ASPECTS REFERRING TO THE THICKNESS AND SPACING OF SOME BEECH AND OAK FORESTS AT THE PRODUCTION UNIT III IN VARCIOROG, FOREST DISTRICT DOBRESTI, ORADEA FOREST OFFICE

Crainic Ghiță Cristian [*], F.C. Tăut [**]

[*]*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea; Romania, e-mail:gccrainic@yahoo.com*
[**]*Forest District Oradea, Forest Office Săcuieni*

Abstract
The stability of stands is a very important aspect for establishing the principles of forest planning and of its durable managing. In order to ensure the necessary stability for the stands, in different stages of development, it is necessary to set a corresponding thickness of these stands that determines the best spacing.
For quantifying the thickness, density, spacing and implicitly the stability of stands it is necessary to determine some synthetic indicators afferent to the studied stands and respectively to compare them to the reference indicators.

Key words: stands, stability of stands, thickness of stands, density of stands, spacing the stands, stability of stands, synthetic indicators, silvic-technical analysis.

INTRODUCTION

In order to have an appropriate view of the structural indices and implicitly on the stability of a stand, we make a rigorous silvic-technical analysis.

By the silvic-technical analysis we aim to characterize a stand by the help of parameters and indicators as exact as possible, so that in the office to be able to design an abstractive model (graphics, schemes) that can figure out the real fact.

The silvic-technical analysis must be performed each time you need an evaluation of the stand state, then establishing the necessary solutions for its management, respectively the fulfillment of the productive and protective functions with a maximum efficiency.

The results offered by the silvic-technical analysis can constitute the start points for scoring the type of silvic-technical intervention and in the meantime of its intensity.

Although relatively known, the advantages offered by a silvic-technical analysis rigorously performed, due to some objective reasons and also some subjective ones, in practice we neither perform it nor interpret the results obtained.

PLACING THE STUDY. METHOD OF RESEARCH
CASE STUDY. PLACING THE RESEARCH AND METHOD OF WORK

The case study was performed in 14 forest planning units from Production Unit III Varciorog and is shown in table 1.

For forest implements we delimited areas of 2500 m^2, with the band, one for each f. p. unit, the variation coefficient being 25%. In order to have a statistic cover for the areas studied, the number of necessary polls was calculated with the following relation:

$$n = \frac{t^2 \times s_{\%}^2 \times F}{F \times \Delta_{\%}^2 + t^2 \times f \times s_{\%}^2} \quad , \qquad (1)$$

where:

F – the stand area (170,2 ha = 1702000 m^2);

$\Delta_{\%}$ - admitted tolerance (12%);

t – coefficient corresponding to the studied probability of covering (1,77);

f – area of sample place (2500m^2);

$s_{\%}$ - variation coefficient of volumes on stand = 25% (the statistic unit being the sample place) ;

$$n = \frac{(1{,}77)^2 \times 25^2 \times 1702000}{1702000 \times 12^2 + (1{,}77)^2 \times 2500 \times 25^2} = 13{,}33 \cong 14$$

The diameter was measured with the slide gauge and the height with the Romanian dendrometer.

The results obtained were transferred to hectare.

In this sense, for stands in different stages of growth we placed polls of 2500 m^3, the number in each stand being established according to the area of the stand.

Table 1

The forest planning units, the number of polls and the number of trees implemented in each poll

No.	F.p.u. number	F.p.u. area [ha]	Type of poll	Area of poll [m^2]	No. of trees implemented / poll
1	77 C	12,2	Square	2500	181
2	87 B	13,9	Square	2500	214
3	90 B	15,3	Square	2500	218
4	72 B	20,6	Square	2500	175
5	92 C	8,4	Square	2500	204
6	93 C	8,6	Square	2500	190
7	73 C	12,6	Square	2500	154
8	95 B	20,8	Square	2500	331
9	86 F	3,4	Square	2500	235
10	81 A	6,7	Square	2500	194
11	89 B	18,1	Square	2500	222
12	78 C	12,2	Square	2500	191
13	75 A	8,1	Square	2500	160
14	75 D	9,3	Square	2500	224

After placing each poll, we performed measurements and descriptions afferent to establishing the structural indices of the stands.

PRIMARY DATA PROCESSING

The value of thickness was established as the relation between the real number of existent trees in a hectare and the number in the tables of production for a stand with the same composition, age and class of production.

The value of density was established as the relation between the real basic area in a hectare and the normal basic area given in the tables of production, and for the stands that are to be made rare it is the relation between the real volume in a hectare (Vr) and the normal volume (Vt) from the tables.

