CONTRIBUTIONS TO SUSTAINABLE MANAGEMENT MEASURES, BASED ON THE TYPE OF FORESTS FROM CRIŞUL NEGRU PLAIN AND HILLS OF TĂŞAD

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Abstract

Developing a typology of forest ecosystem responds, to the highest degree, to the concerns of our current promotion of valuable native species, complex stand structures, for the rational use of all forest structures. Swift introduction of ecosystem typology in forest planning and forest research, will create the widest promotion of ecological forestry, oriented equally towards the production of wood and to protect the living environment (Doniţă and colab. 1990).

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 southwestern county of Bihor, 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.

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.

From the study of climatic conditions results that the investigated area (forests from the perimeter of Tinca's Forestry) stands, in terms of climate, in a quite wet and reasonably warm province, with evenly

distributed rainfall throughout the year. However most of the rain falls in late spring – early summer, respectively May and June. In a year there are an estimated 115-130 days with precipitation. We distinguish precipitation below 600 mm, corresponding to the western forest steppe zone. In the rest of the area, precipitation quantity exceeds 600 mm, being the higher the closer we get to the hills.

We believe that both the field and in the hills, the climate is milder than in other parts of the country.

Winds were generally low and medium strength, throughout the year. Most rains are brought by winds from SW and W.

In conclusion, following the distribution of various climate elements, of which we presented only the most significant in the studied climate, can fit the "Cfax" formula, after Köppen scales, indicating that in this environment meet specific microclimates, formed under the influence of local factors, which are reflected in vegetation structure.

MATERIAL AND METHOD

The used data was taken from the forest management plans, tested on the field and completed with the results of typological studies after the methodology proposed by Donita and colab. in 1990.(Doniță N. Chiriță N., Stănescu C., şi colab. et al, 1990). Sustainable management measures, based on the type of forests from Black Cris plain and Hills of Tăşad were prepared according to the identified types of forest ecosystem ecology and of the modern silviculture.(Doniță N., Borlea F., Turcu D. et al, 2006).

The identified types of forest ecosystems (Doniță N. Chiriță N., Stănescu C., şi colab. et al, 1990) and they made their correspondence with the vegetal association and with the habitat type (Doniță N. şi colab. et al, 2005/2006):

Type of forest ecosystem 4116 High and medium productive European beech stand, with mull, on eumesobasic and luvic brown, eu- and mesobasic, hydric balanced soils with Asperula — Asarum — Stellaria; **Vegetal association**: *Dentario — Fagetum* Hart. 48 em. Pass 68; **Habitat type**: R4118 – Dacian forests of common beech (*Fagus sylvatica*) and common hornbeam (*Carpinus betulus*) with *Dentaria bulbifera.*

Type of forest ecosystem 4125 Medium productive European beech stand, with moder — mull, on brown mesobasic andbrown luvic oligomesobasic, pseudogleyed, hydric cvasibalanced soils and alternated on profile, with Carex pilosa; **Vegetal association**: *Carex pilosae* Fagetum - Oberd. 57; **Habitat type:** R4119 – Dacian forests of common beech (*Fagus sylvatica*) and common hornbeam (*Carpinus betulus)* with *Carex pilosa..*

Type of forest ecosystem 4216 High and medium productive European beech stand with common hornbeam, with mull, on brown eumesobasic and luvic, eu- and mesobasic, hydric balanced soils, with Asperula — Asarum — Stellaria; **Vegetal association**: *Carpino — Fagetum* Pauca 41; **Habitat type**: R4118 – Dacian forests of common beech (*Fagus sylvatica*) and common hornbeam (*Carpinus betulus*) with *Dentaria bulbifera.*

Type of forest ecosystem 4225 Low productive European beech stand with common hornbeam, with moder - mull, on brown luvic, pseudogleyed, oligomeso and mesobasic, hydric cvasibalanced soils alternated on profile, with Carex pilosa; **Vegetal association**: *Carpino — Fagetum* Pauca 41; **Habitat type**: R4119 – Dacian forests of common beech (*Fagus sylvatica*) and common hornbeam (*Carpinus betulus)* with *Carex pilosa.*

Type of forest ecosystem 4625 Medium productive Sessile oak - European beech mixed stand, with moder - mull, on brown luvic pseudogleyed, oligomesobasic, hydric cvasibalanced soils, alternated on profile, with Carex pilosa; **Vegetal association**: - ; **Habitat type**: R4123 — Dacian forests of sessile oak (*Quercus petraea*), common beech (*Fagus sylvatica*) and common hornbeam (*Carpinus betulus*) with *Carex pilosa.*

Type of forest ecosystem 5135 Medium productive Sessile oak stand, with moder, on brown luvic, sometimes even brown acidic, oligomesobasic, hydric cvasibalanced soils and alternated on profile, with Festuca heterophylla; **Vegetal association**: *Genisto (tinctoriae) — Quercetum* petraea Klika 32; **Habitat type**: - .

