ASPECTS FOR THE DETERMINATION OF THINNING INTENSITY IN QUERCUS CERRIS AND QUERCUS FRAINETTO STANDS IN OLTENIA PLAIN

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ABSTRACT

The intensity of the thinning, showing quantum of the extracts, makes a balance between the competition and the mutual help between the species, and in the same species too. By the made researches, it was established the gathering rating values for the thinning (that express in percentages the extras possible volume to an intervention) specific to Oltenia Plain, and the relation between the average diameter to the extras trees by the thinning and the stand diameter before doing this.

The obtain results, with a big application, show that the extraction maximum realizes in the youth at 30-35 years, when the extracts quantum in about 6,8-7,5% by the total volume, period when the growths in diameter and in base area are maximum, and the average diameter of the trees which can extract by thinning represents 78% by the average diameter to Quercus cerris and 82-83% to the Quercus frainetto.

INTRODUCTION

The thinning are the tending cut to the stands which finish the management and selection period to the values trees, and the intensity with it intervenes in the stand to realize or touch the scope is influenced in a determinate mode by the previous works.

The continue reduction to the trees number on an area unity shows that between these a big competition is held, while the help between them and the species (Niţescu, Achimescu, 1979). The balance between the reciprocal help and the competition maintains just when it exists an optimal number to the area unity.

Usually, the intensity of the thinning is determined by the wanted ideal and by the particularity to the respective stand (density, composition, age, productivity, vertical structure, etc) and to the site (height, exposition, the depth ground).

With the choice to the extras trees by thinning, the intensity to that extractions is a very important problem in the tending cuts. By doing these, we must create in the stand the thinning conditions which ensure an activation to the growth for the trees; while, it must a big density which contributes to a good conformation to the trees (Negulescu, Ciumac, 1959).

The intensity must be big to can active the growth of the remained trees, but not to big, because in that case, it can produce the soil degradation. Also, the extractions below the natural level will be avoided.

Usually, after the thinning, it's recommended to remain a maximum trees number which benefits to the good vegetation conditions, for obtain a maximum production.

To make all these conditions and to avoid the subjective appreciations by the determination the applied method and to the operation intensity, the man who makes the thinning, must have some sure criterions which guarantee the success in the conditions to the continue raising to the stands quality.

MATERIALS AND METHODS

The research material is built for 29 experimental plots (16 in Quercus cerris and 13 in Quercus frainetto) with 2000 m^2 each other. The stands where there were put the researches are uniform, pure or practically pure, to a full density, with the ages between 30 and 105 years to Quercus cerris and 30 and 100 years to Quercus frainetto, in that mode, the all area of Oltenia Plain is covered.

For each other experimental plot it was determined the main dendrometric indicators: the diameter and the average height, the trees number to hectare, the base area, the production class, the density indice and the total volume (Giurgiu, 1979, Giurgiu, Drăghiciu, 2004, Leahu, 1994).

The main indices which can define the intensity to the thinning are: the trees number to extras to an area unity, the base area to the stand and the extracted volume.

The extracted volume which results after a thinning, being the most exact indicator tot the intensity, by the made researches it was established the intensity about this process.

The intensity to a thinning about volume (E_V%) defines the gathering rating values and it is expressed by the report in percentages between the wood quantity harvested in a moment - V_E - and the stand volume before the intervention -V_R-(***, 2000):

$$E_V\ (\%) = \frac{V_E}{V_R} \cdot 100 \quad (1)$$

To determinate the volume to the extras trees by thinning, there was started to the general formula *V = G x H x F*, when the trees factorial biometrical features are expressed by with the average diameter to the base (D), area in the next mode:

$$V = G\ x\ H_D\ x\ F_D \quad (2)$$

where: V_R is the hectare volume for a base area G;
G is the base area to the stand;
H_D in the average height to the stand with the D diameter;
F_D is the medium form coefficient to the stand by the average diameter D.

In these conditions, the relation for the determination to the extras trees volume by thinning (V_E) becomes:

$$V_E = G_E \cdot H_{D(\text{sec})} \cdot F_{D(\text{sec})} \quad (3)$$

where: G_E is the base area to the trees which extracts by thinning;
$H_{D(sec)}$-the average height to the trees which extracts by thinning;
$F_{D(sec)}$-the coefficient by a medium form to the secondary stand for the $d_{g(sec)}$ diameter.

The relation (3) can be written:

$$V_E = G_E \cdot (HF)_{D(\text{sec})} \quad (4)$$

where: $(HF)_{D(sec)}$ is the reduced average height to the secondary stand.

