of use categories within the main landforms

The object of study is the soil areas in Arad County, identifying the types and subtypes of soil, the physical, chemical and morphological properties, respectively the determination of the quality classes for the categories of use: arable, pastures, meadows, vineyards, orchards.

The research of the ecopedological conditions was done in accordance with the yb depoleved (III ,II ,I .lov) "SEIDUTS LACIGOLODEP FO NOITAROBALE FO YGOLODOHTEM" ICPA in 1987 and the Romanian Soil Taxonomy System (SRTS 2003, 2012) developed by ICPA Bucharest in 2003, supplemented by the methodological norms.

RESULTS AND DISCUSSIONS

Arad County is located in the western part of the country and stretches from the heart of the Apuseni Mountains (to the east) to the subsidence and digression plain formed by Crisul Alb and Mures (to the west). It has a border with Hungary to the west and borders the counties of Bihor, Alba, Hunedoara and Timiş. It has an area of 7,754 km², being the 6th largest county in Romania.

The relief is diversified, where we meet the Arad Plain (in the west), part of the Western Plain, the Lipova Hills and the Zarand Mountains in the central and eastern part, the Codru-Moma Mountains and part of the Apuseni Mountains in the southeast.

The relief of Arad County as a whole is characterized by the existence of a varied relief proportioned and tiered from west to east, in the field identifying the following forms: meadows and old deltas (with altitudes of about 80-85 m), semi-drained plains (85-100 m), piedmont plains, plateaus and piedmonts, high hills, depressions below and intramontane, as well as mountains with altitudes of up to 1486 m (Gaina Peak in the Bihor Mountains), with specific geological and paleogeographical structures, related to the evolution in time and space of the western part of the country.

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Figure 3.The main physical-geographical units of Arad County (https://pe-harta.ro/arad/)

According to the morphological characters, in the mountainous area belonging to the researched space, the following sectors can be materialized: the north-west, central and south-east. The north-western sector has a massive character, being made up of white and pink limestones, white dolomites, clayey schists, conglomerates and quartzite sandstones.

The high intensity of erosion in this sector is largely due to the existence in the area of the depression basins of Moneasa and Răbușa.

Another common characteristic is the frequency of areas with excess humidity and in terms of the danger of flooding, which is why almost all courses in the lowland area are flooded.

To the ecopedological complexity of the territory considered, among the other technical-edaphic factors, the geology and lithology of the surface deposits which, through the various formations from a geochemical point of view, from the eruptive or crystalline or karst ones in the mountain area, to the clays, loam, and sandstones of the piedmonts to the loessoid formations in the plains and the fluvio-lacustrine deposits in the meadows, represent essential elements for defining the environment for plant growth.

From a geological point of view, the studied perimeter rests on a hard Carpathian foundation formed by Paleozoic and Mesozoic crystalline rocks submerged in the fragmented Tortonian on different directions by a system of tectonic sheets, thus recommending itself through a complex geological composition: a great petrographic variety, a characteristic structure and tectonics.

From the long cooperation of the four terrestrial spheres (lithosphere and biosphere), as a result of complex processes, over long periods of time, a fertile layer has been formed, with stable properties, which can be modified by man through his activities. The primary role in the formation of the soil cover and indirectly of its productive capacity is played by the rocks and parent materials in general, especially the sedimentary rocks, because within the considered space they constitute the origin of the mineral part of the soil.

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The hydrographic network is represented by rivers, lakes and a complex network of drainage and irrigation canals. The network of flowing waters that organizes its hydrographic basins within the radius of Arad County, belong to the Danube basin, being the direct tributaries of the Tisa (Aranca, Bega, Mures, Crisul-Alb, Crisul-Negru).

In the plain area, it does not have important tributaries but only some canals that drain the waters from the neighboring areas or canals that take water from Mures (Păuliș, Felnac).

In terms of salt content, groundwater has different degrees of mineralization. On small areas, the waters are fresh, and on larger surfaces, they are slightly salty (salt content of 0.4-0.9 g/l). Bicarbonic and calcium ions predominate, neutral-weak alkaline pH.

Due to its geographical position, the studied territory is characterized by the existence of a moderate continental climate, with oceanic influences, the highest frequency being the following types of air masses: polar maritime, polar continental, tropical maritime, arctic-maritime, tropical continental, arctic-continental.

The average annual temperature in Arad county varies depending on the relief areas, as follows: high mountain areas, about 6°C, hilly regions, between 8 and 9°C, and in the plain area we have between 10.8 and 11°C.