Type of forest ecosystem 5225 Medium productive sessile oak stand with common hornbeam, moder - mull, on brown luvic pseudogleyed, meso and oligo-mesobasic, hydric cvasibalanced soils and alternated on profile, with Carex pilosa; **Vegetal association**: - ; **Habitat type**: R4123 – Dacian forests of sessile oak (*Quercus petraea*), common beech (*Fagus sylvatica*) and common hornbeam (*Carpinus betulus*) with *Carex pilosa.*

Type of forest ecosystem 5416 High and medium productive Sessile oak mixed hardwood forest (silver lime, common hornbeam), with mull, on typical brown and brown-luvic, eubasic, hydric balanced soils, with Asperula-Asarum-Stellaria; **Vegetal association**: *Tilio (tomentosae) — Carpinetum (betuli)* Doniţă 68; *Melampyro (biharіense) — Carpinetum* Soo 64 banaticum Schrott 72; **Habitat type**: - .

Type of forest ecosystem 5524 High and medium productive turkey oak – sessile oak mixed stand with common hornbeam, with mull, on brown and brown luvic, soft pseudogleyed, eubasic-mesobasic, hydric cvasibalanced soils, with Asperula-Asarum-Stellaria; **Vegetal** association: *Quercetum petraeae-cerris* Soo 57 (proparte); **Habitat type**: - .

Type of forest ecosystem 5535 Medium and low productive Sessile oak – Turkey oak – Hungarian oak mixed stand, with moder, on brown and reddish – brown luvic, pseudogleyed, oligomesobasic, hydric cvasibalanced soils and alternated on the profile with Genista-Festuca heterophylla; **Vegetal association**: *Quercetum farnetto-cerris* Georgescu 45, *quercetosum petraeae* Coste 75; **Habitat type**: R4144 – Dacian forests of pedunculate oak (*Quercus robur*) with *Molinia coerulea.*

Type of forest ecosystem 6117 High and medium productive Pedunculate oak stand, with rnull, on phreatic humid brown and reddish – brown, gleyed, eubasic, hydric optimal soils, with Rubus — Aegopodium; **Vegetal association**: *Quercetum roboris banaticum* Borza '32; **Habitat type**: R4404 –Danubian-pannonic forests of meadow mixed with pedunculate oak *(Quercus robur*), common ashes *(Fraxinus sp*.) and elms (*Ulmus sp*.) with *Festuca gigantea.*

Type of forest ecosystem 6133 Low productive Pedunculate oak stand, with moder, on pseudogleyed luvic, oligomesobasic, hydric soils alternated on the surface, with Agrostis — Carex brizoides; **Vegetal association**: *Carici brizoidi* — Quercetum roboris Rațiu et al. 77; **Habitat type**: R4145 – Pannonian forests of pedunculate oak (*Quercus robur*) with *Carex brizoides.*

Type of forest ecosystem 6216 High and medium productive oak stand with common hornbeam, with mull, on grey and typical brown and luvic, eu — and mesobasic, hydric balanced soils, with Asperula — Asarum — Stellaria; **Vegetal association**: *Melampyro bihariensi — Carpinetum* (Borza 1941) Soó 1964 em. Coldea 1975; **Habitat type**: R4143 – Dacian forests of pedunculate oak (Quercus robur) with Melampyrum bihariense.

Type of forest ecosystem 6514 Medium productive European ash (elm) —Pedunculate oak stand, on chernozemic and brown, non-flooded or rarely flooded for a short time, eubasic, hydric cvasibalanced soils, with Glechoma-Geum; **Vegetal association**: *Fraxino (pallisae-angustifoliae) — Quercetum roboris* Popescu et al 79 (some parts); **Habitat type**: - .

