

RESEARCH ON 7833 MIXED OAK STAND WITH *AGROSTIS STOLONIFERA-CAREX BRIZOIDES* (REGIONAL VERSION OF A NEW TYPE OF ECOSYSTEM WITH FOUR SPECIES OF THE GENUS *QUERCUS*) WITHIN THE SEGMENT OF LANDSCAPE SITUATED ON HIGH PLAIN OF TINCA FOREST DISTRICT

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RESEARCH ARTICLE

Abstract

Each geographic landscape or segment of a geographic landscape has a certain ecological environment decisive for the formation of biocenoses and the constitution of ecosystems. The notion of landscape ecological ambience was defined and it was expected that regional typological studies would be carried out on landscapes or landscape segments, thus being able to causally explain the nature of ecosystems and the presence of certain types of ecosystems in the landscape.

Each geographical unit, either it is about zones – subzones, levels-sublevels, regions-provinces have distinct features which causes the existence of some inventory of types of ecosystems, with strong regional features. The identification and description of types of forest ecosystems on smaller geographical units, from the level of landscapes (landschaft), in order to establish the ecological specificity within a certain territorial unit and the establishment of some sustainable management measures, gives the forest typology a strong regional feature.

The present work is a case study for the development of the regional ecosystem forest typology; the problem of establishing regional typological units is now the order of the day, but through new approaches, both theoretically and methodologically. In the research undertaken, the concept and method of establishing the types and their regional variants expected in Romanian works (Doniță et al., 1990) was adopted, but with more depth regarding the study of soils and phytocenoses.

In this type of forest ecosystem the nucleus of constant species consists of: *Quercus cerris*, *Q. robur*, *Crataegus monogyna*, *C. laevigata*, *Ligustrum vulgare*, *Cornus sanguinea*, *Rosa canina*, *Rubus caesius*, *Agrostis stolonifera*, *Carex brizoides*, *Poligonum hydropiper*, *Juncus effusus*, *Lythrum salicaria*, *Lychnis flos-cuculi*, *Lysimachia nummularia*, *L. vulgaris*, *Geum urbanum*, *Glechoma hirsuta*, *Lathyrus niger*, *Poa angustifolia*, *P. nemoralis*, *Dactylis polygama*, *Veronica officinalis*, *Geranium robertianum*, *Calamagrostis epigeios*, *Lapsana communis*, *Ajuga reptans*, *Fragaria vesca*.

The *Agrostis-Carex brizoides* type characterizes the ecosystems on the plateaus with heavy soils, formed on clays, with less trophicity and with a strong water regime alternating on the surface and alternating on the profile.

Therefore, it is evident that the regional variants of forest ecosystem types arise due to the influence of regional variants of climate and soil – pedogenetic sub-layers.

Keywords: forest ecosystems, geographical segment landscape, sustainable forestry, ecological ambience of landscape

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INTRODUCTION

High piemontan plain situated in the center of the study area, with average altitudes of 100-200 m., with increasing values eastward, is a Pleistocene plain unit, largely folded, resulted from the connection of the alluvial cones of the river flowing from the mountains and hills situated eastward.

The connection between the plain and the hills is marked by a morphological threshold of about 40-60 m.

The provulial deposits from the plain are consisted of clay and silt deposits. On these materials heavy and alternant hydric soils forms.

The relief in dominantly a plateau, slightly folded and fragmented by some shallow, temporary brooks. The clays (red clays) are the base of stagnic luvisols on the slopes, planic and whitish soils on the plateau, with a well balanced hydric regime.

The climate is warm, less humid as in the low hill unit (mean average temperatures of 10°C, average rainfall quantities of 614.7 mm).

Within these natural conditions the plateau ecosystem is consisted of turkey oak, pedunculate oak, sessile oak, hungarian oak, usually the mix of two even three species, with the presence of the common hornbeam along the small brooks. The soil indicators herbaceous and shrub layer is consisted of *Agrostis-Carex brizoides*, *Genista-Festuca heterophylla* on the plateaus, *Glechoma-Geum* and *Arum-Brachypodium* along the brooks.

MATERIAL AND METHOD

The locations of the research are the forests administrated by Tinca Forest District; the study has started in 2022 and continued in 2023.