In close correlation with the variety of geomorphological factors that determine the existence of diversified relief units, of the geolithological ones, which have led to a great diversity of parental materials, or of the hydrological ones, as well as of various anthropic interventions within the researched area, the current edaphic envelope is represented by: lithosoils (0.71%), regosols (0.07%), psamosoils (0.01%), alluvial soils (12.03%), chernozems (23.22%), phaeozoms (4.65%),rendzine (0.01%),eutricambosols (18.58),districambosols (0.13%),preluvosols (11.46%), luvosols(11.46%),pelosols(5.62%),vertosols (7.03%),gleiosols(2.58%),tins(0.17%),solonits(2.36%),erodosols(2.05%),anthroposols(0.02%).

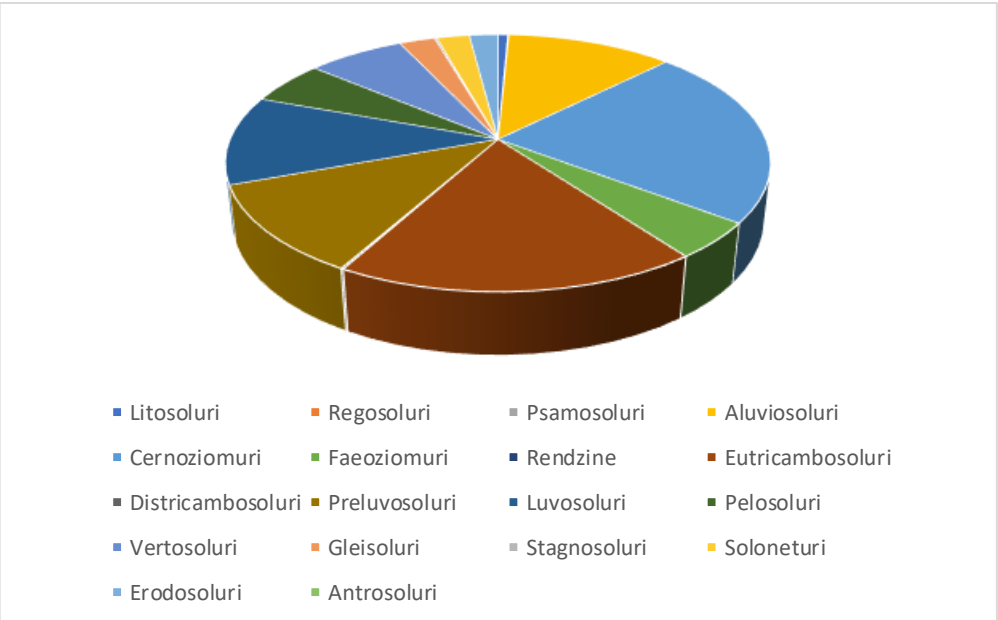

Figure 4. Soils types from Arad county

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Arad County has a significant pedological diversity, due to the varied natural conditions that influenced the formation of soils. According to the Romanian Soil Taxonomy System (SRTS 2003), the main classes of soils identified in the county are: protisols (14.91%), cernisols (30.53%), shades (0.36%), cambisols (6.80%), luvisols (25.11%), podosols (0.07%), pelisols (11.82%), hydrisols (3.20%).

