# THE CHARACTERISTICS OF FOREST SOILS FROM IAŞI COUNTY

## CARACTERISTICILE SOLURILOR FORESTIERE DIN JUDEŢUL IAŞI

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***Abstract.*** *The purpose of this article is to present a description of forest soils from Iasi County, based on the soil analysis realized in the period 1989-2015. As a total, 201 soil profiles and 620 pedo-genetical horizons were analyzed. Amongst the 15 soil types identified in the county, the most widespread are: preluvisol (weakly acid soils, eubasic, with a large total cationic exchange capacity, well supplied with nitrogen and moderately humiferous), eutric cambisol (weakly acid soils, eubasic, with a large total cationic exchange capacity, well supplied with nitrogen and moderately humiferous), luvisol (moderately acid soils, eubasic, with a large total cationic exchange capacity, well supplied with nitrogen and intensely humiferous), phaeozem (weakly alkaline soils, eubasic, with a very large total cationic exchange capacity, normally supplied with nitrogen and intensely humiferous), chernozem (weakly alkaline soils, eubasic, with a very large total cationic exchange capacity, normally supplied with nitrogen and moderately humiferous) and fluvisol.*
**Key words:** soils, pH, humus, preluvisol, eutricambisol

***Rezumat.*** *Scopul acestui articol este de a prezenta o descriere a solurilor forestiere din judeţul Iaşi, pe baza analizei solului realizată în perioada 1989-2015. În total au fost analizate 201 de profile de sol şi 620 de orizonturi pedogenetice. Dintre cele 15 tipuri de sol identificate în judeţ, cele mai răspândite sunt: preluvisol (soluri slab acide, eubazice, cu o capacitate mare de schimb cationic total, bine aprovizionat cu azot şi humifer moderat), cambisol eutric (soluri slab acid, eubazice, cu o capacitate mare de schimb cationic total, bine aprovizionat cu azot şi humifer moderat), luvisol (soluri moderat acid, eubazice, cu o capacitate mare de schimb cationic total, bine alimentat cu azot şi intens humifer, phaeozem (soluri slab alcaline, eubazice, cu o capacitate foarte mare de schimb cationic, alimentată în mod normal cu azot şi cu umiditate intensă), cernoziomuri (soluri slab alcaline, eubazice, cu o capacitate de schimb cationic totală foarte mare, aprovizionate normal cu azot şi moderat humifere) şi fluvisol.*
**Cuvinte cheie**: soluri, pH, humus, preluvosol, eutricambosol

## INTRODUCTION

The forests from Iasi County occupy a total area of 97.773 ha (www.insse.ro). Romsilva, the National Forest Management Administration, manages through its 8 forest districts a forest area of 66.846 ha (www.rosilva.ro).

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Forest soils are an essential part of silvicultural ecosystems (Târziu *et al.,* 2004, Spârchez *et al.,* 2011). The purpose of this article is to present a description of soils from this county's forest fund.

## MATERIAL AND METHOD

At "Marin Dracea" National Institute for Research and Development in forestry from Braşov exists a consistent data base regarding soil analysis realized over time during silvicultural management activities (Crişan *et al*,. 2016). The analyses realized on the soil samples (by using national and international methods - Dincă *et al.,* 2012) were the following: pH, humus content, carbonates content, capacity for basis exchange (Sb), exchange capacity for hydrogen (Sh), total cationic exchange capacity (T), base saturation degree (V), texture, total nitrogen.

The present paper investigates the analysis realizes on soil samples gathered from this County in the period 1989-2015, reaching a total number of 201 soil profiles and 620 pedo-genetical horizons.

## RESULTS AND DISCUSSIONS

### Types of soils from Iasi Forest District

The most widespread types of soils are the ones from Cernisoil and Luvisoil class, which reach together 71% from all the county's soils. As soil type, the most widespread is preluvisol (22%), followed by eutricambisol (20%), luvisol (18%), phaeozem (17%), chernozem (14%) and fluvisol (8%) (fig. 1).

At the country's level, luvisol occupies the 2nd place (with a total area of 1.440.052 ha, meaning 22%), eutricambisol occupies the 3d place (869.909 ha, meaning 13%), preluvisol the 5th place (335.050 ha, meaning 5%), while phaeozem has 235.282 ha and chernozem 46.026 ha (Dincă *et al*., 2014).

On a surface of 27.470 ha situated on the right side of Prutul Mijlociu basin from Iaşi County, the inventoried soils were the following: Cernisols 53%, Antrisols 28%, luvisols 14%, protisols 5%, hidrisols 0.13%, salsodisols 0.03% (Curea, 2016).

