TYPOLOGICAL RESEARCH OF FOREST ECOSYSTEMS FROM CRIŞUL NEGRU PLAIN AND HILLS OF TĂŞAD

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Abstract

Typological substantiation of forestry represents the ecological base in order to establish environmental management measures, with maximum efficiency of forests, to ensure a greater exercise of the forest's complex functions of creating and protecting the living environment.

Key words: *sustainable management, forest typology, forest ecosystem.*

INTRODUCTION

The research was conducted in Crisul Negru plain and Hills of Tăşad. The investigated area is located in the south-western county of Bihor, between 46 ˚ 39 'and 46 ˚ 55' north latitude and between 21 ˚ 30 'and 22 ˚ 5' east longitude, located in the middle basin of the river Crisul Negru.

The complex terrain is characterized by plains, hills and low hills. Structurally, the studied area is part of the great unity of the Pannonian Basin. The Lithologic substrate that formed both types of soil is varied in age and as a constituent part, it is part of the great unity of the Pannonian Basin (***. et al, 1997-1999).

From a geomorphologic point of view, on the studied area are distinguished many unities. The area from East includes some branches of the west hills from Apuseni Mountains.

Piedmont Hills in the north - east of the territory studied are poorly fragmented, with altitudes between 200 and 300 m, consisting of large ridges, slightly convex, bounded by short slopes and extend the slide. Separating valleys, usually shallow and narrow are rare, sometimes showing floodplains and low terraces.

Regarding the hilly area of southern territory (area Hodişel - Olcea), in general, on the broad peaks dominate clay-shale and clay deposits, and on slopes deposits of clay often mixed with sand and gravel.

As an intermediate step between the higher East and the plain of digression from the western edge of the territory, is distinguished the high sub-hilly plain, between Crisul Repede and Crisul Negru, with a large corrugated surface.

Altitude plain area is between 110 and 200m, increasing from west to east and reaching a maximum height near the hills. Switching from plain to the west piedmonts is generally gradual, with a bump of 40 - 60m.

From a geomorphologic point of view, the plain area, considered broadly, is presented in two parts: high plain and low plain.

The low plain is the sequel to the east of the Tisza Plain, formed on the terraces of Crişului Repede and Crişului Negru, with altitude between 80 and 120 m, generally showing a relief.

MATERIAL AND METHOD

The used data was taken from the forest management plans, field tested and completed with the results of typological studies. As data processing software was used ArcGIS version 9 and Xcel program.

Using Geographic Information Systems in forestry is of major importance because they provide a rich knowledge, according to which we can manage the entire forest system, offering as well the possibility to perform analysis and forecasts of the evolution of different components of forest ecosystems as a whole.

RESULTS AND DISSCUSIONS

1. General findings of the investigated forests

Naturally regenerated forests

The analysis of arrangements and field research resulted in several findings that reflect the natural state of trees, forests and hills from Tăşad and Crisul Negru.

1.1. The findings on the composition of trees

Forest stands in the investigated area are composed mostly of four species of the genus Quercus. In order of frequency is about Quercus cerris, Quercus petraea, Quercus robur and Quercus frainetto. On the highest hills, the valleys thread is found beech too (Fagus sylvatica ssp moesiaca).

The Turkey oak appears in pure stands, in mixtures with sessile oak, with common oak, beech and with Hungarian oak, and in complex mixtures: turkey oak – common oak – Hungarian oak, turkey oak – common oak – sessile oak, turkey oak -sessile oak – Hungarian oak, turkey oak – common oak – sessile oak – Hungarian oak. There are also turkey oak mixed with hornbeam, turkey oak – common oak with hornbeam, turkey oak - sessile oak with hornbeam, turkey oak – sessile oak - beech with hornbeam, turkey oak - beech with hornbeam, turkey oak – common oak - Hungarian oak with hornbeam, turkey oak – common oak – sessile oak with hornbeam, sessile

oak with hornbeam, common oak with hornbeam (rare) and beech with hornbeam.

Beech, in pure stands is found only in 6 arranged units from the production units III, IV and V; and oak with beech in a single arranged unit from the production unit III. The only frequently met mixed species is the hornbeam, it appears frequently and only in lowland forests the field ash (Fraxinus angustifolia) and common ash (Fraxinus excelsior).