Because $G = N_i \frac{\pi}{4} d_g{}^2$, the relation for the volume calculation to the extract by thinning becomes:

$$V_E = N_E \frac{\pi}{4} d^2{}_{g(\text{sec})}\, H_{D(\text{sec})}\, F_{D(\text{sec})} = N_E \frac{\pi}{4} d^2{}_{g(\text{sec})}\, (HF)_{D(\text{sec})} \quad (5)$$

So, the N_E, $d_{g(sec)}$ and $(HF)_{D(sec)}$ was determined with the yield tables (Giurgiu, Drăghiciu, 2004). N_E was calculated like a difference between the trees number before intervention and the trees number after intervention. The average diameter of the trees which are extracted by thinning $d_{g\ (sec)}$, was determined by the average diameter to the base area to the tree d_{gT} before intervention, for the next formule (Giurgiu, Drăghiciu, 2004):

$$d_{g\ (sec)} = d_{gT}\,(b_0 + b_1 k_v + b_2 k^2_v) \quad (6)$$

where b_0, b_1, b_2 are the regression coefficients on tables at species and k_v is a reduction coefficient:

$$k_v = a_0 + a_1 \ln T, \quad (7)$$

where a_0, a_1 are the regression coefficients on tables at species (Giurgiu, Drăghiciu, 2004) and T the stand age.

With $d_{g(sec)}$, is calculated, it was determined the reduced average height $(HF)_{D(sec)}$ of the trees which are extracted by thinning

Knowing all the elements to the formula (4), it was possible to calculate the extras volume (V_E) by thinning for Quercus cerris and Quercus frainetto stands.

By the correlation between the volume and height it was determinate the real volume (V_R) to the Quercus cerris and Quercus frainetto stands for the average heights h_g by the yield tables (Cojoaca, 2010).

Finally, we know the V_E and the V_R too and we can replace them in the (1) relation, the established of the gathering rating values for tending cuts (the thinning) in Quercus cerris and Quercus frainetto stand to the III production class to Oltenia Plain.

RESULTS AND DISCUSSIONS

By the made researches, it was established the relation between the average diameter to the stand which represent the tending operations ($d_{g(sec)}$) and the average diameter of the all stand ($d_{g(T)}$) (Table 1).

Usually, the report $d_{g(\sec)}/d_{g(T)}$ is in concordance with the temperament and the ecological features of the species, showing the thinning type in a stand.

For the studied species, featured by a lightly temperament, the report $d_{g(\sec)}/d_{g(T)}$ (with values between 0,72 - 0,84 to Quercus cerris and 0,79 - 0,84 to Quercus frainetto) is bigger than the shadow species (to the Abies alba the values are between 0,61 - 0,67 (Armăşescu, et al., 1965), and to the Fagus sylvatica the values are between 0,65 şi 0,70 (Armăşescu, et al., 1967)).

The knowledge to the relation between these diameters present interest for the sorting and yield tables for the extras stand by thinning. As soon as, it makes more simply the planning and execution work for the thinning.

The made researches show the determination to the average production to the stands which must be extract by thinning (Table 2), and in the establishment to the gathering ration for tending operations (thinning) in Quercus cerris and Quercus frainetto stands at III production class in Oltenia Plain (Table 3).

We can see how, in absolute values, the maximum volume extracts between 45-50 years at Quercus cerris stand (15 m^3 in 5 years) and 65 years at Quercus frainetto stand (15 m^3), and if the age larges, the quantum to the tending operations degreases gradually.

Table 1

The determination of the average diameter for tending operation to Quercus cerris and Quercus frainetto.

The age, years	The average diameter of the base area (d_{gT}), cm		The average diameter for tending operation ($d_{g(sec)}$), cm		The value of the report $d_{g(sec)}/d_{gT}$ with the age $d_{g(sec)}/d_{gT}$	
	CE	GÂ	CE	GÂ	CE	GÂ
25	11.3	9.6	8.2	7.6	0.72	0.79
30	13.8	11.5	10.4	9.3	0.75	0.81
35	16.0	13.3	12.4	10.9	0.77	0.82
40	18.0	15.0	14.2	12.4	0.79	0.82
45	19.9	16.5	16.0	13.7	0.80	0.83
50	21.6	18.0	17.6	15.0	0.81	0.83
55	23.1	19.4	19.0	16.2	0.82	0.84
60	24.5	20.7	20.3	17.4	0.83	0.84

65	25.9	22.0	21.6	18.5	0.83	0.84
70	27.1	23.2	22.7	19.5	0.84	0.84
75	28.2	24.3	23.7	20.5	0.84	0.84
80	29.3	25.4	24.7	21.4	0.84	0.84
85	30.3	26.5	25.5	22.4	0.84	0.84
90	31.3	27.5	26.4	23.2	0.84	0.84
95	32.2	28.5	27.2	24.1	0.84	0.84
100	33.0	29.4	27.9	24.8	0.84	0.84

