

**RESEARCH ON 4236 FOREST ECOSYSTEM TYPE EUROPEAN  
BEECH STAND WITH FESTUCA DRYMEJA WITHIN THE  
SEGMENT OF LANDSCAPE SITUATED ON LOW WESTERN  
HILLS OF TINCA FOREST DISTRICT**

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**Abstract**

*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 (Doniță, 2004). Forest typology evolved from the necessity of differentiating management measures of the forests according to composition, structure, productivity, features of the stands, i.e. after their eco-systemic features (Donițet al., 1990).*

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

**INTRODUCTION**

The Low Hills, situated in the south western part of the study area, have average altitudes of 200-300 m, have reduced vertical fragmentation, with flat or slightly curved interfluves, elongated slopes and mid values inclinations. The valleys are rare, the clay deposits conditioning the formation of heavy soils, and on slopes the clay-loam deposits, with alternation of sand and gravel deposits, conditioning the formation of normal hydric soils.

The relief is fragmented by valleys, the slopes being the main relief form, but also extended plateaus. On slopes, the sedimentary formations of sand, loam, clay, gravel, caused the formation of basic stagnicluvisols, at most mid basic, with a well-balanced hydric regime and on few areas eutricambosols, more fertile and with a well-balanced hydric regime.

The aim of the study was to establish the main forest ecosystem type within Tinca Forest District and to establish the state of these ecosystems in order to find the best management solution for a sustainable use, preserving and conserving the optimum biodiversity of the forest. The aim of the research was also the scientific fundamentation, very useful both in forest management and in applied forestry, in order to find the best management solutions for a sustainable use.

## MATERIAL AND METHOD

The locations of the research are the forests administrated by Tinca Forest District; the study has started in 2016 and continued in 2017.

The forest ecosystems were analysed 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).

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

## RESULTS AND DISCUSSION

**TYPE OF ECOSYSTEM: European beech with common hornbeam stand, mid productive, with moderate, developed on brown luvisols, oligo- and mid-basic, well balanced from hydric point of view, with *Festuca drimeja* (the regional type with turkey oak)**

**Subtypes:** 42362 mid productive subtype.

**Areal distribution:** this type of forest ecosystem is distributed in the low hills within: U.P.III – Sessile oak Forest, Sessile oak Forest, Între Pârae, U.P. III Gânței, U.P.IV - Miheleu-Topile, U.P. V - Măgura.

**The features of the ecosystem within research area:**

**a. Surface:** 456,2 ha.

**b. Environment:**

- Average altitude: 220 m (altitude variation 170-270 m);
- relief: according to the shape - low and mid slopes; according to the inclination - quick and moderate slopes; according to the slope inclination - partly sunny and shady slopes, rarely on sunny slopes;
- Type of rock: sand in alternation with sandy clays;
- Types and subtypes of soil: typic and mollic Eutric cambosol, rarely stagnic Luvisol.
- Limiting ecological factors: soils with medium edaphic volume on fast slopes, with rock near the surface.

**c. The composition of stands:** on the dominant *Fagus sylvatica* level (in high proportions), *Quercus petraea* ssp. *Polycarpa* (in small portions or up

to 10%), in some cases *Quercuscerris* may be found (disseminated); on the dominant level may be found *Carpinusbetulus* with variable coverage, of 10% - 40% of the surface.

**d. The composition of sub-stands:** *Crataegusmonogyna*, *Rubushirtus*, *Cornussanguinea*. Shrubs are poorly developed and unevenly spread, depending on the shades of hornbeam sublevel. In all cases, *Carpinusbetulus* is also present in the sub-stands, with coverage of 5% - 10% of the surface.

Sub-stands are poorly developed, with coverage of 5% - 20% of the surface, depending on the illumination degree.

**e. The composition of the herbaceous layer:** dominating *Festucadrymeja*, *Carexpilosa*, *Galiumodoratum*, *Asarumeuropaeum*, *Anemone nemorosa*, *Lamiumgaleobdolon*, *Dentariabulbifera*, *D. glandulosa*, *Dactylispolygama*, *Melicauniflora*, *M. nutans*, *Cruciatalaevipes*, *C. glabra*, *Mycelismuralis*, *Pulmonariaofficinalis*, *Geranium robertianum*, *Saniculaeuropaea*, *Scrophularianodosa*, *Circaealutetiana*, *Aposerisfoetida*, *Lathyrusvernus*, *Carexdigitata*, *C. sylvatica*.

In some cases may be also found: *Stellariaholostea*, *Galiumschultesii*, *Viola reichenbachiana*, *Poanemorialis*, *Euphorbia amygdaloides*, *Platantherabifolia*, *Paris quadrifolia*, *Veronica officinalis*, *Hypericumperforatum*, *Fragaria vesca*, *Chaerophyllumhirsutum*, *Oxalis acetosella*.

Out of the lianas may be found *Hedera helix* and out of the ferns *Dryopterisfilix-mas*.

The herbaceous layer is unevenly developed, in spots, depending on the degree of shading, with coverage of 10% - 25% of the surface.