The Hart – Becking spacing factor was also determined.

CALCULATION OF STRUCTURAL AND STABILITY INDICES OF THE STAND INDICES OF THICKNESS AND DENSITY

$$I_N = \frac{N_{teren}}{N_{tabel}}, \quad (2)$$

where

I_N - value of thickness,

N_{teren} – number of trees in a hectare of land,

N_{tabel} – number of trees in a hectare given by the tables of production, for a stand with the same composition, age and class of production;

$$I_G = \frac{G_{teren}}{G_{tabel}}, \quad (3)$$

where

I_G - value of density on the basic area,

G_{teren} – real basic area in a hectare of land,

G_{tabel} – normal basic area given by the production tables, for a stand with the same composition, age and class of production;

$$I_V = \frac{V_{teren}}{V_{tabel}}, \quad (4)$$

where

I_V - value of density in volume,

V_{teren} – real volume in a hectare of land,

V_{tabel} – normal volume, given by the production tables, for a stand with the same composition, age and class of production;

Hart - Beking spacing factor - s%

The Hart - Beking value of spacing s [%], a value expressed in percentage – 1, shows a certain state of thickness of the stand.

$$s\% = \frac{a}{h_{dom}} 100 \quad (5)$$

where:

a – represents the distance between the trees measured on the field;

In order to determine the distance *a* between the trees, two variants can be used.

In the first variant it is considered that the trees are situated in the edges of a square device, thus:

$$a_4 = \sqrt{\frac{10\,000}{N}} \quad (6)$$

In the other variant it is considered that the trees are situated in the edges of a regular hexagon device, respectively:

$$a_6 = \sqrt{\frac{10\,000}{\frac{\sqrt{3}}{2} N}} \quad (7)$$

h_{dom} – represents the dominant height of the stand and can be calculated by an equation of regression having the following form:

$$h_{dom} = (0{,}15 - 0{,}25) \times \bar{h} + \bar{h} \tag{8}$$

where:

$\bar{h}$ - the average height of the stand;

RESULTS AND DISCUSSIONS

For the study we analyze, the values are the following:

- for 92C unit the indices have the following values:

$$I_N = \frac{N_{teren}}{N_{tabel}} = \frac{816}{684} = 1{,}19$$

$$I_G = \frac{G_{teren}}{G_{tabel}} = \frac{34{,}27}{31{,}39} = 1{,}07$$

$$I_V = \frac{V_{teren}}{V_{tabel}} = \frac{457{,}3}{440{,}2} = 1{,}03$$

Hart - Beking spacing factor - s%

$s_{4\%} = \frac{a}{h_{dom}}100 = \frac{3{,}50}{29{,}9} \times 100 = 12\%$ (calculations made for the trees situated in the edges of a square device)

$s_{6\%} = \frac{a}{h_{dom}}100 = \frac{3{,}761}{29{,}9} \times 100 = 13\%$ (calculations made for the trees are situated in the edges of a regular hexagon device)

The distances between the trees measured in the field for the two situations shown above, can be found by the relations:

$$a_4 = \sqrt{\frac{10\,000}{N}} = \sqrt{\frac{10\,000}{816}} = 3{,}50$$

$$a_6 = \sqrt{\frac{10\,000}{\frac{\sqrt{3}}{2}N}} = \sqrt{\frac{10\,000}{\frac{\sqrt{3}}{2} \times 816}} = 3{,}761$$

The dominant height can be calculated by the relation:

$$h_{dom} = (0{,}15) \times \bar{h} + \bar{h} = 0{,}20 \times 24{,}93 + 24{,}93 = 29{,}9$$

Doing the same as in the above mentioned case, after replacing the data in the relations, the results obtained for the other units studied are the following:

- for unit 93C the indices have the following values:

$I_N = 1{,}14$; $I_G = 1{,}06$; $I_V = 1{,}05$ $S_{4\%} = 12\%$; $S_{6\%} = 13\%$

- for unit 81A the indices have the following values:

$I_N = 1{,}09$; $I_G = 1{,}17$; $I_V = 1{,}14$ $S_{4\%} = 13\%$; $S_{6\%} = 12\%$

- for unit 95B the indices have the following values:

