THE IMPORTANCE OF KNOWING GEOLOGY AND GEOMORPHOLOGY OF A TERRITORY REGARDING TYPOLOGICAL RESEARCH ON GEOGRAPHICAL LANDSCAPE SEGMENTS

Moţiu Petrică Tudor*

* University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048, Oradea, Romania, e-mail:tudor_motiu@yahoo.com

Abstract

The paper is a contribution to the development of regional ecosystem typology, which should highlight the existent forest ecosystem types in a natural region, as well as their regional particularities, as geographical and ecological foundation for differentiating management measures (Doniţă and colab., 1990; Doniţă, 2004).

Key words: geographical; segment landscape, ecological landscape environment,forest typology, forest ecosystems, sustainable forestry

INTRODUCTION

The Crisul Negru Plain and Tasadului Hills are located within Bihor County, having the following mathematical co-ordinates: 46°39' and 46°55'north latitude and 21°30' and 22°5' east longitude, being located in the lower basin of Crisul Negru river(***, 1998-1999;***, 2007) (Fig. 1).

Knowing the physical and geographical conditions of the territory where the researches have been conducted is important for understanding the complex ecological factors and determinants of the forest ecosystem biotope (forestry resort) (Chiriţă and colab., 1964; Chiriţă and colab., 1977).

MATERIAL AND METHOD

The location of the research are the forests administrated by Tinca Forest District; the study is started in 2015 and continued in 2016.

The typology of forests as ecosystems (as of stands and forestry resorts) must have a strong regional character.

The delimitation criteria of types based on life conditions (stationary conditions), reflect first of all the homogeneity of these conditions. In order to achieve this homogeneity both on the level of geotop and on the level of ecotop, it is absolutely necessary to work on natural regions, understood as relatively homogeneous geographical areas, in terms of geological-, geomorphological-, climatic- and edaphic conditions.

Achieving homogeneity on the climatic level cannot be done directly by analysing the amounts of climatic elements, registered at weather stations whose density is unsatisfactory to the needs of forest typology; so the typification studies were conducted on physic-climatic areas and floors taking into account the relief, as high relief unit and elementary unit, and in case of accidental relief and exhibition, the inclination of the slopes and the general environment(Moțiu și colab., 2011, 2012, 2013, 2014; Moțiu, 2011, 2014, 2015).

After processing the digitized data from parcelling descriptions, it were determined the landscape planner units with the same geomorphological conditions (relief unit and relief form). In the same geological and geomorphological conditions are encountered identical or similar (maybe identical) types of forest ecosystems as biotope and different as biocenosis.

In order to analyse the collected data were used different softwares such as Excel, ArcGis.

RESULTS AND DISSCUSIONS

Regarding the geological characteristics

From structural point of view the area belongs to the Pannonia Basin and the surrounding foothills.

The lithology is diverse and varies from west to east and is the result of the evolution of the Pannonian Lake during the Quaternary and the evolution of the crystalline base. In the vicinity of Tinca, the crystalline base is close to the surface (150 m depth) but it sunk at about 1000 m westward because of the existence of some faults.

In the western territory are found the loess deposits, consisting of sandy-, yellowish dust, with a few lime concretions.

The Pannonia deposits which cover the entire study area consists of clays, sandy clays, marly clays, sands, marly sands and sandy marls. A well represented deposit consist of red clay deposits which could be found at the edge of the plain, at about 120-130 altitude. From this area, during the Quaternary, the red clay was removed by the erosion and re-deposited in lower areas (fig. 2).

Some say that the red clay is an alluvial product, generated by the alteration of pannonian clays. Others say that red clay as a result from the Aeolian dust deposited during warmer periods, dust from which loess was formed in those warmer areas, with lots of rain, dust which was formed at the same time in the loess of arid regions, too. The red color is given by the high content of iron hydroxide. Recent researches (Posea, 1997, Măhăra,

1977) say that red clay is a deluvia deposit, with an extremely low content of carbonate and with a significant fraction of gravel inside the clay.

