CHARACTERIZATION OF REPRESENTATIVE SOILS FROM THE CONFLUENCE OF PERESCHIVUL MIC WITH PERESCHIVUL MARE

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Abstract

The studied area belongs to Tutova Rolling Hills. The geological substrate consists of recent and loose deposits belonging to Kersonian, Meotian, Pontian, Dacian and Romanian, predominantly with sands and clay infilled. These deposits are bisected by a consequent network of parallel valleys, NNW-SSE oriented. The resulted relief is hilly, younger and monotonous, with numerous extended hills, within detaches narrow ridges and slopes association quite steep. The main rivers that drain the Tutova Rolling Hills territory are Tutova, Pereschiv, Zeletin and Berheci. Pereschiv River is located in the central-southern Tutova Rolling Hills, with a basin that occupies an area of approximately 23266.768 ha. Representative soils of the studied area belongs to classes Chernisols, Cambisols, Protisols (Regosols), Anthrosols and Hydrisols. Chernisols class includes soils very rich in humus, well structured and have the highest fertility. Chernisols prevails on the reverse cuesta of the valleys of Pereschivul Mare and Pereschivul Mic rivers. On lands with greater slope prevails Anthrosols and Regosols. In the plains of the both rivers appear alluvisols and gleysols. Chernisols are used as arable lands and Anthrosols presents a high level of degradation due to clearing of trees and vine plantations.

Key words: Tutova Rolling Hills, Pereschivul Mare, Pereschivul Mic, soil profiles

In the basin area, was modeled a sculptural relief, constituted by sandy-clayey inter-fluviums affected by geomorphological processes like gullying erosion, landslides, crumbling. Along the Pereschiv valley, appears an accumulation relief represented by alluvial plains and accumulation glacis (Niacşu L., 2012).

In terms of the type of erosion, the erosion surface represents 34% from the amount of eroded land, then the erosion in depth with 26.4% and then landslides with only 13.1%.

The temperature of the soil cover (10-11°C) is a little higher than air temperature (8-9°C). The large variations of soil and air temperature have major effects on rocks disintegration. The material is detached in the winter time due to freezing and the transport of this material begins in the springtime, due to thawing and melting (Niacşu L., 2012).

In the Pereschiv basin, erosion has unearthed only Superior Badenian-Romanian deposits, although Ionesi L. (1994) identifies 4 cycles of sedimentation: Inferior Devonian–Carbonifer, Permian–Triassic, Jurassic–Cretacic–Eocen and Superior Badenian–Romanian. In the sediments brought to the surface, predominant deposits are Maeotian, Pontian and Dacian with recent alluviums, but the studied basin area is essentially Maeotian.

The vegetation consists of forest steppe species and deciduous forests. In this area are characteristic sessile oak forests (*Quercus petraea*) mixed with *Quercus pedunculiflora* (gray oak) and *Quercus pubescens* and rare *Quercus frainetto*.

In the Pereschiv basin, there are two zones of vegetation, which make the difference between latitude and altitude.

The forest zone (the vertical one) is situated on 250-300 m altitude and it is composed by two subzones: sessile oak and beech subzone and sessile oak and oak subzone. The herbaceous species are *Poa nemoralis, Brachypodium silvaticum, Fragaria vesca, Viola odorata, Convallaria majalis.* The forests have been extensively cleared the land being later used for agriculture (Niacşu L., 2012).

The forest steppe zone (the orizontal one) is characterized by herbaceous vegetation interrupted only by some clumps of forest: *Quercus* and *Tilia species*.

Complex relief and vegetation conditions prompted the formation of a complex envelope

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soil. Some of the lands are degraded by landslides and have severe restrictions for the arable use.

Knowledge of dominant characteristics of soils are important to establish an effective management of the soil resources and and preventing or reducing their degradation.

MATERIAL AND METHOD

Our investigation were carried out in the area from the confluence of Pereschivul mic with Pereschivul mare. The study area belong to the geomorphological unit of Tutova Rolling Hills.