The description of the forest ecosystem was made based on collected field data. In order to analyze the collected data were used different softwares, such as Excel, ArcGis.

After determining the types, they were mapped by researching all the planning units and classifying them into types, considering the composition of the trees, the type of grass-subshrub layer, the type of humus (Moțiu and co., 2011; Moțiu and co., 2012). The delimitation method of the forest ecosystems had as base some typological schemes made for the study area (for ex forest corps) (Moțiu and co., 2011; Moțiu and co., 2012). The landscaping units with non-native species cultures were classified into types based on the type of resort.

The forest ecosystems were analyzed according to **location** within the study area; **the features of the ecosystem type**: surface area, geographical parameters (average altitude, altitude range); relief forms: types, inclination of the slopes, slope exposition, lithology, soil types and subtypes, ecological limitative factors); the description of the stands, the description of the herbaceous layer; the **correspondence with**: types of forests, types of stations, plant associations, types of habitat, **present state of the stands and management measures (particularities)**: main features, distribution according to age classes, the source of main elements, natural regeneration, productivity classes, management measures, variability and succession tendency (forms of type, successional tendencies and forest facies).

RESULTS AND DISCUSSIONS

TYPE OF ECOSYSTEM: 7833 Mixed oak, middle – and low productive, with moder, on

stagnic luvisolis, albic and planic-stagnic, oligomesobasic, hydric strongly alternating, with *Agrostis - Carex brizoides* (regional variant of a new type of ecosystem, with 4 species from *Quercus* genus)

Subtypes:

78332 highly productive subtype

78333 mid productive subtype.

Dispersion: this type of ecosystem is widespread in the Piedmont plain, in: U.P. I - Trup Ceret, Trup Goruniște, U.P.II - Trup Coltău - Șirinca, Trup Peri, U.P.III - Trup Șoima, U.P.IV - Trup Tinca - Topile, U.P.V - Trup Călăcea - Olcea, Trup Belfir, Trup Măgura.

Characteristics of the type of ecosystem within the researched area:

a. Surface: 1888,6 ha.

b. Forest sites:

- average altitude 144 m (altitude variation 110-200 m);

- relief: by shape - plateau; by slope: without inclination; after the exhibition - flat terrain;

- type of rock: reddish clay;

- types and subtypes of soil: Luvisol stagnant, planic-stagnant and albic-stagnant;

- limiting ecological factors: very compact, poorly aerated soils in the Btw horizon, which prevents the infiltration of rainwater and causes the soil to become waterlogged in the spring and during heavy rains; in dry summers lack of moisture.

c. Compositions of the stands: in the dominant floor *Quercus cerris* (in high proportions), *Quercus robur* (in varying proportions), sometimes accompanied by *Quercus frainetto* and/or *Quercus petraea* ssp. *dalechampii*, from disseminated specimens to facies proportion; *Carpinus betulus* and *Pyrus pyraeaster* can appear scattered in the tree dominated floor; rarely met *Acer campestre*, *Acer tataricum*; towards the valleys *Carpinus betulus* and *Acer campestre* can appear in a proportion of up to 10% - 20% in the composition of the stand. In most situations, the second arborescent floor is absent or very poorly represented.

d. Compositions of the sub-stands: *Crataegus monogyna*, *C. laevigata*, *Ligustrum vulgare* *Cornus sanguinea*, *Rosa canina*, *Rubus caesius*. The subtree level is generally strongly developed, with variable coverage of 10% - 90% of the area, in most cases 60% - 90% of the area.

e. Composition of the herbaceous layer:

The grassy layer is mosaic due to the unevenness of the plateau relief; in slightly

depressed places, hydrophilic flora predominates - *Agrostis stolonifera*, *Carex brizoides*, *Poligonum hydropiper*, *Juncus effusus*, *Lythrum salicaria*, *Lychnis flos-cuculi*, *Lysimachia nummularia*, *L. vulgaris*, *Galium palustre*, etc., and in higher places the usual flora predominates of thermophilic forests - *Geum*

urbanum, *Glechoma hirsuta*, *Lathyrus niger*, *Lychnis coronaria*, *Poa angustifolia*, *Stachys sylvatica*, *Stellaria holostea*, *Dactylis polygama*, *Poa nemoralis*, *Vincetoxicum hirsutaria* etc.