At the contact area with the hills, large alluvial fans could be found, consisted of gravels, sandy clays, with a thickness from few meters to tens of meters. The alluvial deposits situated upon the fluvial terraces are consisted of gravel and sand having a thickness of 5-10 m and were deposited during the entire Holocene. These alluvial deposits are covered with deposits of loess rocks, and local reddish clay.

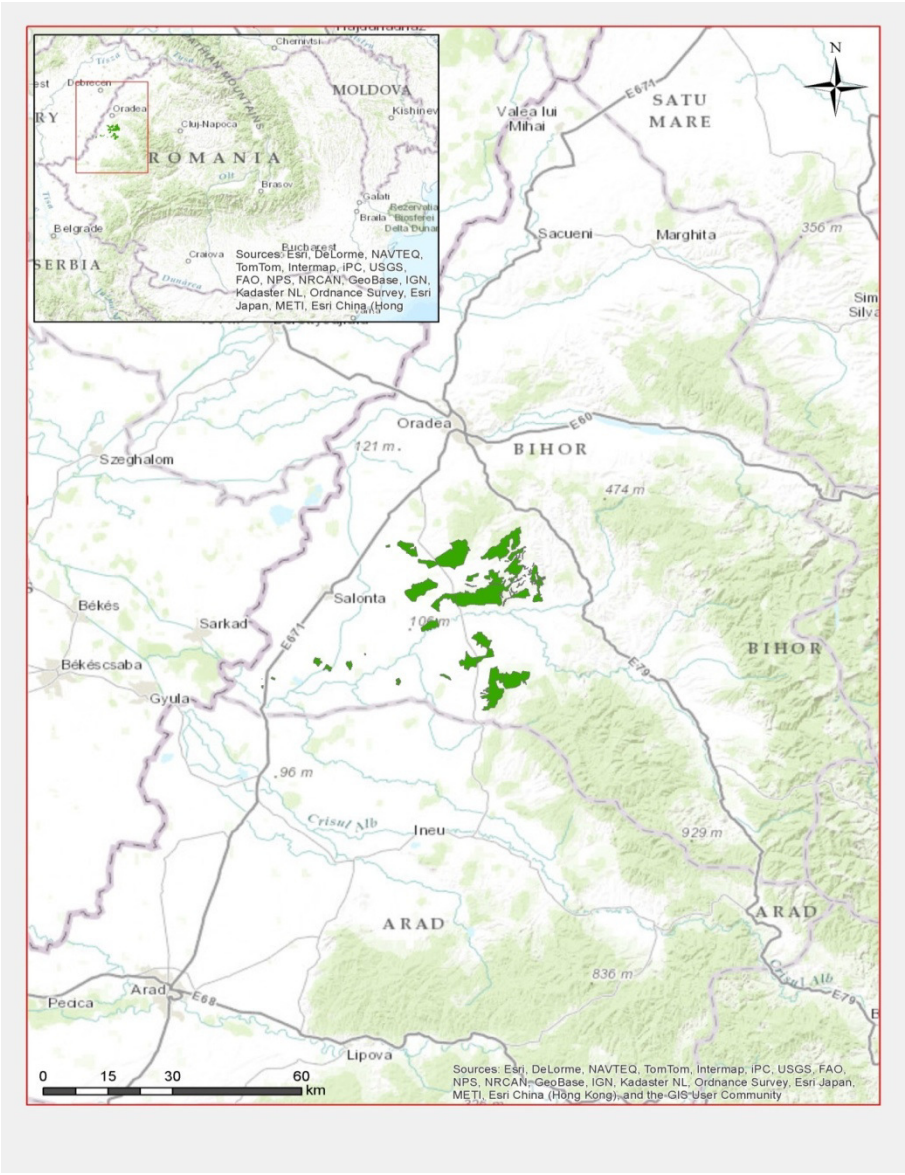

Fig. 1. Location of study area (source, ArcGis, with modifications)

