

PEDOLOGICAL RESOURCES OF ROMANIA

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Abstract

Due to the landscape and hydrographic conditions, also specific climate and vegetation of our country territory, on a relatively small area (238 391 square km), most global soils can be found.

Romania presents such a variety of soils from those of the specific semiarid areas to those found in wetlands and cold, but associated with the soil caused by local conditions of landscape, hydrogeology and rock.

The vast majority of soils in Romania are found distributed in a horizontal scale, especially in the plain and plateau area, and also in a vertical scale in mountain regions.

There are 32 types of soil who are grouped in 12 classes.

A quarter of the country is occupied by Chernisols class (26.7%), followed by soil from Luvisols class (25%), then Cambisols and Spodosols addition to Umbrisols, all these three classes summarize a considerable area, about 60 000 square km (25%).

Except Aluvisols class, spread in the form of a strip of both sides of the river (9% area) and Psamosols (1%), the remaining 13.3% of the country is occupied by soils with local distribution (intrazonals) among which we mention: Hidrisols (3.2%), Salsodisols (0.8%), Protisols (3.9%), Histisols (1.1%) and Pelisols (1.6%).

INTRODUCTION

Romania has an important agricultural area with soil and climatic conditions that allow the practice of intensive agriculture.

Following the intensive development of pedology knowledge and international and national progress, in 1980 a unique classification system (S.R.C.S.) was developed which focuses on the intrinsic characteristics, quantified for soil.

Recently there was a improvement in the ratings, especially following the FAO/UNESCO (1988) reviewed legend and world soils, also dissemination of improved edition of several American classification and French Pedology Referential Issue (1990).

Thus, in 2003, a definitive form of classification was reached called "Romanian System of Soil Taxonomy". It comprises two main levels, an upper and a lower level of four categories, namely: variety, species, family and soil variant. Keeping

the tradition of the Romanian school of pedology, the basic unit of system is the genetic type of soil.

Some classes were introduced: Andisols Pelisols, Protisols and Antrisol, thus leading to a total of 12 classes, the last two by splitting the previous class, unevolved soils, truncated or sloppy. There appeared new types of soil as pelosols, lymnosols and anthrosols and were elevated to some kind of soil other subtypes as alosols, cryptopodzols and foliosols.

MATERIAL AND METHODS

Since 2003, in Romania has been used a final form of a classification called “The Romanian Soil Taxonomy System”. It is considered a multicategory system with two main levels, an upper level with three categories: class, type and subtype and at an inferior level with four categories: species, family, variety, soil type. The different elements between categories are those soil properties which can't be observed in the field.

Andisols, pelisols, protisols, antrisol have been introduced, and the name molisols has been changed into cernisols.

On a genetic soil level limnosoil, alosoil and pelosoil have been introduced. Cernosioms, cambic cernosioms have been united under the name of cernizom, and then, the argiloiluvial cernosiom, the cernoziomoid soil and pseudorendzine - under the name of preluvosols, and brown-red luvic soil and brown luvic soil have been reunited under the name of luvosoil.

An uniformization of names has been made through applying some rules. So, at the soil class level the name is a noun used in plural, ended in soils, of which part shows the essential character of the soil types, which compiles the class: for example, cernisols, luvisols, salsodisols, pelisols, protisols, etc. At all names is pointed out the presence of the vocal “I” as a connection element to the “soil” suffix.

At a soil genetic level was shown that names represented through a single word (which doesn't have anything in common with the name of the soil class), and as a connection vowel with some exceptions is “o” (cernoziom, luvosoil, gleiosoil, aluviosoil, regosoil, vertosoil, pelosoil).

RESULTS AND DISCUSSION

Relief

Romania is composed of very diverse landforms, proportionately distributed and fairly symmetrical and concentrically arranged. Mountains, hills, plateaus and plains succeed from the inside edge of the country around a central plateau - Transylvania Plateau.

Mountains stage is the centerpiece of the dominant relief tectonic-erosive and extends the 31% of the country.

The hills and plateaus stage is 35% of the country, with highly variable absolute altitude. Morphometrical indices still indicate the existence of two types of forms: a - the-hills of the plateau, b - Carpathian hills.

Hills of the plateau have altitudes ranging from 300-1000 having moderate to severely fragmented interfluves, sometimes they have the appearance of narrow peaks.

The subcarpathian hills generally achieved greater heights than the hills of the plateau, occurring with chain forms in the outside of the Southern Carpathians.

Plains stage includes the forms of relief flat plains with low relief energy and fragmentation, with absolute altitudes ranging from 0-300 m, they occupy about 34% of the country. Plain relief is represented by Danube Delta and river systems major corridors, the Romanian Plain and the Western Plain (Tisa).

Climate

Being situated on the one hand, halfway between the equator and pole, and on the other, at a considerable distance from the ocean, Romania is located in the temperate continental climate, maritime influences are felt only slightly.