In order to highlight main characteristics of dominant soils from the studied area, some soil profile were made in the representative location.

Choice of representative locations for the main soil profile was done taking into account the particular characteristics of relief. The location of the soil profiles is shown in *figure 1*.

The first two locations soil profiles are located in upper and lower thirds of the heavily tilted slope from Valley of Pereschivul Mare. The representative soil for arable land is located on the face of landslide from Cabesti and Pereschivul Mare Valley.

We also studied soil profiles from wetland flood plain of Pereschivul mare and from terraces that have been clearing plantations trees and vine.

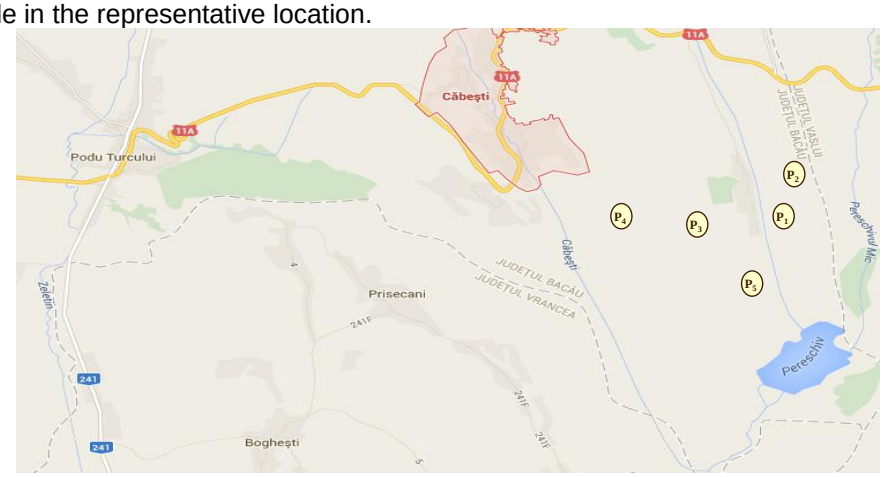

Figure 1 **The location of the soil profiles (P1- P_5) in the confluence area Pereschivul Mic with Pereschivul Mare**

The soil units were completed with new obtained data, in the field and laboratory. It was necessary the equivalence of taxonomic units name, from the Romanian System of Soil Classification (Conea A. *et al,* 1980) and the Romanian System of Soil Taxonomy published 2003, 2012 and 2014 (Florea N. *et* Munteanu I., 2003 and 2012, Vlad V. *et al,* 2014).

Disturbed samples from the soil profiles were used to determine the total soil organic matter by potassium dichromate method (Walkley-Black method), the calcium carbonate by Scheibler method. The chemical analyses in three replicates for each depth were independently performed (Stoica E. *et al,* 1986, Dumitru E. *et al*, 2009, Obrejanu G. *et al,* 1964).

The particle size distribution was also determined. The textural classes and subclases were established after Romanian clasification system (Soil Survey Methology, 1987).