**Correspondence with:**

- **Forest types<sup>1</sup>:4281**–European beech stand with *Festucadrymeja* (m);
- **Resort types<sup>2</sup>:6.9.1.1.** - Hilly mixed oak stand with European beech stand of inferior limit Pm, luvisols, including albicluvisols ( $\pm$  **hypostagnic**), medium edaphic;
- 6.9.1.2.** - Hilly mixed oak stand with European beech stand of inferior limit Pm, luvisols, including albicluvisols ( $\pm$  **hypostagnic**), highly edaphic;
- **Vegetable associations<sup>3</sup>:** *Carpino–Fagetum* Paucă'41;

<sup>1</sup>Forest types are cited from Doniță et al., 2005.

<sup>2</sup>Resort types are cited from Dănescu, Costăchescu, Mihăil, 2010.

<sup>3</sup>Vegetal associations are cited from Doniță et al., 1990, and the types of new ecosystems, after Sanda, Popescu, Stanciu, 2001.

- **Type of habitat<sup>4</sup>:R4118**–Dacian woods of beech (*Fagus sylvatica*) and hornbeam (*Carpinusbetulus*) with*Dentariabulbifera*.

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

**f. Tree structure:** 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 u.a. 71A, U.P.V. Composition of the tree: 6Fa 4Ca, 95 years old, number of trees per hectare: beech - 164, hornbeam - 100.

**g. Distribution by age:** 11-20 years old - 4%, 21-40 years old - 11%, 41-80 years old -59%, over 80 years old - 26%.

**h. The origin of the main arboretum elements:** beech- natural sowing 98%, shoots 2%; oak - natural sowing78%, shoots 22%; hornbeam - natural sowing21%, shoots79%.

**i. The production class of the main arboretum elements:** Fa cl II/III, Go cl II/III, Ca cl III/IV.

**j. Natural regeneration:** beech regenerates very well, the hornbeam abundantly; the oak regenerates well, but encounters hardships because of the hornbeam and beech seedlings.

**k. The indicated target composition:** 4Go 3Fa 2Pam, Ci, Fr 1Ca.



Fig. 1. European beech stands with *Festuca drymeja*, u.a. 71A, U.P.V area (photo - P.T. Moțiu)

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<sup>4</sup>The habitat types are cited from Doniță et al., 2005.

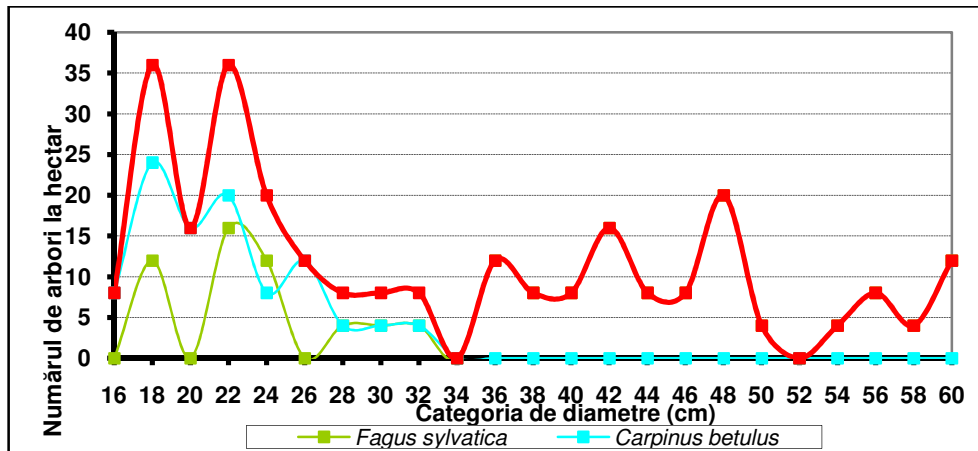


Fig. 2.The distribution of tree numbers per hectare in stand, according to diameter categories and species in u.a. 71A, U.P.V Belfir-Hodişel area

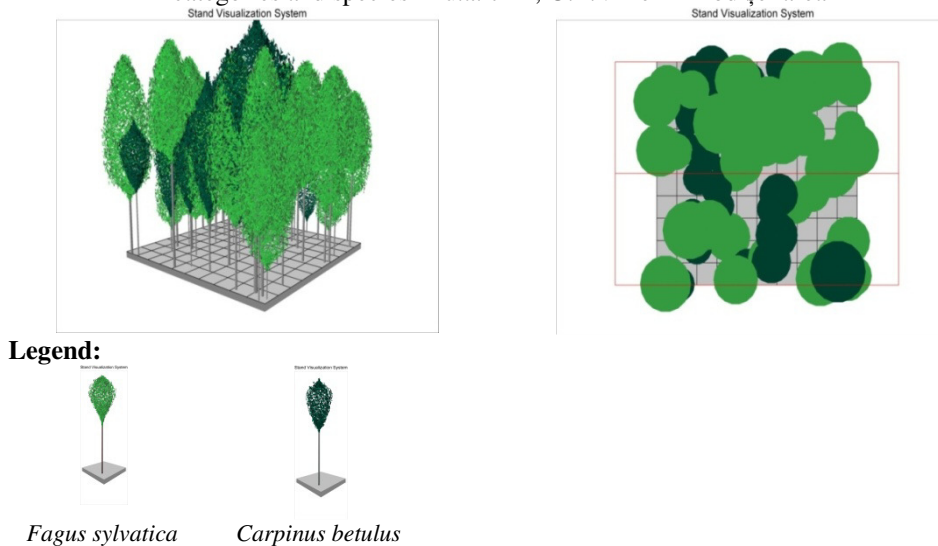


Fig. 3.The diagram of vertical structure (left) and plan projection of the canopy (right) for test plot of 2500 sqm, using SVS software, 3.36 version, in u.a. 71A, U.P.V Belfir-Hodişel area