Romania's climate is not uniform but are outstanding issues from one region to another, and on that basis, the country, it is creating some climatic regions which correspond to certain provinces (regions soil).

Medium values of annual temperature varies with latitude, longitude and altitude in particular. Thus, between south and north of the country there is a temperature difference of 3°C, and between west and east of about 1°C.

The largest quantities of precipitation fall in mountain areas (1200-1400 mm). As the altitude decreases, the amount of precipitation is reduced, so 700 mm izohieta surrounding high mountains and hills in their vicinity.

Rock

The geological structure of Romania consist in rocks of different ages from the Protherozoic-Paleozoic, Mesozoic, Cenozoic and Quaternary which, by genesis, are divided in eruptive, metamorphic and sedimentary rocks.

The role of rocks in soil formation is less important compared to that of the climate and vegetation, although from transformation of rocks is resulting mineral part of soil, which is often over 80-90% of its total mass.

Soil cover

According to the actual Romanian Soil Taxonomy System (SRTS, 2003) on our country's territory appear about 32 soil types grouped in to 12 classes. A quarter of the country is occupied by mollisols (25.4%). They are spread mostly in the plain

and highland regions represented through kastanozems, chernozems, phaeozems and rendzinas, the last ones can be found locally in hills and more frequently in some mountain areas on limestone rocks. From these the most spread are chernozems and phaeozems (24.9%) (Figure 1).

MOLLISOLS have as a diagnostic an Amolic horizon (Am), dark colored (chromes and values <3.5 in a humid state and <5.5 in dry state) and a sub-acent horizon, with a little mollic horizon character in the superior part.

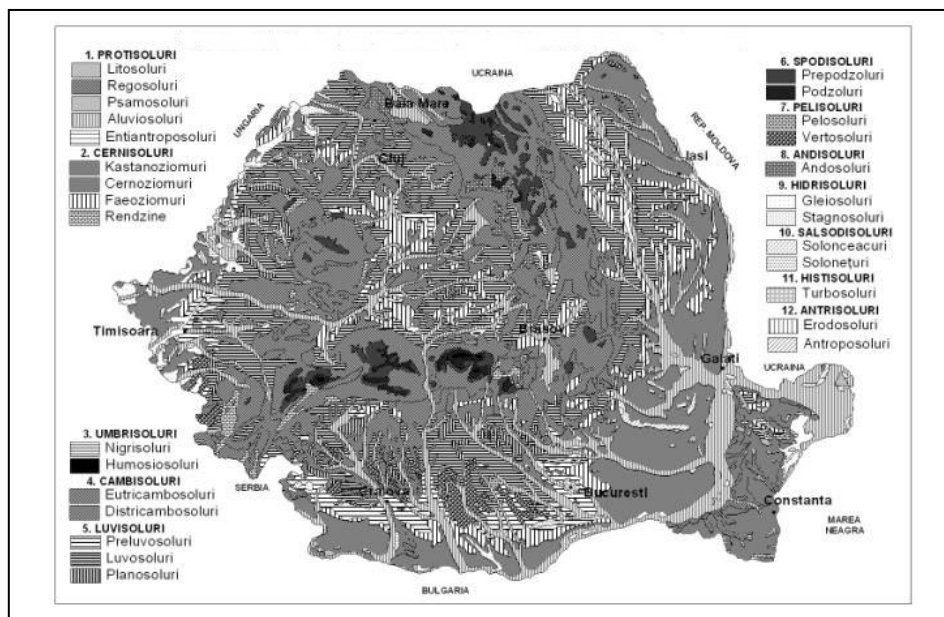


Fig. 1. Soils of Romania in Romanian Soil Taxonomy System from 2003

The grain composition of the mollisols is maintained relatively uniform on the profile. It contains about 19-23% clay (under 0.002 mm), around 26-27% dust and up to 53% sand. The nutrient supplying is medium with nitrogen (0.146-0.160%), good with phosphorus (41-62 ppm) and very good with potassium (150-219 ppm).

Another quarter of the country is occupied by **LUVISOLS** (25.5%) represented through *preluvosols*, *luvosols*, *planosols* and *alisols* and are spread in the plains and highlands, mostly in the hill and highlands regions. Dominant are typical *luvosols* which participate with about 15%.

LUVISOLS includes those soils which don't have as a diagnosis a rich migrated clay BT horizon. They can have or not an eluvial horizon (El or Ea). There are soils with an acid reaction (pH=5.4-5.7), weakly moderated humifere, with a mezobazic

character and a supplying with fertilizing elements that is unsatisfying (N, 0.100-0.130%; P, 20-36 ppm and 100-110 ppm).

CAMBISOLS and **SPODISOLS** at which are added **UMBRISOLS** and **ANDISOLS** represent together a quarter (25.5%) and are characteristic to mountain regions.