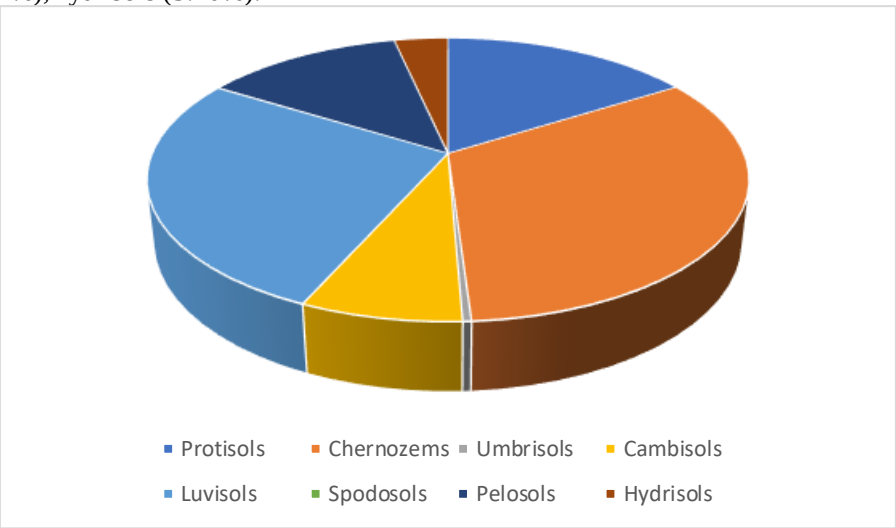

Figure 5. Soil quality classes from Arad county

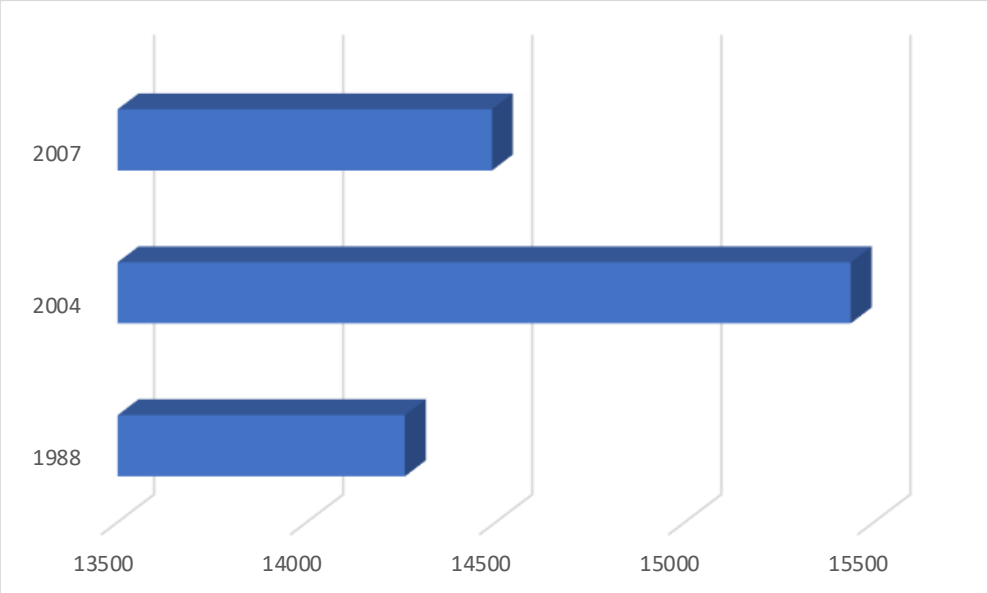

Figure 6. Evolution of soils from Arad county depending of pH

The systematic research of the soils in Arad County was deepened only after 1971, with the establishment of the Agrochemistry Laboratory.

Correlating the first researches in the field of soil reaction with those subsequently carried out, conclusions can be drawn, which indicate both the evolution of the reaction and the consequences that followed these fluctuations. Thus, in 1988, on the studied area, in a cycle of agrochemical evaluation of agricultural lands, 14260 ha (3.20%) have a strongly acidic reaction.

The following researches, carried out on the occasion of agrochemistry maps, show an insignificant evolution of the areas occupied by soils with a strong acid reaction, in 2004 it increases slightly to 15439 ha (3.40%), then decreases to 14490 ha (3.03%) in 2007.

The insignificant reduction of the land areas occupied by soils with a strong acid reaction is due to the action of calcium amendment that in the last 10 years have been decreased.

Limiting factors of the soils in Arad County are determined by natural conditions (climate, relief, bedrock), as well as by anthropogenic activities.

Table 1

.Comparative table of the main limiting factors of soils in Arad County

Geographical area	**Predominant limiting factors**	**Observations**
The Arad Plain	-excess moisture -salinization and alkanization -heavy clay texture	The low-lying areas are poorly drained, requiring drainage and improvement works
Crișurilor Plain	-compaction -salting -low humus content	Intensive agriculture has led to the gradual degradation of natural fertility
Mureș Meadow	- periodic floods -excess moisture - alluvial soils with variable fertility	It requires works to regulate rivers and improve drainage
Lipova Hills	-erosion - steep slopes -medium to heavy texture	Soils are prone to washing and loss of nutrients, especially on untilled land
Zarand Mountains	-stoniness - superficial layers of soil -severe erosion	Land used mainly for grazing or forestry; limited agriculture
Piedmont of Arad	-moderate erosion -variable texture -medium fertility	Medium to high agricultural potential with moderate risks
Peri-urban areas (e.g. Arad)	- point pollution -compaction -accelerated urbanization	Urban and industrial pressure reduces agricultural areas and affects soil quality

CONCLUSIONS

As an open ecological system, the soil is linked to the environment through a continuous flow of matter and energy. In its long evolution, under the action of natural factors and later of the anthropic ones, the soil tends towards a state of equilibrium through tendencies of equalization of imports and exports of energy and substances, and its state of fertility and production capacity depends to a large extent on its agrophysical properties, but also on the agrochemical ones.

The determination of soil quality takes into account both soil properties and other factors of vegetation, relief, climate and hydrology that determine the agricultural or forestry production capacity.

This can be achieved by conducting soil studies and laboratory analyses on the basis of which soil maps are drawn up, representing more precisely the geographical areas, which will

determine the credit assessment and the technology of the valuation degrees for the established part of the land.

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