$I_N = 1,83$; $I_G = 1,28$; $I_V = 1,31$ $S_{4\%} = 10\%$; $S_{6\%} = 10\%$
- for unit 73C the indices have the following values:
$I_N = 1,00$; $I_G = 0,85$; $I_V = 1,0$ $S_{4\%} = 15\%$; $S_{6\%} = 16\%$
- for unit 86F the indices have the following values:
$I_N = 1,33$; $I_G = 1,29$; $I_V = 1,26$ $S_{4\%} = 12\%$; $S_{6\%} = 13\%$
- for unit 87B the indices have the following values:
$I_N = 1,31$; $I_G = 1,13$; $I_V = 1,10$ $S_{4\%} = 12\%$; $S_{6\%} = 13\%$
- for unit 90B the indices have the following values:
$I_N = 1,05$; $I_G = 1,08$; $I_V = 1,05$ $S_{4\%} = 12\%$; $S_{6\%} = 13\%$
- for unit 72B the indices have the following values:
$I_N = 0,92$; $I_G = 1,05$; $I_V = 1,06$ $S_{4\%} = 12\%$; $S_{6\%} = 13\%$
- for unit 89B the indices have the following values:
$I_N = 1,43$; $I_G = 1,12$; $I_V = 1,14$ $S_{4\%} = 11\%$; $S_{6\%} = 11\%$
- for unit 75A the indices have the following values:
$I_N = 0,95$; $I_G = 0,78$; $I_V = 0,89$ $S_{4\%} = 13\%$; $S_{6\%} = 14\%$
- for unit 75D the indices have the following values:
$I_N = 1,35$; $I_G = 1,28$; $I_V = 1,26$ $S_{4\%} = 11\%$; $S_{6\%} = 12\%$
- for unit 77C the indices have the following values:
$I_N = 1,11$; $I_G = 1,18$; $I_V = 1,16$ $S_{4\%} = 13\%$; $S_{6\%} = 14\%$
- for unit 78C the indices have the following values:
$I_N = 1,17$; $I_G = 1,09$; $I_V = 1,07$ $S_{4\%} = 11\%$; $S_{6\%} = 13\%$

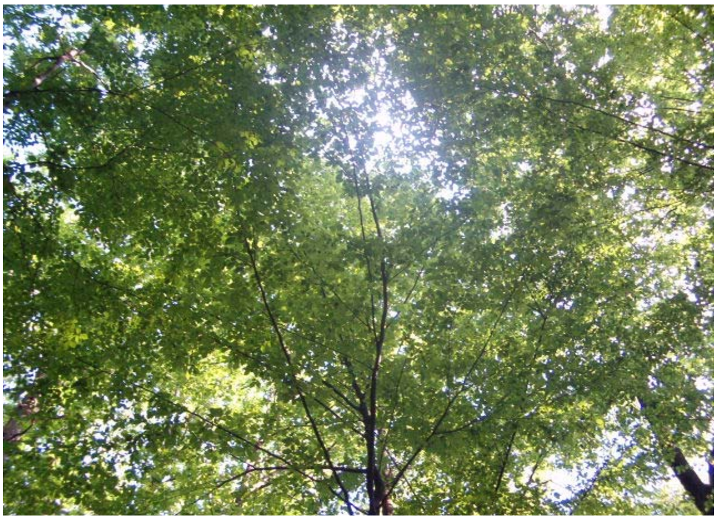

Fig. 1 –The appreciation of the consistency value in the stand from unit 87 B that is to be processed with cultural operations

The values of thickness and density are unitary and supra-unitary, thus the consistency of the stands analyzed is full - fig.1., the stands being relatively dense.

The calculated values of the spacing factors lay between 10 - 16%, therefore the studied stands are low to moderate spaced.

It can be noticed the fact that between the values of thickness and density and spacing factors there is an inverse correlation, aspects that can be observed in the regression equations in the diagrams of figures 2 and 3.

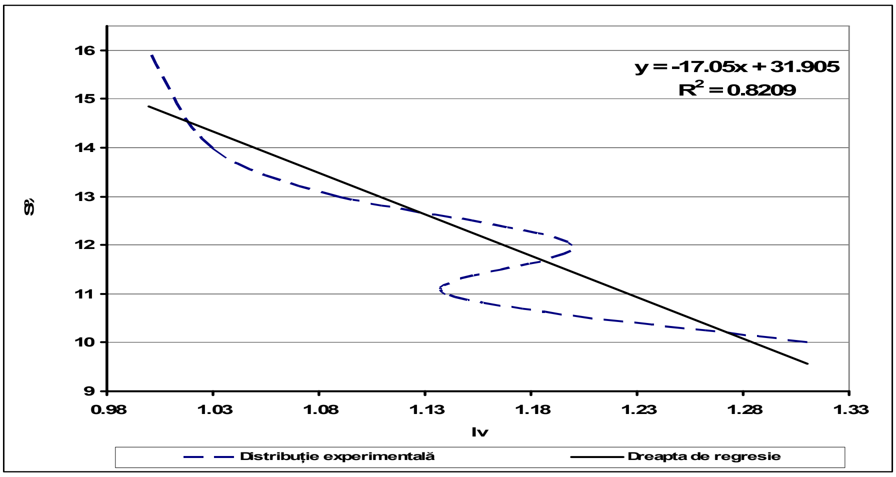

Fig. 2 - Correlation between the valued of density in volume (Iv) and the Hart-Beking (s%) spacing factors for the stands studied

