THE ANALISYS OF THE STANDS STRUCTURE AND THE INTERVENTIONS FOR APPLING THE WARANTY OF DURABLE DEVELOPMENT OF SESSILE OAK AND EUROPEAN BEECH MIXES FROM THE MIDDLE BASIN OF CRISUL REPEDE RIVER

Sorin Lucian DOROG

Faculty of Environmental Protection, University of Oradea
Gen. Magheru Nr. 26, Oradea, Romania
Corresponding author: dorogs@yahoo.com

Abstract: *The structure of stands is the one which gives the more complex information about the programe of the stand and its following evolution if there are no esential (unexpected) modifications which can totally change the initial programe. This paper studied a mixed stand of sessile oak and european beech for which its characteristics were established and then, through successive simulations, different tipes of thinnings were pictured for which the characteristics of the stand were calculated afterwords. Appling different sistems of silvotechnical mesures influences the size of growth and the quality of the wood, meaning the ratio between the volume of thick and thin trees, of different species and qualities. The structure of a stand can be defined as an interaction sistem between the element obeyed to modifications. These interactions give the stand stability and durability in time. The structure appears as a general characteristic of the coexistence relations between the elements of the stand. The relations between the elements of the stand which define its structure can be of many types: gathering relations, asociation relations, size and domination relations. Each of these relation types distinctevly establish some characteristics of the structure of the stand. The gathering relations establish the consistence of the stands, the asociation ones-type of the mix, size and domination relations establish structure of the stand in a vertical plan. Structure of the stands is the result of the abiotic environment action and the interaction of the system elements. Among the complex interactions which influence the structure of the stand, the intraspecific and and interspecific relations have an important role. These interactions are obeyed to the capacity of the species for perpetuation in space and time. Among intraspecific relations the ones of embaresment and rivality can be mentioned and among interspecific relations the ones of favouring, embaresment and rivality are mentioned. The forming and the dynamics of the structure of the stands is given on one hand by the competition, favouring, embaresment relations, the intra and interspecific cooperation and on the other hand by the interactions with the abiotic environment, taking into acount the genetic features also. In the mixed stands, as in the case of European beech, European spruce and European silver fir stands, the competition, favouring and cooperation appear as interspecific rates. In the mixed stands the interspecific competition in minimum and the cooperation and favouring relations act in the way of asuring stability and perennity of the stands. As a result of the factors complexity which interfear in defining the structure of the stands it is necesary that on the basis of the concret conditions, the models which correspond to silvicultural conditions, social- economical and ecological functions of the stands to be established.*

Key words**:** *structure, stands, programme, thinnings,sessile oak, european beech*

INTRODUCTION

The structure of stands is the one which gives the more complex information about the programe of the stand and its following evolution if there are no esential (unexpected) modifications which can totally change the initial programe.This way, knowing the structure of the stands becomes extremely important also from the point of view of the interventions which will be made. For having a comparing term in this paper the expermental distributions obtained from the field data with the ones recomendded by the field literature were analised.

Appling different sistems of silvotechnical mesures influences not only the size of growth but also the quality of the wood production, meaning the ratio between the volume of thick and thin trees, of different species and qualities which are croped, and also the eficiency of the social ecological interest services which the stands have to accomplish. Being considered representative in this area even-aged or relatively even-aged sessile oak with european beech mixed stands a characterization of the stands in ratio with the proportion of the species but also with the structure of the stands on diameter categories will be tested.

Simulating the intervention gives information about the direction of the stand for optimising the composition, structure, the optimal exersation of the given functions and the direction towards management goals established through the management plan.

MATERIAL AND METHODS

For evaluation of sessile oak and european beech mixed stands structure the stands which vegetate in proper conditions concerning stational conditions for the two species mentioned above were chosen.

The stands were chosen in a way that the situations in which these are partly or totaly derived to be evoided. On the field, rectangular sample plots of 2.500 mp. were located. The location of the plots was choosed in a way that the structure of the stand to be captured as loial as possible.

On each plot the diameters of all stands on species and the hights of the stands arround centered medium diameter for each species were mesured. After collecting the data from the field the structure of the stands on species and diameter categories was registered. On the basis of this data, the structure of the stands on diameter categories using distributions recomended by the field literature: Gauss, Charlier type A and Beta distribution (GIURGIU V., 1979, 1972) was evaluated.