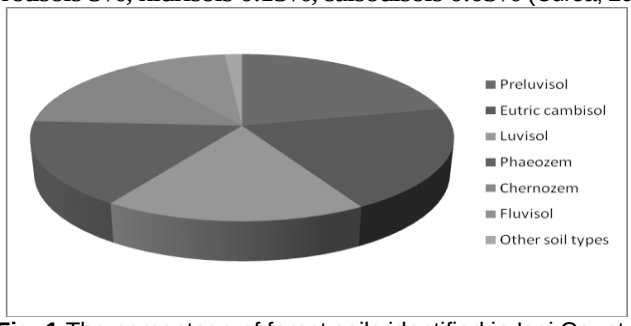


**Fig. 1** The percentage of forest soils identified in Iasi County

In Bahluieţului basin, the most widespread soils are chernozems, luvisols, fluvisols and phaeozems (Todosi and Niculiță, 2015).

In the limits area between Copou hillslope and Cacaina floodplain, the typical soil-landscape system is formed by chernozems and regosols affected by

landslides on hillslope and two-generations of soils, phaeozems and fluvisols on the floodplain (Niculiță and Rusu, 2010).

**Soil solution reaction**

The soils pH was analyzed differentially for the most widespread types of soils (preluvisol, eutricambisol, luvisol, phaeozem and chernozem) (fig. 2).

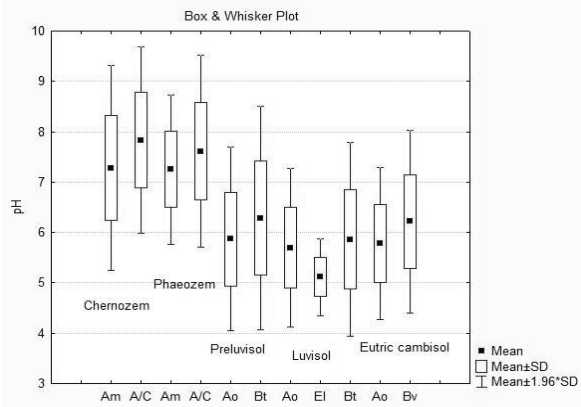


**Fig. 2** pH variation of genetic horizons for the most widespread forest soils from Iaşi county

Chernozem and phaeozem, soils characterized by significant quantities of $CaCO_3$, have a very high pH, being weakly alkaline soils. As such, the average pH for chernozem is of 7.37 in the Am horizon, 7.84 in the A/C horizon and 8.35 in Cca, while for phaeozem is of 7.25 in Am, 7.62 in A/C and 8.16 in C.

Luvisol has an average pH of 5.7 in the Ao horizon, 5.11 in El and 5.86 in Bt, being moderately acid in the first two horizons and weakly acid in the third one. Preluvisol has an average pH of 5.87 in the Ao horizon and of 6.29 in Bt, being a weakly acid soil.

Eutricambisol, a type of soil specific to beech stands from the hill areas, has an average pH of 5.78 in the Ao horizon and 6.22 in the Bv horizon, being a weakly acid soil.

Also in Iaşi county, but in Dobrovăț basin, which occupies an area of 196 $km^2$, the soil acidity increases from south towards norths, which means that soils from areas with higher altitude are more acid, while soils from areas with higher humidity and steep slopes are more alkaline (Patriche *et al*., 2011).

**Base saturation degree**

As in the case of pH, the average values for each horizon of the most representative soils from the County were calculated for the base saturation degree (fig. 3).

It can be observed that the variation amplitude of this parameter is high for all soils.

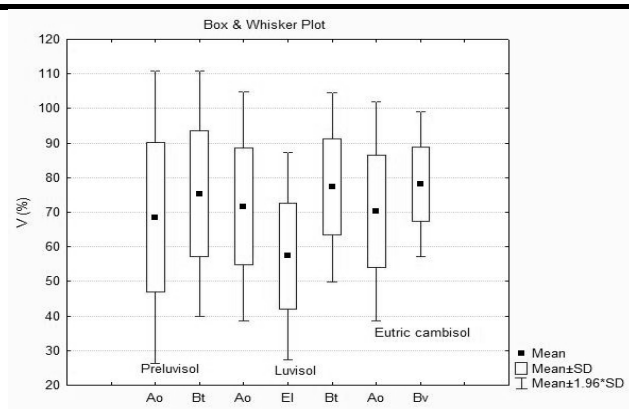


**Fig.3** Base saturation degree variation for the most widespread soils from Iaşi county

Chernozem has an average V of 92% in Am and 99% in A/C, phaeozem has a value of 91% in Am and 93% in A/C, luvisol 72% in Ao, 57% in El and 77% in Bt, preluvisol 69% in Ao and 75% in Bt, while eutricambisol has 70% in Ao and 78% in Bv. All soils are eubasic.

**Total cationic exchange capacity**

An average value per profile was calculated for the total cationic exchange capacity and was rendered as table for each type of soil (tab. 1).