The grass layer is generally well developed, with variable coverage of 5% - 80% of the area, in most situations 50% - 80% of the area.



Figure 1: Mixed oak stand with *Agrostis stolonifera*-*Carex brizoides*, u.a. 141A, U.P.II Sititelec area, (photo - P.T. Moşiu)

Correspondence with:

- **Forest types²:** 7432 - Mixture of Common oak, Sessile oak, Turkey oak, Hungarian oak (m).

- **Resort types³:** 7.4.1.0. - Hilly mixed oak stand with common oak Pm, white and typical mezzo-stagnic luvisols (\pm vertic, \pm planic), stagnosols (\pm vertic, \pm planic), planosols (\pm vertic), small - sub-medium edaphic; 7.4.1.1. - Hilly mixed oak stand with common oak Pm, white and typical epihipostagnic - mezzo-stagnic luvisols, cu *Poa pratensis*-*Carex caryophylla*;

- **Vegetable associations⁴:** *Quercetum cerris* Georgescu '41;

- **Type of habitat⁵:** -.

The current state of stands and management measures (peculiarities):

f. The structure of the stands: Figure 2 shows the distribution of the number of trees by diameters, and Figure 3 shows the vertical and horizontal structure of a representative arboretum, inventoried in 141A, U.P.II. Composition of the tree: 6St 4Ce diss.Go,Gâ, 70 years old, number of trees per hectare: common oak - 156, turkey oak - 128, sessile oak - 12, hungarian oak - 8.

g. Distribution according to age intervals: 6-10 years old - 6%; 11-20 years old - 7%; 21-40 years old - 41%; 41-80 years old - 41%; over 80 years old - 5%.

h. The source of the main elements of the stand: common oak - natural sowing 14%, shoots 25%, plantation 61%; turkey oak - natural sowing 30%, shoots 45%, plantation 25%; hungarian oak - natural sowing 6%, shoots 74%, plantation 20%; sessile oak - natural sowing 16%, plantation and artificial seeding 84%.

²Forest types are cited from N. Doniță et al., 2005.

³Resort types are cited from F. Dănescu, C. Costăchescu, Elena Mihăil, 2010.

⁴Vegetal associations are cited from N. Doniță et al., 1990, and the types of new ecosystems, after V. Sanda, A. Popescu, D. I. Stanciu, 2001.

⁵The habitat types are cited from N. Doniță et al., 2005.

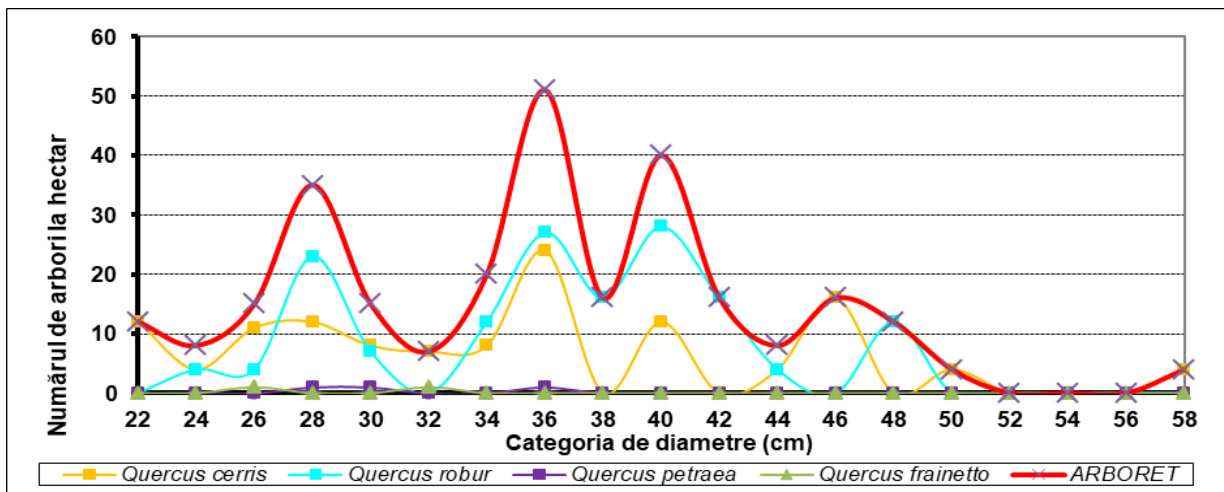
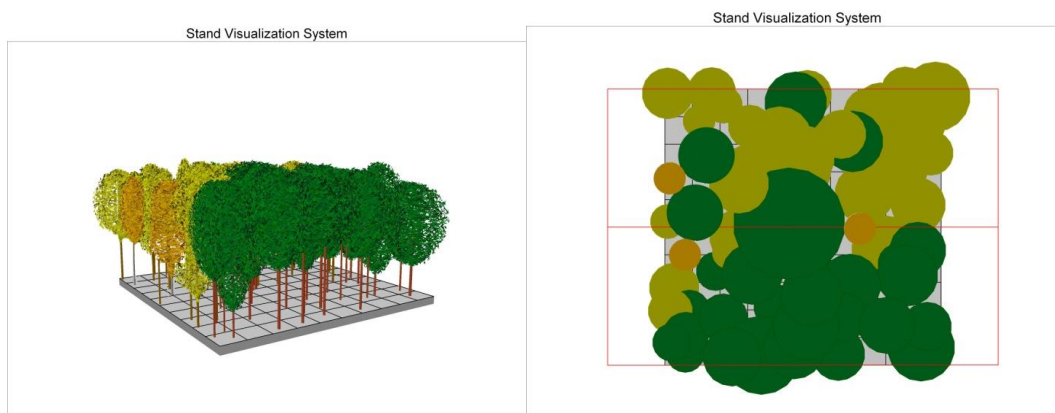