For evaluating the quality of expermental distribution adjustments after the theoretical ones, Hi-rectangulat criteria was applied. After knowing the structure of the stands, simulating some interventions (thinnings) having as goal promoting of the most valuable samples of the stand as species and quality, emproving quantity and especially quality production.[FLORESCU I., NICOLESCU N., 1998]

The simulation of some intervention was made on the basis of the data taken on the field and using the data obtained on the basis of adjusting experimental distributions with the ones recomended by the field literature. Testing the simulated intervention quality was made through calculating the dispersion and distribution indicators, the intervention intensities on tree number, basic plot and volume, Hart-Becking clues (spacing factor) before and after intervention. The calculation of the volume was made using relative volums method, recomended by field literature.

The structural differentiation in a stand is a consequence of integrality estate and at the end leads to natural elimination of the stands respecting self-reglation characteristic of biological sistems [LEAHU I., 2001].

RESULTS AND DISCUSSIONS

For showing simulation and evaluation of an intervention in a stand some sintetical data which was calculated before and after simulated intervention in u.a. 78C U.P.III, O.S. Dobreşti is shown as follows.

From the data obtained above it can be noticed that an intervention which means extracting the trees from inferior diameter categories, mostly white beech trees but also dying sessile oak and oak trees which remaind in in the inferior content. The intensity on tree number is close to 32% value which indicates a moderate to strong thinning while the intensity on volume is somewhere at 11% which indicates a weack intensity thinning. From here it can be concluded that a low thinning was simulated in the stand. The spacing factor also modifies, meaning the experimental value grows after intervention with 3%.

Table 1

The calculation of medium diameter, dispersion indicators and distribution shape case 1

CHARACTERISTICS OF THE STAND CASE 1		
Calculated characteristics	**Before intervention**	**After intervention**
Medium diameter(cm)	22,04	26,00
Variancy	67,44	65,92
Standard deviation	8,21	8,11
Variation cofficient	0,37	0,31
Asimetry	-0,14	-0,92
Exccess	1,89	2,55

Proportion on species						
Species	Proportion on basic plot		Proportion on volume		Proportion on tree number	
	Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention
Fa	33,60	45.34	35,32	39.91	27,96	45.24
Go	42,29	43.69	43,74	49.06	26,88	38.89
Ca	20,51	7.23	17,37	7.01	43,01	12.70
St	3,60	3.75	3,56	4.02	2,15	3.17
Ce	0,00	0.00	0,00	0.00	0,00	3.97
Ci	9,95	0.00	8,30	0.00	2,69	0,00

Calculation of intervention intensity and Hart-Becking index		
Calculated characteristics	Values	
Intensity on tree number	32,25	
Intensity on basic plot	9.32	
Intensity on volume	11,48	
Spacing factor (Hart-Becking index)	Before intervention	After intervention
	14,27	17,34

Another possible intervention simulated in the stand from u.a. 78C is the one which operates on the stands from inferior diameter categories an also on hte stands from medium and superior categories. So, the obtained data is shown as follows.

In this so said intervention it can be noticed that medium diameter is not artificially encreasing as in the first case, which enphasizes the fact that interfearing in all diameter categories, the medium diameter of the stand remains aproximatelly constant. Plus, in this case, there are not much bigger differences concerning intensities on tree number, basic plot and volume.