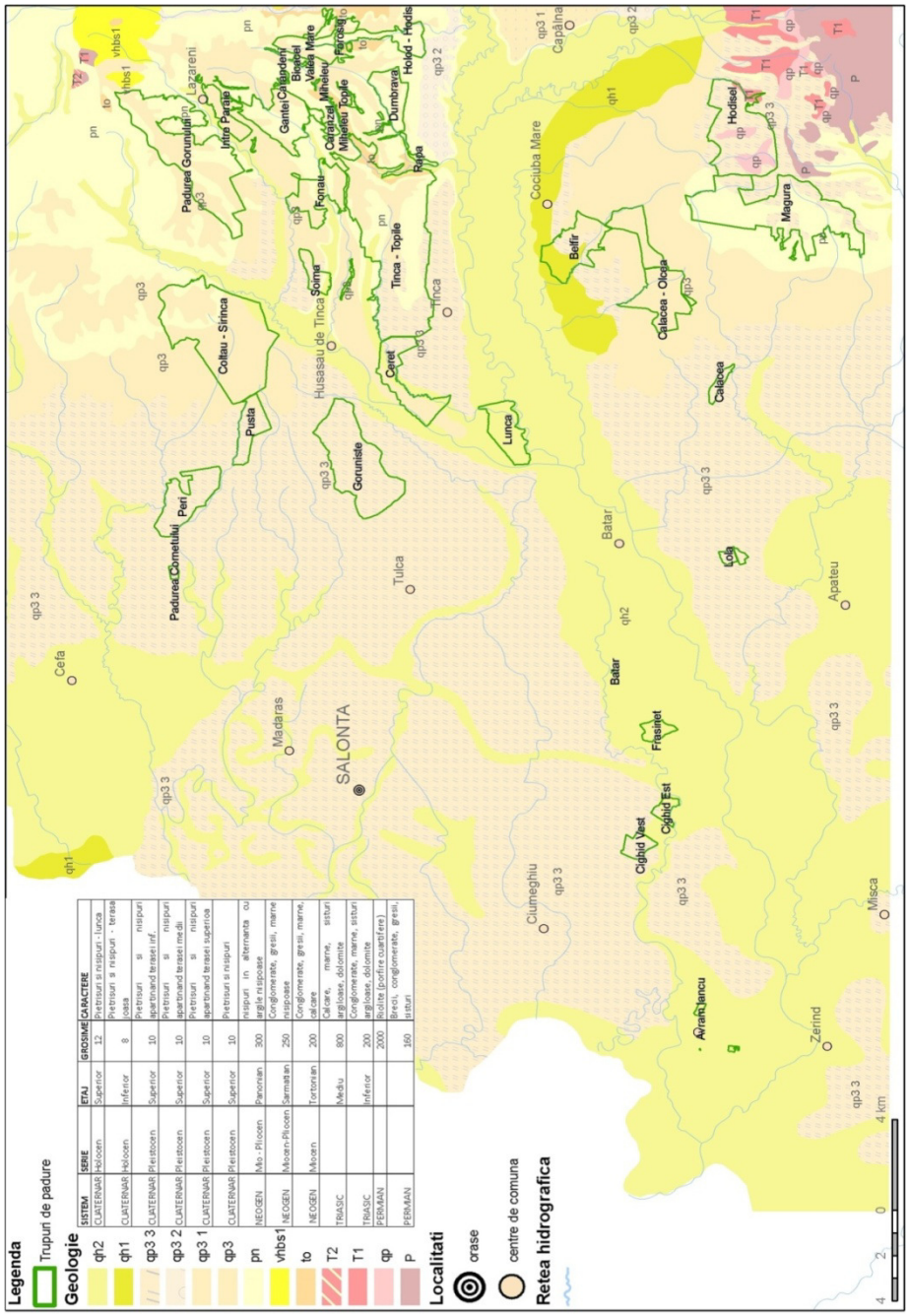

Fig. 2. Geological map (source, Harta Geologică, scale 1/200 000, sheet no. 8 Oradea, Geological Institute, 1965, with modifications)

Regarding the geomorphological characteristics

From geomorphological point of view there are three main relief steps (Coteț, 1971, 1973; Posea, 1997) (fig. 3):

- Low plain,
- High plain
- Low hills.