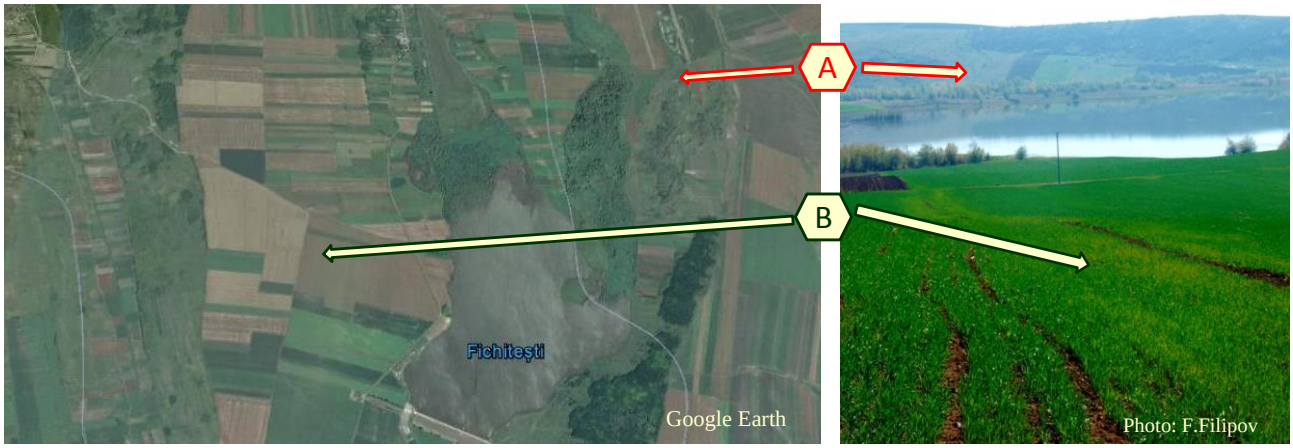

Figure 2 **The faces and cuestas landslides of the Pereschivul Mare catchment A - cuesta relief from Pereschvul Mare Valley; B - The face of landslide from Cabesti and Pereschivul Mare Valley)**

RESULTS AND DISCUSSIONS

Typical hilly area (*figure 2*) of Tutova Rolling Hills linked to developments of different soil units.

First profile was made near the left slope of the river Pereschiv, in the lower third, South-East of Căbeşti village, Bacău county (*figure 3*). The GPS coordinates are 46° 10' 96" North latitude and 27° 29' 85" East longitude. The soil profile is located upstream Fichiteşti lake, the altitude is 94 m. The land has, Western exposition, with a slope of 18°. Alluvial plain, meadow vegetation with reed, willow, poplar, natural vegetation and *Helianthus angustifolia* expanded from the plantation nearby. Parental material clayey delluvium. Usage for intensive grazing leads to continuous degradation of the land resources.

Soil features highlights the cumulative effect of poor land management.

The first soil horizon is the thatch layer (0-4 cm) consisting predominantly of organic material. The humus accumulation horizon with a thickness of only 12 cm humus shows small humus reserve. Due to continuous erosion, soil remains in the early stages of development. Calcium carbonates exists in all soil horizons. The calcium carbonates presence can be easily seen deeper than 20 cm (*figure 3*). The slight alcaline soil reaction is due to presence of calcium carbonates.

The soil with no significant profile development is defined as calcaric Regosols (after Romanian System of Soil Taxonomy, Florea N, 2003, 2012 and Vlad V., 2012) or Calcaric Leptic Regosols (WRB 2006 and 2014).

Details of soil thatch layer, humus accumulation and local accumulation of calcium carbonates are illustrated in figure 3.