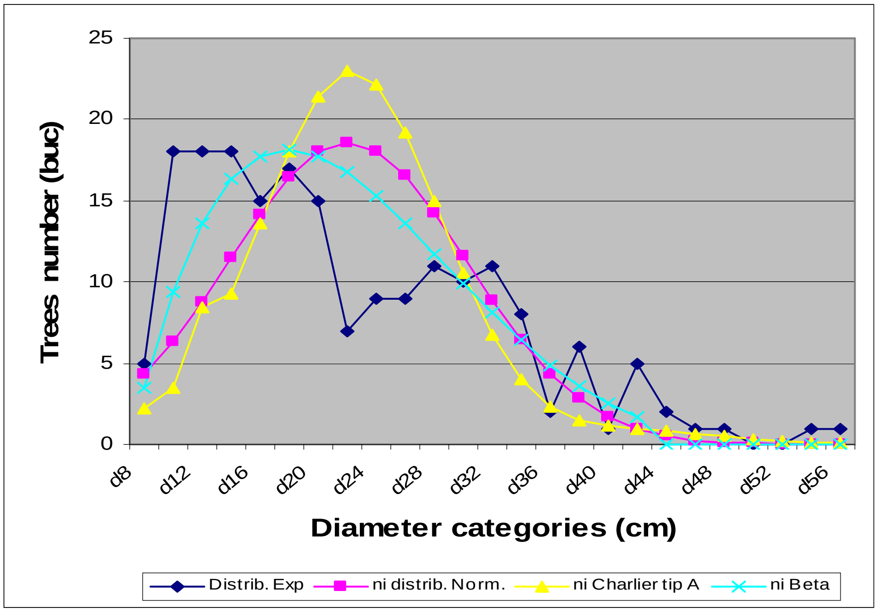

Figure 1 – Experimental distribution, distribution after simulation of intervention and adujstment according to normal law, Charlier type A and Beta, case 1

Table 2

The calculation of medium diameter, dispersion indicators and distribution shape case 2

CHARACTERISTICS OF THE STAND CASE 2						
Calculated characteristics		**Before intervention**			**After intervention**	
Medium diameter (cm)		22,04			21,33	
Variancy		67,44			50,10	
Standard deviation		8,21			7,07	
Variation cofficient		0,37			0,33	
Asimetry		-0,14			0,17	
Exccess		1,89			2,20	
Proportion on species						
Species	Proportion on basic plot		Proportion on volume		Proportion on tree number	
	Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention
Fa	33,60	33,26	35,88	35,15	27,96	35,43
Go	42,29	43,40	44,43	45,70	26,88	29,92
Ca	20,51	20,46	16,08	16,23	43,01	33,07
St	3,60	2,88	3,62	2,92	2,15	1,57
Ce	0,00	0,00	0,00	0,00	0,00	0,00
Ci	9,95	0,00	8,43	0,00	2,69	0,00
Calculation of intervention intensity and Hart-Becking index						
Calculated characteristics			Values			
Intensity on tree number			31,72			
Intensity on basic plot			36,49			
Intensity on volume			36,99			
Spacing factor (Hart-Becking index)			Before intervention		After intervention	
			14,27		17,27	

Table 3

The calculation of medium diameter, dispersion indicators and distribution shape case 3

CARACTERISTICI ALE ARBORETULURI CAZ 3		
Calculated characteristics	**Before intervention**	**After intervention**
Medium diameter (cm)	22,04	23,17
Variancy	67,44	65,02
Standard deviation	8,21	8,06
Variation cofficient	0,37	0,34
Asimetry	-0,14	-0,20
Exccess	1,89	2,00

Proportion on species						
Species	Proportion on basic plot		Proportion on volume		Proportion on tree number	
	Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention
Fa	33,60	34,62	35,32	35,73	27,96	36,23
Go	42,29	47,54	43,74	48,55	26,88	34,78
Ca	20,51	13,51	17,37	11,49	43,01	26,09
St	3,60	4,33	3,56	4,23	2,15	2,90
Ce	0,00	0,00	0,00	0,00	0,00	0,00
Ci	9,95	0,00	8,30	0,00	2,69	0,00

Calculation of intervention intensity and Hart-Becking index		
Calculated characteristics	Values	
Intensity on tree number	25,80	
Intensity on basic plot	16,79	
Intensity on volume	15,80	
Spacing factor (Hart-Becking index)	Before intervention	After intervention
	14,27	16,57