CAMBISOLS group soils at which the essential diagnostic element is the presence in the profile of the B cambic (Bv) horizon, like *eutricambosols* and *districambosols*. They appear in the Subcarpathic areas, Transylvania Highlands, Getic Highlands and Western Piedmont Hills.

SPODISOLS unite the soils in which the main diagnostic element which constitutes the presence of a spodic B horizon can be Bs or Bhs type. They are specific to the boreal mountain level (corresponds to conifers) and under the sub-alpine level. The inferior limit is situated at 1300-1450 m and goes up to approximately 2000 m. From the spodisols class there are prepodzols and podzol. *Prepodzols* represent a type Au-Bs-R profile, have a sandy-clay or clay-sandy texture, high permeability (25-39 mm/h), high acid reaction (5.0-5.5) and are well supplied with nitrogen (0.09-0.39%).

Podzols are described through the presence of Bhs or Bs and Es horizons and occupy extended areas in a mountain area (4.6%). In general they have a type Aou-Es-Bhs-Bs-R morphology, have a varied texture on profile (sandy-clay, clay-sandy), low clay content (under 25%) and are acid (3.6-4.6).

UMBRISOLS include soils having as diagnosis an A umbric horizon like *nigrisols* and *humosiosols*.

Nigrisols are defined by an Au horizon, with chromes under 2 at humid material and a Bv horizon, having V under 55%. They are spread in the mountain areas with the same areas as the brown acid soils.

Humosiosols. This kind of soils are defined by an Au horizon with chromes smaller than 2 at the humid material, containing humified organic matter separable from the silicate mineral part and A/C, A/R or Bv horizon, having at least in the upper part colors with values and chromes under 3.5 at the humid state material.

ANDISOLS are represented just by the *andosol* type defined through the presence of an A (Au, Ao, Am) horizon, followed by an intermediary horizon A/C, A/R, Bv to which amlic properties are associated. They can be found at altitudes between 1000-1800 m in volcanic mountains.

PELISOLS. They have as a diagnostic horizon the presence of a pellic or vertic horizon, of which higher limits are situated in the 0-20 cm interval and include among vertisoils also very clay soils which don't have vertic characters.

HYDRISOLS refer to soils formed in permanent or periodic high humidity conditions watery or stagnant. Included in this class are gleiosols and stagnosols (3.3%).

Gleiosols are watery hidromorf soils defined through an A horizon (mollic-Am, ochric-Ao, umbric-Au and a gleyic horizon-Gr). In Romania they are spread locally in plain areas, hill regions and inner-mountain highlands.

Stagnosols, considered hydromorphed pluvial soils are defined through a stagnic diagnostic horizon (W) with an upper limit up to the depth of 50 cm, grafted on the A horizon and/or E and B.

They are spread in plains, piedmonts, highlands, terraces on plane horizontal surfaces imperfectly watered made out of fine sediments, hard permeable. Usually they are moderated acid soils (pH, 5.0-5.8).

SALSODISOLS concern soils with a salic horizon (sa) or a nitric horizon (na) in the superior part like the solonchaks and solonetz (0.9%).

Solonchaks are soils with an A ochric or mollic (Ao, Am) horizon and an intermediary horizon to which is associated a salic horizon (sa) in the first 50 cm, they are spread on extended areas in the plain areas, on terraces and meadows.

Solonetz were defines as soils that have an A ochric or A mollic horizon (Ao,Am) followed by an intermediary natric (na) horizon from the surface or in the first 50 cm, they are spread in the same areas as the solonchaks, they have a clay texture, extremely low permeability, moderated neutral alkaline reaction (6.7-8.9).

PROFILES OR UNEVALUATED SOILS. These were formed on recent sediments, with a wind or alluvial nature which have different textures, sandy up to clay. In this class the most popular are *regosols*, *arenosols* (*psamosols*) and *aluviosols*. To these are added *lithosols* and *entiantrosols* (11.0%).

HISTISOLS. They are made out of organic hidromorphic horizons, the minimum thickness of the peatfull horizon (T) is at least 40-50 cm, they can be found in small spots in intracarpatic depressions, in some swamp areas, meadows, former lakes etc (1.8%) having a low fertility they are used as grasses.

ANTHRISOLS. Recently introduced in the soil classification worldwide and in our country, they refer to soils that have on the surface an intense modified atrophic horizon of at least 50cm thickness of which A and E horizon were excluded through erosion. In this class we can find erodosols and anthrosols (3.5%).

CONCLUSIONS

1. The Romanian System of Soil Taxonomy-2003 includes a total of 12 classes of soils and 32 soil types. As it stands now, is an attempt to systematize and order latest progress in the light soils ever made in nationally and internationally scale.

2. Without changing the basic structure and entities of the system since 1980, provides a better system of soils classification, a consistent application of diagnostic criteria, increased awareness of practical application and also a uniform soil terminology.

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