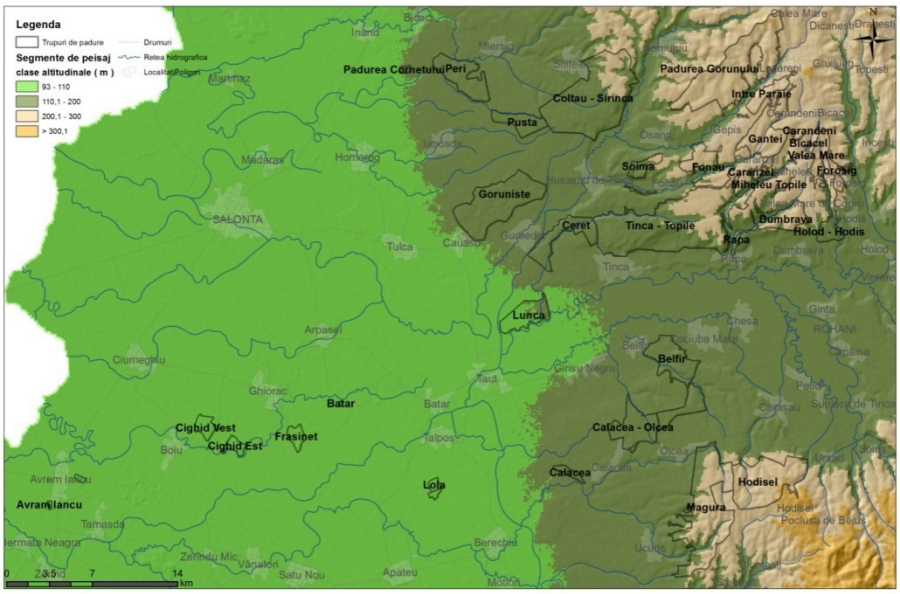

Fig. 3. The map of landscape types (source ArcGis, with modifications)

This determines the formation of three different landscape segments as relief, substrate and soils, having consequences on the complex of forest ecosystems covering them.

The alluvial (low) plain located in the western area, having altitudes of 90-110 m, is a flat plain, formed on the old terraces of Crişului Alb and Negru rivers. It is crossed by several meanders of the old dead river beds, some not too deep (3-5 m) rivers which ramble on the surface, having grinds on the edges. Local depressions meet with marsh soils.

This plain is covered with thin loess deposits.

The only larger meadow is of Crişului Negru, with rough and fine alluvial deposits, often without carbonates. The river being dammed for over 100 years, there are missing accumulations of recent silts, the soils being in advanced stages of development.

The (high) piedmont plain, located in the center of the territory, having altitudes of 100-200 m, increasing from west to east, it is a Pleistocene piedmont plain, widely corrugated, resulting from the union of dejection cones of rivers, descending the mountains and hills in East.

The transition from this plain towards the hills is made through a hump of 40 – 60 m.

The proluvial deposits from this plain are made of clay and loamy clays on the surface. On this surface are forming heavy soils, alternating fluid.

The low hills, located in the eastern and south-western territory,

having altitudes of 200-300 m**,** are poorly fragmented, having flat or slightly domed peaks, long slopes with small or medium slopes. The rare walleys, with narrow or no meadows are slightly deep.

The clay deposits predominate the peaks, conditioning the formation of heavy soils, alternating fluid, and on the slopes there are loam clay deposits, with sand and gravel outputs on which are formed soils with normal hydric regime.