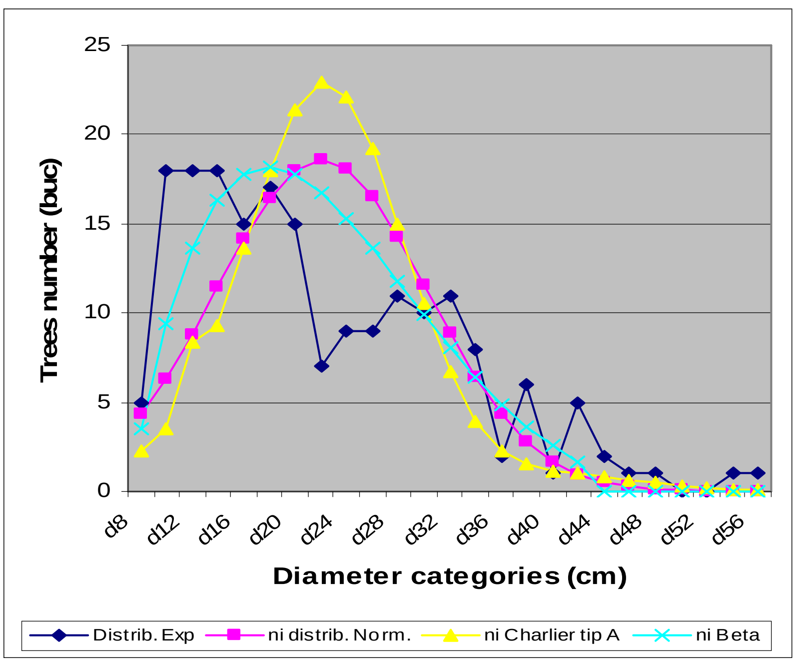

Figura 2 – Experimental distribution, distribution after simulation of intervention and adujstment according to normal law, Charlier type A and Beta, case 2

The last case shows a strong thinning (5), recomanded in this concret situation because a bigger intensity might unstabilise the internal structure of the stand.

This type for simulating and evaluating intervention gives the user also a comparancy of experimental distributions with the ones recomended to be normal by the field literature (1,2). As follows, the distribution formulas of tree number on quality classes will be showed for the examples above:

- Experimental distribution according to Beta

$y = 0,01592 \times 10^{2} (x-7)^{1,0446} (57-x)^{3,7517}$

- distribution after intervention case 1

$y = 436,064 \times 10^{2} (x-7)^{2,0153} (57-x)^{3,9197}$

- distribution after intervention case 2

$y = 10,3337 \times 10^{2} (x-7)^{1,0706} (43-x)^{2,1281}$

- distribution after intervention case 3

$y = 2,9207 \times 10^{2} (x-7)^{1,0882} (49-x)^{2,3354}$

in which x represents diameter categories and y tree number for each diameter category.

CONCLUSIONS

From the data converted in mixed stands of european beech and sessile oak appear interesting aspects concerning the interspecific competition between the 2 species and also between them and white beech, lime tree or other species of mixed hardwood stands. For the leading of the stand according to management goals established by the management plan, interventions with silvotechnical character will supervise the modification of composition and structure of the stands in the way indicated by the social economic and ecological established goals.

The type for evaluating and simulating intervention in a stand shows the advantages of the fact that before intervention it can be obtained information concerning the structure on tree number, basic plot, volume, species proportion, values of Hart-Becking coefficient which gives the possibility for analising and optimising intervention in accordance to the goals established through management plan.

The value of spacing factor encreases with each thinning, its value being adjustable up to 5% in each intervention [5]. Data showed as examples in the data showed in the last case is eloquent.

Simulation of a low thinning is recognised due to intensities on tree number over 25 – 30% while on the basic plot and volume they are between 5 – 10% which is normal concidering that trees from inferior categories are being extracted trees wich remained behind with growth, placed on an inferior level. Sessile oak and turkey oak stands remained on an inferior level are dying standing first recomended to be extracted through carring works. The combined thinning means extracting trees from all diameter categories and its recognised through the fact that intensities on tree number, basic plot and volume are aproximatelly equal or not much different then 4 – 5%.

BIBLIOGRAPHY

1. CHIȚEA GH., 1997, Biostatistică, Editura Universității Transilvania, Brașov
2. CHIȚEA GH., 2001, Biostatistică, Editura Universității Transilvania, Brașov
3. CRISTEA MARIA, 2004, Riscurile climatice din Bazinul hidrografic al Crișurilor, Editura Abaddaba Oradea

4. FLORESCU I., NICOLESCU N., 1998, Silvicultura, vol. I – Silvobiologia, Editura Universității Transilvania, Braşov
5. FLORESCU I., NICOLESCU N., 1998, Silvicultura, vol. II – Silvotehnica, Editura Universității Transilvania, Braşov
6. GIURGIU V., 1979, Dendrometrie şi auxologie forestieră, Editura Ceres, Bucureşti
7. GIURGIU V., 1972, Metode ale statisticii matematice aplicate în silvicultură, Editura Ceres, Bucureşti
8. LEAHU I., 1994, Dendrometrie, Editura Didactică şi Pedagogică, Bucureşti
9. LEAHU I., 2001, Amenajarea pădurilor, Editura Didactică şi Pedagogică, Bucureşti