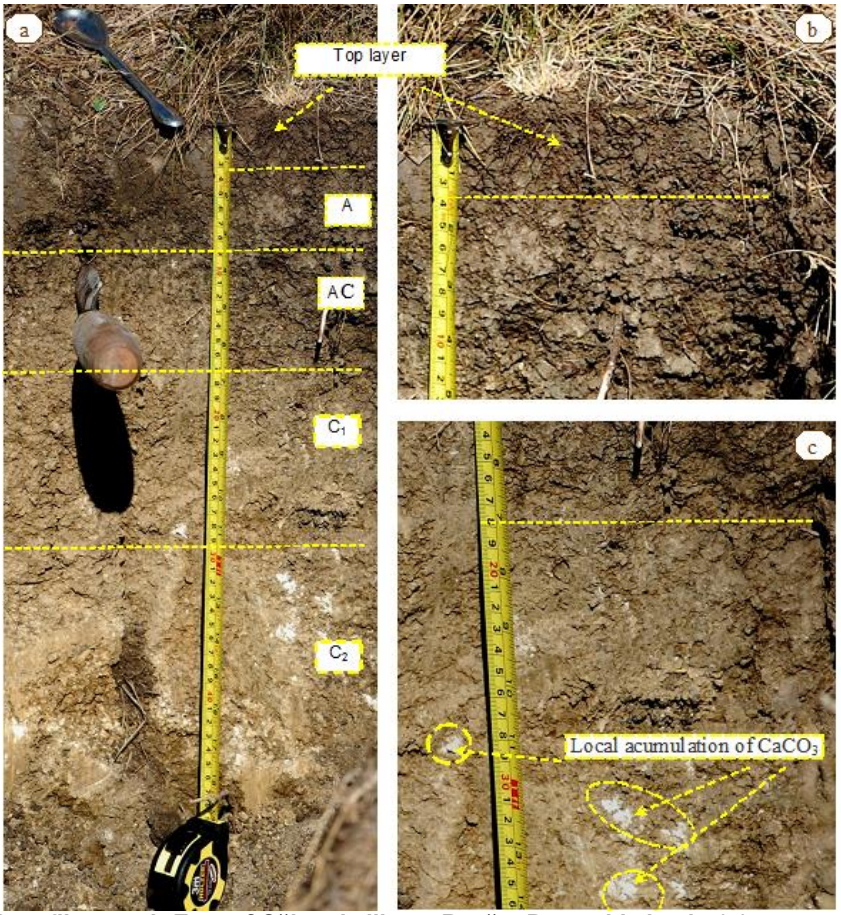

Figure 3 **Soil profile, South-East of Căbeşti village, Bacău, Pereschiv basin** (Photo: Lungu C.)

The second profile was located in the upper third of slope (Lungu C., 2015).

The coordinates of soil profile are 46° 13' 45" North latitude and 27° 30' 11" East longitude. The soil profile is located on the upper third of moderately sloped land, with Western-South-East exposition and on the altitude of 198 m. The soil is defined as Cambisol eutric (Florea N. *et al*, 2012) or Eutric ochric Cambisols (WRB 2014). The diagnostic horizon is B cambic from middle part of soil profile (figure 4)

The soil is the beginnings of horizon differentiation. A slight humus accumulation on the upper part of soil profile (A horizon) is

evidentiated by light brown colour. The B horizon is developed after leaching of calcium carbonate and changes in colour and structure.

The Eutric ochric Cambisols formation is favored by relative dry climate (under 500 mm), by high water permeability and by active geologic erosion. Moderate eroded soil developed on diluvial deposits consisting in maeotian sands. Usage for grazing, ruderalised degraded pasture. General slope is 15°.

In all soil horizons we could see biological neoformations represented by earthworm and mole channels.