*Table 1*

**Total cationic exchange capacity, average nitrogen content and humus for forest soils from Iaşi County**

| Chernozem | Phaeozem | Preluvisol | Luvisol | Eutric cambisol |
|---|---|---|---|---|
| Average total cationic exchange capacity per type of soil (T-me 100 $g^{-1}$ sol) | | | | |
| 28.32 | 26.39 | 21.30 | 21.07 | 20.72 |
| Average nitrogen content in the A horizon per soil type (%) | | | | |
| 0.17 | 0.25 | 0.22 | 0.27 | 0.21 |
| Average humus content in A horizon per soil type (H-%) | | | | |
| 3.56 | 5.04 | 4.39 | 5.44 | 4.15 |

Charnozem and phaeozem have a very high cationic exchange capacity, while preluvisol, luvisol and eutricambisol are registering high capacities of cationic exchange (fig. 4).

Similar values for the total cationic exchange capacity for forest chernozem in Prisecani (Iaşi) area (24-29 me 100 $g^{-1}$ sol) were also obtained by Bireescu *et al*., 2006.

**Nitrogen**

Due to the fact that the nitrogen quantity is decreasing on the soil's profile, only the afferent values of this parameter were analyzed for the first horizon of the studied soils (tab. 1).

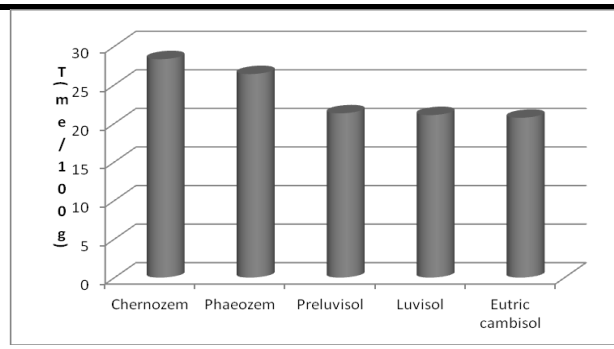


**Fig. 4** The variation of total cationic exchange capacity for the most widespread types of forest soils from Iaşi County

Chernozem is normally supplied with nitrogen, while the other soils are well supplied with it.

In Prisecani area from Iaşi County, the realized soil analysis have revealed similar values for the nitrogen quantity in the first horizon of cambic chernozem and vertic ones from the forest area (Bireescu *et al*., 2006).

**Humus**

As in the case of nitrogen, the values corresponding to the A horizon were analyzed for humus (tab. 1).

The largest quantity of humus is found in the case of luvisoil (5.44%), while the smallest one is found for chernozem (3.56%) (fig. 5).

Phaeozem and luvisol are intensely humiferous soils, while chernozem, preluvisol and eutric cambisol are moderately humiferous soils.

The humus quantities from this county are similar with the average values calculated for the entire country for forest soils (Dincă *et al.,* 2012).

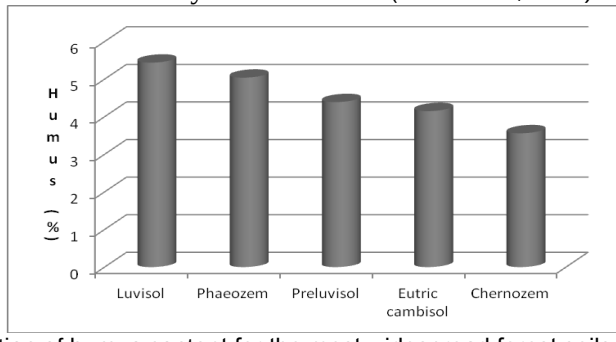


**Fig.5** The variation of humus content for the most widespread forest soils from Iaşi County

## CONCLUSIONS

1. In Iaşi County, the most widespread soils are the one specific to the field area (chernozem, phaeozem) and low hill one (preluvisol, luvisol, eutric cambisol). The above mentioned 5 types of soils have approximately an equal spread on the county's surface (between 22% and 14%).

2. Chernozem and phaeozem are weakly alkaline soils, while eutric cambisol and preluvisol are weakly acid and luvisol is moderately acid in Ao and El and weakly acid in Bt. All soils are eubasic. 3. Chernozem and phaeozem have a very high cationic exchange capacity, while preluvisol, luvisol and eutric cambisol are registering high cationic exchange capacities.

4. Chernozem is normally supplied with nitrogen, while phaeozem, preluvisol, luvisol and eutric cambisol are well supplied with nitrogen.

5. Phaeozem and luvisol are intensely humiferous soils, while chernozem, preluvisol and eutric cambisol are moderately humiferous soils.

6. The differences between chernozem and phaeozem are consisting of larger value of the soil's reaction and base saturation degree for chernozem in all the horizons. Similarly, preluvisol is a more alkaline soil than luvisol, whose base saturation degree decreases in the El horizon due to the eluviation process.

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