Type of forest ecosystem 6517 High and medium productive, European ash — (elm) — Pedunculate oak mixed stand, with mull, on brown eumesobasic and cambic humic gley ± gleyed, eubasic, hydric optimal soils, with Rubus caesius-Galium aparine; **Vegetal association**: *Querco-Ulmetum* Issler 24; *Fraxino (pallisae-angustifoliae) — Quercetum roboris* Popescu et al 79; **Habitat type**: R4404 – Danubian-pannonic forests of meadow mixed with pedunculate oak *(Quercus robur*), common ashes *(Fraxinus sp*.) and elms (*Ulmus sp*.) with *Festuca gigantea.*

Type of forest ecosystem 6732 Low productive Sessile oak – Oak mixed stand, with moder on Luvisols and brown luvic, pseudogleyed, oligomesobasic, hydric poor soils, strongly alternated on the surface, with Poa - Carex praecox. **Vegetal association**: - ; **Habitat type**: R4139 - Getic

forests with pedunculate oak (Quercus robur) and sessile oak (Quercus petraea) with Carex praecox.

Type of forest ecosystem 6814 High and medium productive Turkey oak – Oak mixed stand with hornbeam, with mull, on brown and typical reddish – brown and low — medium luvic ± eu and mesobasic, hydric cvasibalanced soils, with Arum — Brachypodium; **Vegetal association**: *Querco robori — Carpinetum* Soo et Po.cs 57; **Habitat type**: R4152 - Dacian forests of turkey oak (*Quercus cerris*) and common hornbeam (*Carpinus betulus*) with *Digitalis grandiflora.*

Type of forest ecosystem 6824 High and medium productive Turkey oak – Oak mixed stand, with moder – mull, on brown and reddish – brown luvic, pseudogleyed, mesobasic, hydric cvasibalanced soils, with Glechoma – Geum; **Vegetal association**: - ; **Habitat type**: - .

Type of forest ecosystem 7114 High and medium productive Turkey oak stand, with mull, on brown and typical reddish-brown and ± luvic, eu- and mesobasic, hydric cvasibalanced soils, with Glechoma - Geum; **Vegetal association**: -*Quercetum cerris* Georgescu 41, subas. crisicum I. Pop; **Habitat type**: R4149 – Danubian-balcanic forests of turkey oak (Quercus cerris) with Pulmonaria mollis.

Type of forest ecosystem 7133 Low productive Turkey oak stand, with moder, on Planosols and pseudogleyed, planic, oligobasic, hydric cvasibalanced soils and alternated on surface, with Agrostis-Carex brizoides; **Vegetal association**: - ; **Habitat type**: - .

Type of forest ecosystem 7135 Medium productive Turkey oak stand, with moder, on brown luvic soils and pseudogleyed, oligomesobasic, hydric cvasibalanced luvisols and alternated on profile, with Genista-Festuca heterophylla; **Vegetal association**: Quercetum, cerris Georgescu 41; **Habitat type**: R4150 - Danubian-balcanic forests of turkey oak (*Quercus cerris*) with *Festuca heterophylla.*

Type of forest ecosystem 7214 High and medium productive Turkey oak stand with common hornbeam, with mull, on brown and reddish – brown luvic, pseudogleyed, eu- and mesobasic, hydric cvasibalanced soils, with Arum Brachypodium; **Vegetal association**: *Querco cerris — Carpinetum* Roşcaiu et all. 66; **Habitat type**: R4152 - Dacian forests of turkey oak (*Quercus cerris*) and common hornbeam (*Carpinus betulus*) with *Digitalis grandiflora.*

Type of forest ecosystem 7414 High and medium productive Turkey oak – Hungarian oak mixed stand, with mull, on brown and typical reddish – brown and mollic, soft luvic eu- and mesobasic, hydric cvasibalanced soils, with Glecoma-Geum; **Vegetal association**: *Quercetum farnetto-cerris* Georgescu, 45; **Habitat type**: R4153 - Danubian-balcanic forests of turkey

oak (*Quercus cerris*) and Hungarian oak (*Quercus fraineto*) with *Crocus flavus*.

Type of forest ecosystem 7435 Medium productive Turkey oak – Hungarian oak mixed stand, with moder, on brown and reddish – brown luvic soils and pseudogleyed, oligomesobasic, hydric cvasibalanced luvisols and alternated on profile, with Genista-Festuca heterophylla; **Vegetal association**: *Quercetum farnetto-cerris* Georgescu 45; **Habitat type**: R4153 - Danubian-balcanic forests of turkey oak (*Quercus cerris*) and Hungarian oak (*Quercus fraineto*) with *Crocus flavus*.