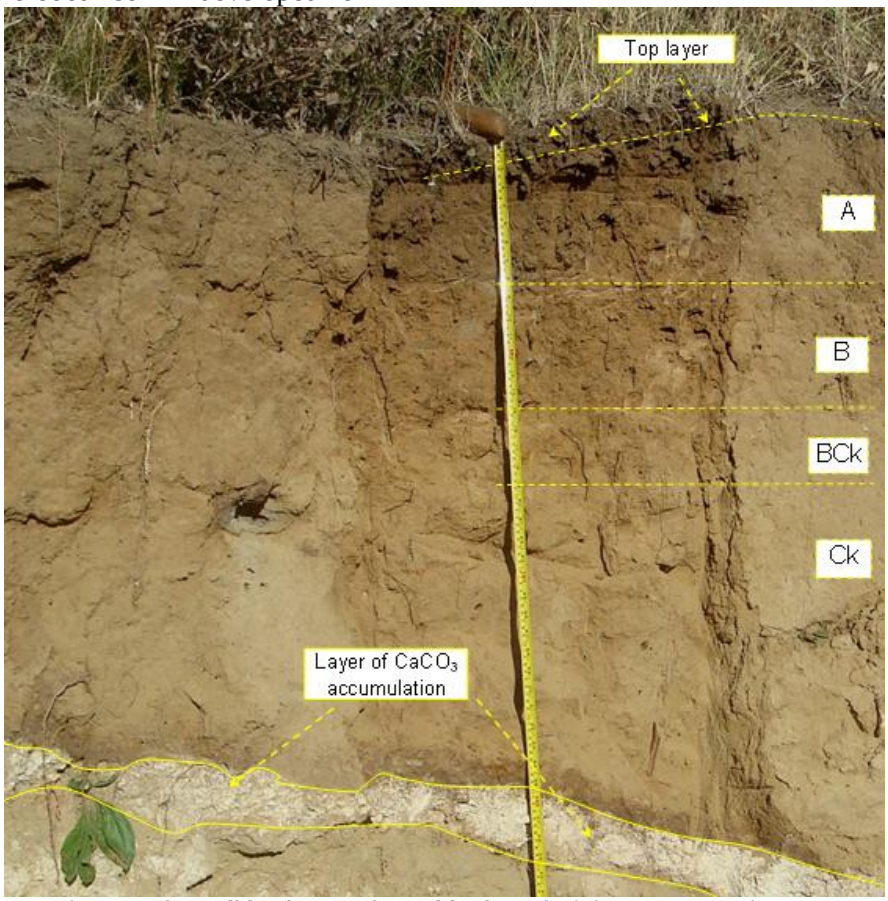

Figure 4 **The soil horizons of Cambisol eutric** (Photo: Lungu C.)

The representative soil for arable land is Chernozem cambic mezocalcaric (figure 5) depth of occurrence of calcium carbonate being 70 cm (Florea N. *et al*, 2012). After european soil classification (WRB-2014) soil is defined as Haplic Chernozems.

The cambic mezocalcaric Chernozem formation processes consisted of bioaccumulation, clay formation and leaching of calcium carbonate. Bioaccumulation was favored by saturation colloidal complex with Ca^{2+}. Clay formation occurs after removal of $CaCO_3$ and formation of iron hydroxides.

The Cambic Chernozem has high useful soil volume and good inernal drainage. Relatively uniform color of soil matrix indicates that the soil is not affected by excess moisture. The soil is relatively loose except plowpan layer that appears, locally. Discontinuous soil compaction is evidenced by the different distribution of roots. In the compacted place, the plants roots has preferentially distribution, especially on the faces of structural aggregates.

The Chernozem cambic mezocalcaric is slightly eroded and has a medium texture at the top (table 1) and coarse at the base of soil profile.

Soil has a nonhomogeneous texture, differentiated on profile. The textural differentiation occurs due mostly to textural nonhomogeneity of delluvial deposits, reshuffled by geomorphological slope processes (erosion).

Soils with medium texture, are most favorable for the majority of crops. Excess moisture present in lowland areas and humid climates can be easily removed due to good soil drainage. After A. Canarache (1991), the best expressed positive features are found in sandy clays containing less than 24-25% clay.

Silty clays are susceptible to crust formation and erosion. Coarse sandy clays and coarse loamy clays are very susceptible to compaction.

The granulometric composition is the determining factor of cohesion and adhesion of soil on which depends the resistance to plowing.