Other met, mixed species are: cherry, common maple, tartarian maple, field ash, rarely silver lime (in some plots), field elm. In a few plots at higher altitudes we can find aspen and goat willow, showing a strong tendency to expansion, also serotonin is found in lowland forests, in some sub-plots invading undergrowth. In the 60 arranged units of production, from the production units III, IV and V, the hornbeam is found in pure stands, totally derived, on the bottom of the valleys and shaded slopes.

Hungarian oak appears in plain medium and low hills (150-200m), sessile oak particularly on low and medium hills, but also on high plains (200-300m). Beech appears exclusively on the highest altitudes (200-300 m), and generally shaded slopes or near the valleys.

The Turkey oak stands appear exclusively on plane lands of middle and high plains in the UPI and UPII and only 40% of UA in UPIII, IV and V, generally on sunny slopes of $6\text{-}10^0$;

The Turkey oak stands with common oak appear exclusively in medium plain (120-160).

The Turkey oak stands with sessile oak are located mostly (85 from u.a.) on the slopes, both sunny and shady (one exception is turkey oak – sessile oak mixed stand terrace from UPIII, u.a 2B, 4B, 6C and 71A)

The Turkey oak stands with hornbeam are located mostly on slopes (75%), and in shade, with a slope of up to 15^0;

The turkey oak – sessile oak mixed stands with hornbeam is located on partly sunny but also shadowy slopes;

Mixtures of turkey oak + turkey oak and Hungarian oak + sessile oak, with few exceptions are found on flat plains and plates, while other mixtures of Quercus species: turkey oak + common oak + Hungarian oak, turkey oak + sessile oak + Hungarian oak, turkey oak + common oak + sessile oak + Hungarian oak and all mixtures of Quercus species with hornbeam are found on partly sunny, partly shaded slopes, but with low slopes ($6\text{-}10^0$).

Small common oaks with ash are found exclusively on the meadows in the low plain, and the pure small common oaks, or with hornbeam are found on high plains or on the field.

Small sessile oaks with hornbeam appear only on partly sunny and partly shaded slopes.

Small hornbeams occur mostly on shaded slopes, or on the lower third of the slopes with other exhibitions.

Small beech with sessile oak with hornbeam appears on partly sunny, rarely shaded slopes;

Small beech with turkey oak and hornbeam appears on partly sunny slopes.

The pure small beech appears on shaded slopes or on the lower third of partly sunny slopes.

1.2. After the proportion of species association participation we have:

1. Turkey oak – Common oak, 16%
2. Turkey oak – sessile oak, 16%
3. Turkey oak, 15%
4. Turkey oak – sessile oak – hornbeam, 15%
5. Turkey oak – hornbeam, 6%
6. Turkey oak – common oak – sessile oak, 5%
7. Sessile oak – beech – hornbeam, 3%
8. Hornbeam, 3%
9. Turkey oak – sessile oak – beech – hornbeam, 2%
10. Turkey oak – common oak – Hungarian oak, 2%
11. Turkey oak – sessile oak – Hungarian oak, 2%

1.3. Findings on the origin and the way of regeneration of trees

Very few trees, 9.19% of total u.a. - 11.46% of the total surface comes from seed, most of them from shoots, 30,36 % of total u.a. – 35,32% of the total surface; a part has mixed origins — from shoots and seed, 11,12 % of total u.a. – 15,83% of the total surface.

This shows that only in few cases was promoted natural regeneration of trees from seed, or if cuts were done for this purpose, the results were not satisfactory.

In fact in quite many trees (21.71%), occupying large areas (13.34%) re-establishment was made artificially by planting mostly native species, stationary indicated, but also with alien species, stationary compatible (Red Oak, black walnut, Douglas fir); Scots pine, European black pine, common larch and common spruce have been introduced outside their natural range, showing drying at a certain age. Planted false acacia was used too, but then regenerated from shoots (root - sucker), leading to III - and IV – generation, most of these trees reached physiological and morphological degradation due to aging stumps.