CONCLUSIONS

Regarding the subdivisions of the territory

Because of a temperate climate, with sub-Mediterranean hues, on territory where researches were conducted, are distinguished three geographical landscapes, which differ in climatic variations as rain, relief, pedogenetical substrates, soils and biocenosis:

- Low western, Crisan hills;
- Piedmont, Crisan plain,
- Alluvial, Crisan plain.

Each of these segments has a certain ecological environment, decisive for the formation of biocenosis and the constitution of ecosystems.

It was defined the notion of ecological landscape environment, and it was expected that the typological regional studies will be conducted on landscapes or landscape segments, thus being able to explain the casual nature ecosystems and the presence of some types of ecosystems in the landscape.

Regarding the soils and local phytocenosis

Because of the high clay content in the pedogenetical substrates, the most widespread type of soil is the stagnic- and oligo mezo basic luvisol, with alternating humidity on the profile. On the loamy plains it is widespread the albicand flat-, oligo basic luvisol, alternating humidity both on the surface and on the profile (Târziu and colab., 2004; Târziu, 2006). The fertile soils (preluvisol, eutricambosol) (Dănescu and colab., 2010) are to be found in small surfaces.

Regarding the regional particularities of ecosystem types

The existence of oligo loamy and oligo mezo basic soils on plains, on large surfaces, strongly alternating humidity both on the surface and on the soil, which develops edified biocenosis of some species from the *Quercus* genus, with a few mixed species, having in the herbaceous layer many species of swamp (Beldie and Chiriţă, 1967; Ciocârlan, 2000).

Under these conditions, the competitiveness of species from Quercus genus, being reduced, may form mixtures, in which participate three or more

four species from this genus, present in the region: *Quercus robur,Quercus petraea, Quercus cerris, Quercus frainetto*.

REFERENCES

1. Beldie Al., Chiriţă C., 1967, Flora indicatoare din pădurile noastre. Ed. Agro-silvică, Bucureşti.
2. Chiriţă C., Tufescu V., Beldie Al., Ceucă G., Haring P., Stănescu V., Toma G., Tomescu Aurora, Vlad I., 1964, Fundamentele naturalistice şi metodologice ale tipologiei şi cartării staţionale forestiere, Editura Academiei, Bucureşti.
3. Chiriţă C., Vlad I., Păunescu C., Pătrăşcoiu N., Roşu C., Iancu I., 1977, Staţiuni forestiere, Editura Academiei R.S.R., Bucureşti, p. 518.
4. Ciocârlan, V., 2000, Flora ilustrată a României. Editura Ceres, Bucureşti.
5. Coteţ, P., 1971, Geomorfologiecuelemente de geologie. Editura Didactică şi Pedagogică, Bucureşti.
6. Coteţ, P., 1973, GeomorfologiaRomâniei. EdituraTehnică, Bucureşti.
7. Dănescu F., Costăchescu C., Drăgan D., 2010, Corelarea Sistemului român de clasificare a solurilor cu (SRCS, 1980) cu Sistemul român de taxonomie a solurilor (SRTS, 2003), Editura Silvică, Bucureşti p. 80.
8. Dănescu F., Costăchescu C., Mihăilă E., 2010, Sistematica staţiunilor forestiere, Editura Silvică, Bucureşti, p. 253.
9. Doniţă N., 2004, Tipologia forestieră integrată şi sarcini de viitor ale tipologiei forestiere în România, Revista Pădurilor, No. 2/2004.
10. Doniţă N., Borlea F., Turcu D., 2006, Cultura pădurilor, Editura Eurobit, Timişoara, p. 367.
11. Doniţă N., Chiriţă C., Stănescu V. et al., 1990, Tipuri de ecosisteme forestiere din România, C.M.D.P.A., I.C.A.S., Bucureşti.
12. Doniţă N., Popescu A., Păucă-Comănescu M., Mihăilescu S., Biriş I., 2005, Habitatele din România, Editura Tehnică Silvică, Bucureşti.
13. Florea, N., Munteanu, I., 2003, Sistemul român de taxonomie a solurilor (SRTS), Editura Esfalia, Bucureşti.
14. Măhăra Gh., 1977, Câmpia Crişurilor, Crişul Repede, Tara Beiuşului. Editura Ştiinţifică şi Enciclopedică, Bucureşti.
15. Moţiu P. T., 2011, Contributions tosustainablemanagementmeasures, based on thetypeof forests from Crişul Negru Plain and Hills of Tăşad. „Risk Factors for Environment and Food Safety". EdituraUniversităţii din Oradea, pg. 589 - 598.
16. Moţiu P. T., 2011, Typological research of forest ecosystems from Crişul Negru Plain and Hills of Tăşad. „Risk Factors for Environment and Food Safety". Editura Universităţii din Oradea, pg. 580 -588.
17. Moţiu P. T., Bucur L., Nistor S., 2011, Contribution to the typological substantiation of the forestry using gis tools in Crişul Negru plain and Tăşadului Hills, "Risk Factors for Environment and Food Safety", Annals of the University of Oradea, Forestry Fascicula, University of Oradea Printing House, pp. 572-579.
18. Moţiu P. T., Bucur L., Nistor S., 2012, Researches on types of forest ecosystems in the Crisul Negru Low Plain,„Risk Factors for Environment and Food Safety", Annals of the University of Oradea, Forestry Fascicula, University of Oradea Printing House, pp. 516-529.
19. Moţiu P. T., Bucur L., Nistor S., 2012, The methodology of elaboration researches regarding typology studies and typological mapping of forest ecosystems in CrisulNegru Plain and Tasadului Hills, „Risk Factors for Environment and Food