Fig. 2: The distribution of tree numbers per hectare in stand, according to diameter categories and species in u.a. 141A, U.P.II Sititelec area



Legend:

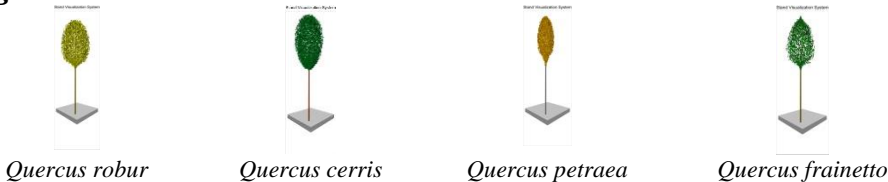


Fig. 3: The diagram of vertical structure (left) and plan projection of the canopy (right) for test plot of 2500 sqm, using SVS software, 3.36 version, in u.a. 141A, U.P.II Sititelec area

i. Production classes of the main species of the stand: common oak cl III/IV; turkey oak cl III/II; hungarian oak cl III/II; sessile oak cl III/IV.

j. Natural regeneration through seeding: turkey oak and hungarian oak regenerates very well, common oak and sessile oak regenerates less actively, but in more favorable micro-stations, especially in valleys, they regenerates better.

k. Indicated composition: 3St 3Go 1Gâ 1Ce 2Ju,Ar,Pă,Mă.

l. Management measures on age intervals: 0-5 years - uncovering natural regenerations and/or the plantations; 6-10 years - the preferential promotion of common oak and sessile oak, introduced through plantations or sowing, by applying release cutting. It is

mandatory to maintain mixed species (field maple, field elm, tartarian maple, wild pear) to create a tree dominated floor (lower storey); 11-20 years - proportioning the mixture in favor of common oak and sessile oak by cleaning, maintaining the hungarian oak; 21-40 years - choosing the trees of the future (come from the seed) and applying the first combined thinning around these trees; 41-80 years - the designation of future trees, mainly from the common oak, sessile oak, hungarian oak species and the application of thinnings combined with mainly removing the turkey oak; over 80 years - application of hygiene cuts.

m. Other management measures: stands from shoots will be converted gradually, as far as possible by natural regeneration (if the stand is at

the age of fruiting) or by restoration. In the case of crops with ecologically non-indicated species (false acacia, American red oak, European black pine, Scots pine, black cherry), it is recommended to replace them with native species adapted to local seasonal conditions.