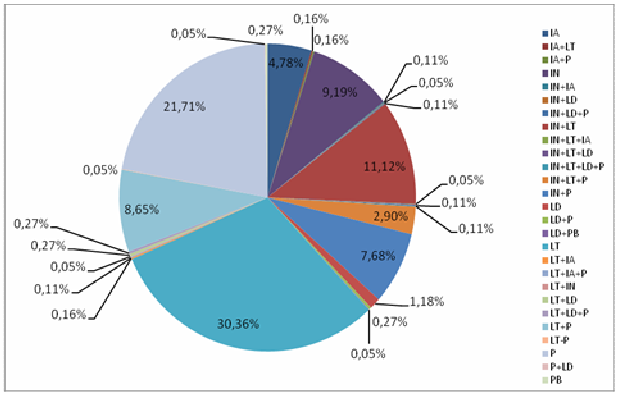

Fig. 1 Way of regeneration of trees – percentage of total number of arranged units

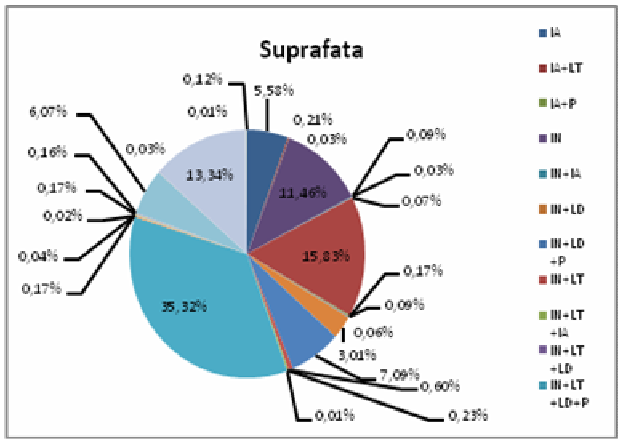

Fig. 2 Way of regeneration of trees – percentage of the total surface

For coppice stands were set lower age exploitability (50-80 years) to be converted to forest; in most cases this being done by plantations, after exploitation of coppice stands; but for quite a number of shoots, were set high exploitability age (120-130 years), without special justification, many trees are already subject to several cycles of branches, having old beak.

Since the area occupied by coppice stands is high, the conversion process will be long (Doniță N., Borlea F., Turcu D. et al, 2006).

1.4. Findings on stand structure

1.4.1. In terms of spatial structure

Most trees, especially those regenerated by cutting the grove have simple structure, single-storey, regular high forest, in which a maximum height difference of 1-2 m are found in stands where there are 2-3 Quercus species with different productivity

If there were made irregular cuts, there may appear two generations of branches, and if conversion was attempted by aging, stands can be two-storied with a high floor of shoots, and one less high, in case of trees derived from seed. Two-storied are those trees too, in which hornbeam occurs as mixed species, usually having reduced height with 2-4 m than the Quercus species or beech.(Florescu I., Nicolescu N. et al, 1998).

Horizontal composition of most stands is 0.7 to 0.8. In mixed stands, species distribution in this plan can be grouped or random, depending on how its initial product of seed regeneration and tree removal within the age occurred, as effect of competition.

1.4.2. In terms of age structure

Most trees are even aged stands and absolutely even aged stands, in the case of the coppice stands.

However, there are few old trees with two age elements, in case of those with a single generation of shoots and one of forest.

Young aged stands predominate (Table with structure age classes). Those having on old age (100-120 years) are rare: 56,9 ha in UP I, 32,4 ha in UP II , 101,5 ha in UP III, 44,2 ha in UP IV and17,8 ha in UP V.

With these low stands surfaces it cannot be supported continuous exploitation of crops and income.

Just on the basis of conversion of coppice stands of 50-80 years cycles can be achieved harvested volume, but obviously with lower income because of the smaller dimensions of timber, resulted from exploitation. It is added also the wood from thinning, because the majority of trees (%) are in age classes, provided for this work.

1.5. Findings on age exploitability

Although most of stands originate from shoots, and only in case of the beech and partially of sessile oak originate from seed, the proposed exploitability age are high in 70% of the cases: of 100-110 years, but also 120 or even 130 years. If conversion was followed, this was made on the line of forest exploitability, replacing the coppice stands through aging, and not at the age when it reach fructification. Although, 30% of cases adopted also exploitability ages too of 80-90 years, this means conversion at the age of fructification.(Doniță N., Borlea F., Turcu D. et al, 2006) In few cases

were proposed lower conversion ages, usually 50 years for small hornbeams and rarely for the species from genus Quercus.

In this conception the conversion of coppice stands, which occupy almost all the area and have stands close to the natural composition, will in most cases last at least for 100 years.