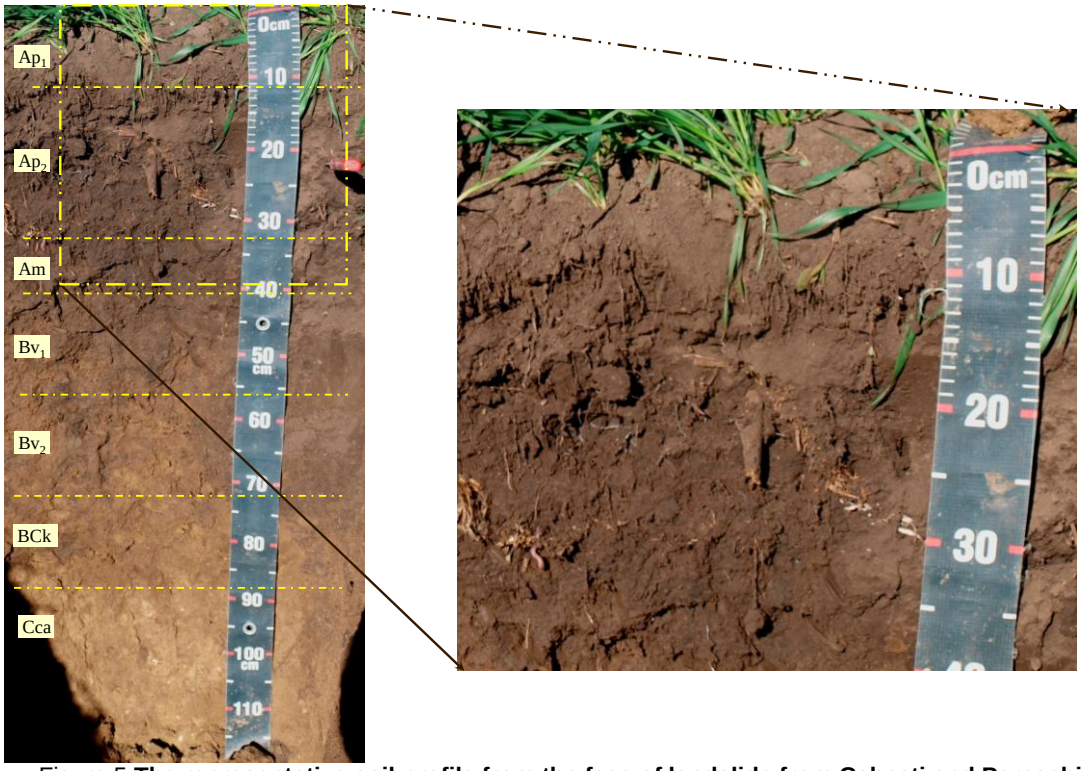

Figure 5 **The representative soil profile from the face of landslide from Cabesti and Pereschivul Mare Valley** (Photo: F. Filipov)

Table1

Texture of cambic chenozem

Depth (cm)	Horizon	Size particle (%)				Texture
		coarse sand	fine sand	silt	clay	
0-14	Ap_1	2,5	57,2	21,6	18,7	Fine sandy loam
14-32 cm	Ap_2	3,2	59,1	20,3	17,4	Fine sandy loam
32-40	Am	2,7	59,2	18,9	19,2	Sandy loam
40-54	Bv_1	1,6	50,4	23,5	24,5	Medium loam
54-70	Bv_2	4,3	45,5	25,4	24,8	Medium loam
100-140	BCk	6,7	62,6	19,8	10,9	Middle loamy sand
140-175	Ck	7,4	63,8	20,3	8,5	Middle loamy sand

The soil is poor to moderately stocked with humus and nutrients. Annual fertilization with complex fertilizers on crop establishment, ammonium nitrate and ammonium sulphate fertilizers, associated with the foliar fertilizers, compensates the nutrient deficiency in soil. Soil reaction is slightly acid and neutral in arable layer and in the subarable layer (Am).

Frequently, in marginal areas of agricultural parcels not apply fertilizers, the plants stagnate growing and became chlorotic, the yield diminish considerably (*figure 5*).

Figure 5 **The wheat strip from parcel margin where the plants are chlorotic due to poor application of fertilizers**

CONCLUSIONS

The features of calcaric Regosols with no significant profile development highlights the cumulative effect of poor land management. natural vegetation. Some plants such as *Helianthus angustifolia* expanded from the the neighboring area.

The Eutric ochric Cambisols from upper part of slope is developed under dry climate (under 500 mm) and active geologic erosion.

The representative soil for arable land is cambic Chernozem with high useful soil volume and good inernal drainage. Relatively uniform color of soil matrix indicates that the soil is not affected by excess moisture. The soil is relatively loose except plowpan layer that appears, locally.

Discontinuous soil compaction is evidenced by the different distribution of roots. The plants roots has preferentially distribution, especially on the faces of structural aggregates.

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