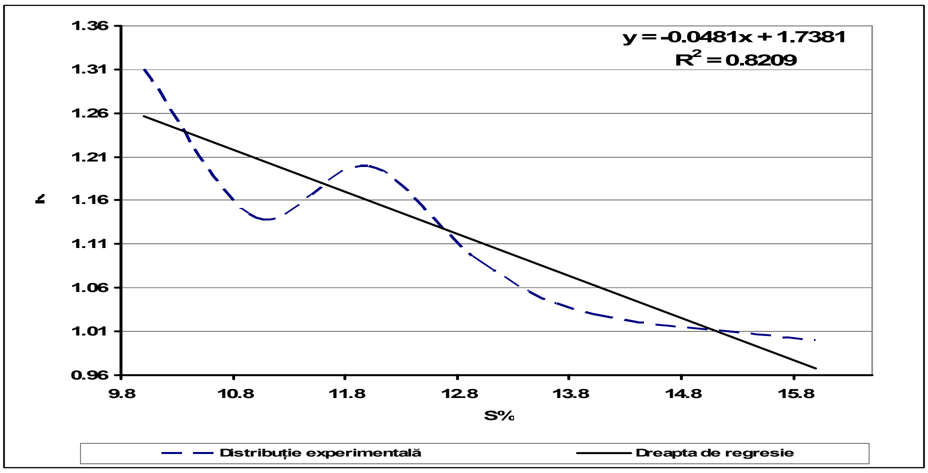

Fig. 3 Correlation between the Hart-Beking (s%) spacing factors and the values of density in volume (Iv) for the stands studied

CONCLUSIONS

From the analysis of the results obtained we can conclude a series of aspects we present in the following lines.

Thus, taking into account the values of the indices and factors analyzed, the stands studied show a relatively low stability, with direct implications on the intensity of the future interventions.

It is recommended that the intensity of the silvic-technical interventions in the stands studied to be low to moderate and their periodicity to be more reduced, in other words secure interventions are recommended due to their relatively low stability.

In order to prevent the situations as those analyzed in the present case study it is necessary that the silvic-technical interventions to be correct established and to be applied at the right moment when referring to stage.

When establishing the correct type of silvic-technical interventions, it is recommended to take into account the aspects referring to the thickness and stability of the stands.

REFERENCES

1. Constantinescu, N., 1973, Regenerarea arboretelor, Ed. a II-a, Editura Ceres, Bucureşti.
2. Crainic Gh. C., 2007, Silvicultură vol. I, vol. II - Note de curs, Universitatea din Oradea, Facultatea de Protecția Mediului, Catedra de Silvicultură.
3. Doniță, N., ş.a., 1977, Ecologie forestieră, Editura Ceres, Bucureşti.
4. Enescu Val., Ioniță L., Palada Nicolau M., 1994, Înmulțirea vegetativă a arborilor forestieri, Editura Ceres, Bucureşti.
5. Florescu, I.I., 1985, Silvicultură, Îndrumar de proiectare, Universitatea din Braşov.
6. Florescu, I.I., 1991, Tratamente silviculturale, Editura Ceres, Bucureşti.
7. Florescu I. I., Nicolescu N. V., 1996, Silvicultura vol. I Studiul pădurii, Editura Lux Libris, Braşov.
8. Florescu, I.I., Nicolescu, N.V.,1998, Silvicultura, Vol. II, Silvotehnica, Editura Universității Transilvania din Braşov.
9. Nicolescu, N.V., 1995, Silvicultura, Îndrumar de lucrări practice, Editura Universității Transilvania din Braşov.
10. Tăut F. C., 2004, Lucrare de diplomă, Universitatea din Oradea, Facultatea de Protecția Mediului, Catedra de Silvicultură.
11. Vlad I., Chiriță C., Doniță N., Petrescu L., 1997, Silvicultură pe baze ecosistemice, Editura Academiei Române, Bucureşti.
12. ***, 1986: Norme tehnice privind îngrijirea şi conducerea arboretelor, Ministerul Silviculturii, Bucureşti