**1.Management measures on age ranges:**0-5 years–eliminating natural regeneration and/or plantations through works done on time and with perseverance; 6-10 years – promoting the well-conformed, vigorous beech and oak specimens,by applying recesses. It is mandatory to keep the aid species (mountain ash, hornbeam) in order to create a sub-level; 11-20 years– proportioning the mixture according to the set target composition, by cleaning, preserving the valuable specimens of beech and oak, the aid and mixed specimens; 21-40 years – designating the future trees (from seed) of

the main, basic species—beech and oak, but also of the main species of mixture (mountain maple) and rarefying; 41-80 years – continuing future tree promotion by combined rarefying around them, keeping the rest of the mass closed; over 80 years – applying hygiene cuts and preparatory cuts. Recommended treatment: progressive cuts.

**m. Other management measures:** the introduction of oak and mixed species in the arboretum composition will be done by planting, in addition to the regeneration of beech and hornbeam, in open holes by the treatment of progressive cuts. Maintaining the arboretum structure closed vertically. It is recommended to extract on time (before fructification) of the tremulous poplar and the willow, which tend to eliminate other species in the early stages of development of the stands. In case of the cultures with ecologically unspecified species, and stationary inappropriate (black pine, silver pine, acacia), the ecological reconstruction of natural forest ecosystem is recommended, by substituting them with native species, adapted to local station conditions. In places with a higher abundance of hornbeam in the sub-level and sub-arboretum, are mandatory to perform works in order to help natural regeneration, in years with abundant fructification, of beech and mixed species; are necessary to perform works of completing natural regeneration by direct sowing in case of oak, hornbeam, cherry and/or plantations of these species.

In the same time, it is recommended the reconstruction of the fundamental natural forest ecosystem, in case of partially or totally derived arboretum with hornbeam by substitution.

**n. Variability and successional tendencies (forms of the type, successional tendencies and silvofacies):** near the valley, the soils are deeper, more trophic, with mull type humus, the trees reach higher; the type of ecosystem presents a form of transition towards the type **4216**—Beech with hornbeam with *Asperula-Asarum-Stellaria* or towards the type **4136**—Beech with *Festucadrymeja*. On slopes with a lower inclination, especially on sunny, or partially sunny, exhibitions appears the oak (in some cases also the Turkey oak), sometimes in proportions of facies, making within the type a form of transition towards the forest ecosystem type **4616** -Beech-hornbeam with *Asperula-Asarum-Stellaria*; on shady slopes, in situations with increased humidity, the oak can make facies with oak, a form of transition towards the type of ecosystem **4636** – Sessile oak stand-European beech stand with *Festucadrymeja*. In many cases the hornbeam produces proportions of 50-60% in the arboretum composition, in some cases 70 - 90%, tending to eliminate even the beech, producing the succession towards common hornbeam forests. **Silvofacies:** with hornbeam, mountain maple and cherry (mixture in bouquets or groups with up to 50% coverage in the

arboretum composition), in favourable stationary conditions, on slopes with a lower inclination, and a higher illumination degree.

**o. Notes:** danger of erosion on rapid slopes with excessively uncovered soil.

## CONCLUSIONS

Knowing the physical-geographical conditions of the territory in which researches were carried out, are important for knowing the ecological complex of factors and determinants of the forest ecosystem biotope (forestry resort) (Chiriță et al., 1964; Chiriță et al., 1977).

The regional variation differences of the forest ecosystem type in the researched territory, compared to the type described nationally, consists in the possibility of presence of Turkey oak in arboretum composition, the presence of *Crataegus monogyna*, *Rubus hirtus*, *Cornus sanguinea* shrub stand some new species in the herbaceous layer: *Melica uniflora*, *M. nutans*, *Cruciatulae vipes*, *C. glabra*, *Circaea lutetiana*, *Aposeris foetida*, *Lathyrus vernus*, *Carex digitata*, *C. sylvatica*, sometimes even *Stellaria holostea*, *Galium schultesii*, *Viola reichenbachiana*, *Poa nemoralis*, *Euphorbia amygdaloides*, *Platanthera bifolia*, *Paris quadrifolia*, *Veronica officinalis*, *Hypericum perforatum*, *Fragaria vesca*, *Chaerophyllum hirsutum*, *Oxalis acetosella*. The herbaceous and shrubby layer is still unevenly developed, in spots, depending on the arboretum shade degree, but with a larger coverage than 10- 25% of the surface.

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.

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