Type of forest ecosystem 7724 High and medium productive Sessile oak – Turkey oak mixed stand, with moder – mull, on brown and reddish – brown soft-medium luvic, mesobasic, hydric cvasibalanced soils, with Glecoma-Geum **Vegetal association**;: *Quercetum petraea — Cerris* Soo 57; **Habitat type**: R4132 –Pannonian-balcanic forests of sessile oak (*Quercus petraea*), turkey oak (*Quercus cerris*) and common beech (*Fagus sylvatica*) with *Melittis melissophyllum.*

Type of forest ecosystem 9317 High and medium productive Riverside coppice of black alder, with mull, on brown gleyied soils or stratified alluvial eubasic, hydric optimal soils, with Rubus caesius-Aegopodium; **Vegetal association:** Stellario nemori – Alnetum glutinosae (Kästner 1938) Lohm. 1957 ; **Habitat type**: R4402 –Hilly meadow dacian-getic forests of black alder (*Alnus glutinosa*) with *Stelaria nemorum.*

Type of forest ecosystem 0117 High productive European ash, with mull, on brown and alluvial, eubazic, hydric optimal soils, with Rubus-Aegopodiun; **Vegetal association**: *Ulmeto — Fraxinetum pallisae* (Borza 66) Sanda 70; **Habitat type**: - .

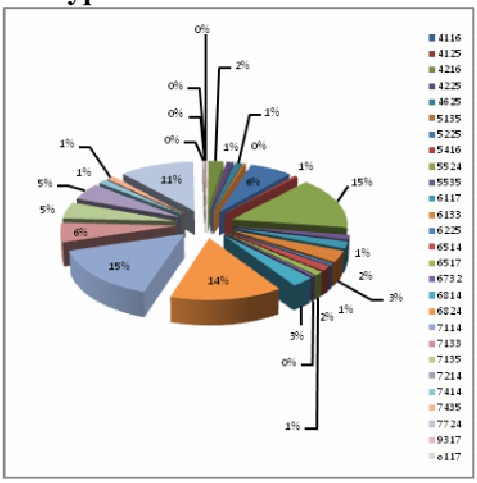

Fig. 1 Types of forest ecosystems – percentage of the total surface

From these forest habitats the following: R4118, R4119, R4123, R4144, R4404, R4143, R4152, R4149, R4150, R4153, R4132, R4402, ar part of ”List of natural habitat types of community interest whose conservation requires designation of Special Areas of Conservation (SAC) – Habitats Directive, Annex I – from Romania.

RESULTS AND DISSCUSIONS

Main proposals for forest management on the composition of the investigated stands

Keeping in stand composition the existing Quercus species, with the following limitations:

In mixtures with sessile oak, increasing the proportion of this species up to 70% on the account of turkey oak and/or Hungarian oak, if this is weakly developed (vegetating weak, showing lower production class of sessile oak).

Reintroducing common oak in all small derived sessile oaks, from valleys or lands situated near valleys.

In brushes with turkey oak and hungarian oak, increasing the proportion of hungarian oak and reducing the proportion of turkey oak.

Introducing the following mixed species in pure Quercus species by planting and seeding: common maple, wild pear, tartarian maple.

Providing in goal compositions the Quercus species with hornbeam, keeping this species in mixture in a proportion of at least 30%.

Maintaining hornbeam in the mixture, wherever presented in proportions of at least 30%.

Reintroducing sessile oak in small derived hornbeam from the slopes.

Increasing proportions of sessile oak in the regeneration from European beech stands and European beech-sessile oak mixed stands up to 40%, following fulfilment of regeneration composition: 4Go 6Fa, 4Go 4Fa 2Ca.

Reintroducing common oak and maintaining or increasing its proportion up to 40% in small ash and small common oak – common ash mixed stands from meadow.

Introducing species with valuable wood: cherry, field ash, maple, silver lime with proportions of 10% in turkey oak – hornbeam mixed stands, sessile oak – hornbeam mixed stands, turkey oak – sessile oak – hornbeam mixed stands.

Increasing proportion of common oak in turkey oak – common oak mixed stands up to 50%.