n. Variability and successional trends (forms of type, successional tendencies and forest facies): within this type of forest ecosystem, the natural tendency is to eliminate the common oak and the sessile oak by the turkey oak and the hungarian oak, producing the succession to the turkey oak - hungarian oak mixed stand, type of ecosystem **7435** - Turkey oak - hungarian oak mixed stand with *Genista-Festuca heterophila* (terrace form). With the transition from the plateau to the valley, hornbeam is installed on the slopes in the composition of the stand, forming a facies with hornbeam within the type; this is a form of transition to type **6925** - Mixed oak stand with *Arum-Brachypodium*. **Silvofacies:** with hungarian oak (mix in bouquets or groups with coverage up to 30-40% in the composition of the stand).

o. Observations: the alternation of humidity is reflected in the micromosaic of the flora, represented by mesoxerophyte species and hygrophyte species, this indicating a soil with high humidity alternation (spring - excess, summer - deficit). In the „Trupul Goruniște”, as well as in the „Trupul Ceret”, the „Trupul Pusta” and in part of the „Trupul Coltău – Șirinca” (the high plain part), the mosaic of the grassy layer is specific: hygrophilous flora in microdepressions and mesoxerophilic flora on microelevations.

In the forest ecosystem type 7833 the pedunculate oak shows growths lower than the sky by 2-3 meters, trunks that are weakly jointed, with greedy branches starting from 3-4 meters high (dominated trees, belonging to class III Kraft). In some places the common oak is completely eliminated by the turkey oak, or is about to be eliminated (in a certain stage of deterioration, belonging to class IV Kraft).

The regional variant of a new type of ecosystem that is edified by the presence and coexistence of four species of the genus *Quercus* (*Quercus cerris*, *Quercus robur*, *Quercus petraea*, *Quercus frainetto*).

CONCLUSIONS

Forest typology evolved from the necessity of differentiating management measures of the forests according to composition, structure, productivity, features of the stands ie after their eco-systemical features.

Regarding forestry measures by type of forest culture have revealed that there were concerns relating to differentiating normal types but not the present state of the as result of more or less proper management methods. Forester practitioner is forced to differentiate on the basis of this action and the current state of forest types that manage them

Regarding the regional particularities of ecosystem type

Due to the high clay content of the pedogenetic substrates, the most widespread soil type is stagnant oligo and oligomesobasic luvosol with alternating moisture on the profile. On the clay plateaus, the albic and planar luvosol, oligobasic and with alternating moisture both on the surface and on the profile, is spread.

Regional variation of ecosystem type - Mixed oak stand with *Agrostis stolonifera-Carex brizoides* is given by the existence on the plateaus, on large areas of oligo and oligo mesobasic clay soils, with strongly alternating moisture on the surface and on the profile, on which biocenoses built up by several species of the genus *Quercus* develop, with few mixed species, having in the layer many species of marsh grass. Under these conditions, the competitiveness of *Quercus* species being reduced, mixtures can be formed in which three or even all four species of this genus, present in the region, participate.

Silvicultural recommendation

In order to improve the stationary forest conditions, more precisely to reduce the consistency of the soil and increase its aeration in the upper part of the Btw horizon, it is necessary to form a tree floor dominated by secondary (helper) species: field maple, field elm, tartarian maple, wild pear. These species, which mainly perform ameliorative functions for the stand and the forest as a whole, have a very high contribution to the optimal functioning of the forest ecosystem and at the same time to the harmonious growth and development of the main species.

By maintaining a full consistency of the stand (C=1) soil compaction and compaction will be avoided, thus improving the water regime, which is deficient in the second part of the vegetation period.

Treatments with repeated cuts and regeneration under the massif are recommended, and more precisely, the treatment of progressive cuts through which the mixture can be better proportioned in favoring the common oak and sessile oak instead of turkey oak and hungarian

oak. Preparatory cuts are mandatory to extract badly shaped hornbeam specimens with defects, especially those originating from shoots; thus avoiding the transmission of their genetic characteristics in the future tree, improving the gene pool of the hornbeam population and at the same time, maintaining the desired proportion of hornbeam.

This priority of this period is to establish types of forests ecosystems on small geographic units, at the level of landscapes, the typology having thus a strong regional feature.

We tried, as the research of this paper to establish ecosystem-based forest type principal existing in a territory smaller but representative low western hill within Tinca Forest District, to state the current status of types and propose appropriate management measures this state and designed to bring a type similar to the natural state.

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