Safety", Annals of the University of Oradea, Forestry Fascicula, University of Oradea Printing House, pp. 507-516.
20. Moțiu P. T., Bucur L., Nistor S., 2013, Research on 5225 forest ecosystem type sessil oak with common hornbeam with Carexpilosa within the segment of landscape situated on low hills of Tinca forest district. „Risk Factors for Environment and Food Safety". Editura Universităţii din Oradea, p. 453 - 462.
21. Motiu P. T., Bucur L., Nistor S., 2013, Research on 7214 forest ecosystem type turkey oak with common hornbeam with Arum-Brachypodium within the segment of landscape situated on high plain of Tinca forest district. „Risk Factors for Environment and Food Safety". Editura Universităţii din Oradea, p. 463 - 472.
22. Motiu P. T., 2014, Research of the Main Types of Forest Ecosystems on the West Crişana Low Hills. „Risk Factors for Environment and Food Safety". EdituraUniversităţii din Oradea, p. 503 - 508.
23. Motiu P. T., 2015, Research of the Main Types of Forest Ecosystems on the West Crişana Piedmont Plain. „Risk Factors for Environment and Food Safety". EdituraUniversităţii din Oradea, p. 325 - 332.
24. Posea, G. 1997, Câmpia de vest a României.EdituraFundației "România de Mâine", Bucureşti.
25. Târziu D. R., 2006, Pedologieşistaţiuniforestiere, Editura Silvodel, Braşov.
26. Târziu D., Spârchez G., Dincă L., 2004, SolurileRomâniei, Editura „Pentruviață".
27. * * *, 1998 - 1999, Amenajamentul O. S. Tinca,U.P. –uri, Studiul general, Bucureşti.
28. *** 2007, Amenajamentul O. S. Tinca - Studiul general, Bucureşti.
29. *** 2007, Microsoft, Microsoft Excel [computer software]. Redmond, Washington: Microsoft.
30. *** 2011, ESRI ArcGIS Desktop: Release 10. Redslands, CA: Environmental Research Institute.
31. *** www.esri.com.