Introducing common ash (Fraxinus excelsior) in turkey oak – hornbeam mixed stands up to 50%.

CONCLUSIONS

With the institutionalization of the concept of sustainable forest management, it has increased considerably the importance granted to natural regeneration, which is widely throughout Europe is recommended, whenever possible, which can be explained if we consider that these methods provide primarily conservation, regeneration the original genetic structure downward, but also the ecosystem with the capacity to improve, where treatments are chosen improperly.(Giurgiu V. et al, 2004).

Regarding measures to underpin the sustainable management of forest biodiversity and conservation of great importance, it will be given the choice of treatment. Thus the most suitable are those with repeated cuts and with regeneration under shelter, that is group shelterwood system treatment, and shelterwood system.

The group shelterwood system treatment creates the best conditions for natural regeneration of mixed forest, and biodiversity conservation fund for our existing ones.(Florescu I., Nicolescu N. et al, 1998).

This treatment is indispensable for mixed forests; the application creates the most favorable bioecological conditions on natural regeneration from seed and suitable proportions to achieve a mixture of species.(Florescu I., Nicolescu N. et al, 1998).

This treatment can be applied successfully in pure stands (except Norway spruce stands - not the case in our study area), is a more complex, more demanding and more expensive, choice and adoption should be done with discretion and only where experience has shown that another treatment simply does not work (Florescu I., Nicolescu N. et al, 1998). In case of our study, it is indicated common oak in pure turkey oak stands from friendly resorts, from which this was removed under the competitive feature of turkey oak or because of other reasons (ex. Applying some inappropriate treatments, "Clear cutting with artificial regeneration"), situation in which it is indicated reinstallation of common oak in the open mesh, by artificial seeding, or more indicated by supplementing the natural regeneration of common oak seedlings, to resist large turkey oak competition, being known its competitive ability, exercised from the earliest years, through a very active growth. In pure turkey oak stands, developed in unsuitable conditions for common oak, situations in which is necessary to maintain the turkey oak, successful treatment can be applied by shelterwood system treatment. In this case too, it is recommended the introduction of mixed species, compatible with stationary conditions: hungarian oak, common maple, etc. and other helpful species like: tartarian maple, wild pear, etc. It is also recommended to maintain the coppice, within this too, of a high diversity characterized by a variety of well distributed species on the entire surface,

the brush making this way a closed vertical structure. The helpful species and the coppice have a very important role in protecting the soil from increased drying, during the summer, and to improve internal soil drainage.

It is well known the fact that in the lowland forest, forests in our country occupy an extremely low surface, compared to other cultures, and that a large part of these forests fulfil important environmental functions, climatic – therapeutic and recreational.

In general, in case of forests from plain can be made the following observations, with strong implications on integrated system forestry work, which are going to be applied in different brushes of the studied stations:

- Soils, in most cases, are characterised by a high morphological thickness.
- Physiologically useful soil thickness varies, but very much on the horizon structure, degree of stagnogleyzation, air- fluid circulation, the amplitude of variation in soil moisture during the growing season, etc.
- In most resorts in this region, the minimum factor is humidity, in many cases totally deficient or in other situations temporally excess, becoming then very poor.
- In many cases, to balance the soil's hydro regime, it is necessary to apply special agro-technical, hydro -, and forestry measures to save and use rationally the water from precipitation.
- A large part of these forests (35%) are constituted from artificial stands with low production (48%), important natural underproduction stands (40%) – mainly coming from shoots and entirely derived stands (11%), which currently are assigned versatile functions.
- Artificial forests of low production, underproduction and those derived, inadequate or insufficient to be assigned the appropriate role, must be partially or entirely substituted or restored as fast as possible, along with conversion to forest of those coming from stands.
- In relation to the functions assigned to these forests, on the occasion of regeneration or restoration of the damaged ones, are maintained or introduced in the trees' composition wood species available in the basic types of forests, or in addition to these other helpful mixed species.

From those presented results the fact that in our studied region, the treatments to be applied have a strong recovery (substitution) character, partial or integral, as well as many of the trees coming from shoots must be converted to forest. In other situations are applied treatments of repeated cuts and mixed regeneration under the shelter top or side; by adopting treatments of this kind, it is changed slightly the structural and functional balance of the ecosystems, in which the interventions are made but this will be restored quickly, and the stands may exercise under normal conditions and continuously the assigned functions.

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