1.6. Findings on goal compositions

In case of more or less natural stands, the goal composition in most cases is the same with the species from genus Quercus, but eventually with increasing proportion of the turkey oak, common oak, sessile oak, especially at the expense of hornbeam. In addition to reducing the proportion of this mixed species, the only more frequent, were not used, except for a few cases, other species mixture, so necessary for the proper management of trees composed of species from genus Quercus. We are talking about ash, cherry, plane maple and sycamore maple, common maple and lime rarely. On the contrary, there were introduced some invasive species - serotonin (Prunus serotonin), others with a tendency to heaviness, Red oak (Quercus rubra), which is in competition with species from genus Quercus, and even changes stationary and phytocenotics conditions (red oak eliminates some species by pronounced shading).(Stănescu V., ofletea N., Popescu O. et al, 1997).

Resinous species introduced outside their natural range, common spruce, common larch, European black pine, Scots pine, were not adapted to local conditions taking place stationary drying and broke because of the wind. These stands are not up to expectations and desired quality, having low wood uses.

It is desirable rapid replacement of these trees with fundamental natural forest ecosystem type.(Stănescu V., ofletea N., Popescu O. et al, 1997). The only species of pine introduced, adapted to certain stationary conditions (higher summer humidity - EU-3) is Douglas fir.(Stănescu V., ofletea N., Popescu O. et al, 1997). It can be introduced in the future, but only in pure stands. So most future forest stands, as much of the current will be made only from Quercus species, pure or mixed, hard to control and with lower wood quality because of the greedy shoots.(Doniță N., Borlea F., Turcu D. et al, 2006).

Some examples:

-in case of turkey oak stands, the goal compositions are 60 % of the situations 10 turkey oak and 30% of the situations 8-9 turkey oak,1-2 DT and in 10% of the situations are mixture with red oak, common oak and various hard.

- in case of turkey oak stands with common oak and sessile oak the goal compositions are almost exclusively with these mixtures in most of the

cases with a lot of turkey oak, rarely common ash, plane or sycamore maple, silver lime, cherry, various hard.

-in case of turkey oak stands with hornbeam, only in 40 % of situations kept this mixed composition species, hornbeam missing from the formula, being used in many cases mixture with maple, ash and cherry, rarely common oak and red oak, or even beech, or being proposed formulas with common oak or with sessile oak from the mentioned mixed species: manna ash, tartarian maple, common maple and field ash.

-in case of turkey oak –sessile oak mixed stands with hornbeam in composition, were kept the turkey oak and sessile oak in various proportions, only in 50 % from u.a. was proposed hornbeam too, but usually only in proportion of 10 % and in few u.a. were seen as mixed species with plane maple, ash, cherry and rarely with lime or other various hard;

-in complex mixtures of Quercus species (turkey oak , common oak, sessile oak, Hungarian oak) were proposed similar compositions to the current ones, more or less natural, maintaining in big proportions the turkey oak 40-80% and in lower proportions other species from Quercus genus, rarely red oak. In 30% from u.a. were provided mixed species: ash, lime, plane maple, cherry, hornbeam, but in small proportions 10-20%;

-in case of small oaks from meadow with ash, were provided similar goal compositions but with variable proportions of common oak, ash, and very rarely mixed with hard species, for example elm. (Ulmus laevis).

-in pure common oaks from meadow were provided only common oak compositions of 100%, without missing. Only in those with hornbeam was provided mixture with this species.

-in case of small common oaks with sessile oak, the goal compositions are the same with those from the above mentioned, more or less natural, without mixed species.

-in case of small sessile oak with hornbeam, the compositions have hornbeam and sessile oak in varied proportions.

-in case of small hornbeam, was maintained the pure hornbeam in the goal compositions almost in every arranged unit. Reducing the age of exploitability to 50 years, probably relied on its coppice stand regeneration without proposes of replacing with common oak and sessile oak;

- in case of small beech with sessile oak and hornbeam, or turkey oak and hornbeam, were provided similar goal compositions with those natural, without using other mixed species.

- in case of few pure small beech the goal composition is also 10 Fa

So, the general finding is that the forest management designer sought to maintain almost in each unit in goal compositions the common oak species, eliminating in many cases hornbeam from the natural compositions

and using relatively few a.u. with other mixed species: ash, plane maple, sycamore maple, cherry, lime, various hard (without precising which). In many cases were used in goal compositions: red oak or Douglas fir, Spanish chestnut.

CONCLUSIONS

In conclusion, in case of conversion will be adopted primary the conversion by aging, mixed conversion, in cases it is absolutely necessary, on this occasion being able to introduce other valuable species, non-existent in the old forest, or it may assure increasing proportion of basic participation of species, and conversion by recovery (replacement) of small hornbeam coppice stands, derived partially or entirely.(Doniţă N., Borlea F., Turcu D. et al, 2006).

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