Table 2

Eestimation of volume removed by thinning (V_E) in the Q. cerris and Q. frainetto stands at the III production class

QUERCUS CERRIS					QUERCUS FRAINETTO				
The age, years	$d_{g(sec)}$ cm	$(HF)_{D(sec)}$	N_E	V_E, m^3	The age, years	$d_{g(sec)}$ cm	$(HF)_{D(sec)}$	N_E	V_E, m^3
30	10.4	5.186	269	12	30	9.3	4.6	227	7
35	12.4	5.871	185	13	35	10.9	5.5	180	9
40	14.2	6.473	134	14	40	12.4	6.3	145	11
45	16.0	7.021	102	15	45	13.7	6.9	118	12
50	17.6	7.494	79	15	50	15.0	7.5	98	13
55	19.0	7.895	64	14	55	16.2	8.1	82	14
60	20.3	8.254	52	14	60	17.4	8.5	70	14
65	21.6	8.595	43	14	65	18.5	9.0	60	15
70	22.7	8.877	37	13	70	19.5	9.4	51	14
75	23.7	9.124	30	12	75	20.5	9.7	45	14
80	24.7	9.360	26	12	80	21.4	10.1	39	14
85	25.5	9.566	23	11	85	22.4	10.4	35	14
90	26.4	9.763	20	11	90	23.2	10.7	31	14
95	27.2	9.933	16	9	95	24.1	11.0	28	14
100	27.9	10.078	15	9	100	24.8	11.2	25	14

Table 3

Gathering rating values for thinning (%) in the Q. cerris and Q. frainetto stands at the III production class

QUERCUS CERRIS					QUERCUS FRAINETTO				
The age, years	h_g, m	V_R, m^3	V_E, m^3	E_V (%)	The age, years	h_g, m	V_R, m^3	V_E, m^3	E_V (%)
30	12.6	160	12	7.5	30	9.5	95	7	7.4
35	14.3	192	13	6.8	35	11.1	127	9	7.1
40	15.7	220	14	6.4	40	12.5	158	11	7.0
45	17.0	247	15	6.1	45	13.8	189	12	6.3
50	18.0	268	15	5.6	50	14.9	217	13	6.0
55	19.0	291	14	4.8	55	15.8	242	14	5.8
60	19.8	309	14	4.5	60	16.7	267	14	5.2
65	20.5	325	14	4.3	65	17.5	291	15	5.2
70	21.1	339	13	3.8	70	18.2	312	14	4.5
75	21.7	354	12	3.4	75	18.8	331	14	4.2

80	22.2	366	12	3.3	80	19.4	350	14	4.0
85	22.7	378	11	2.9	85	19.9	367	14	3.8
90	23.1	388	11	2.8	90	20.4	384	14	3.6
95	23.5	399	9	2.3	95	20.8	397	14	3.5
100	23.8	406	9	2.2	100	21.2	411	14	3.4

The gathering rating values established on species and they present on age classes to 5 in 5 years, in report with the average height h_g. The values express in percentages to the total volume, the average volume which is possible to extract in the conditions to the recommended thinning to instructions. These indices have a large applicability in the practice, especially in the management forests

So, the gathering rating have values between 2.2-7.5% to Quercus cerris and 3.4-7.4% to Quercus frainetto the total volume, and, with the age, these continually decrease.

The maximum extras volume (percentagely expressed by the volume) realizes in the youth to the 30-35 years, when the quantum of the extracts represents in averagement 6.8 – 7.5 % by the volume.

CONCLUSIONS

The made researched in the Quercus cerris and Quercus frianetto stand to Oltenia Plain for the establishment to an optimal intensity of the thinning sent to the next conclusions:

- beginning with the experimental dates correlated with the yield tables, there was obtain the gathering rating for thinning, specified Oltenia Plain, in the condition to them systematically execution. These express in percentages, the possible extras volume to an intervention;

- in the conditions to application some systematically thinning, it can harvest before 100 years, a volume to tending operations by thinning which represents about 31% to Quercus cerris and 32% to Quercus frainetto to the total production to age and almost 50% (46% to Quercus cerris, and 47% to Quercus frainetto) to the main stand production;

-in the technical normes for the care and the management to the stands which had the gathering rating to 3-11% for Quercus cerris and Quercus frainetto stands, by the made researches there was obtained the gathering rations, generally smaller, with values to 2.2-7.5% to Quercus cerris and 3.4-7.4% at Quercus frainetto to the total volume. The differences are explicable, thinking to the growth and progress conditions to these stands for the studied area, but for the substantiation to the obtain results their study in experimental plots is necessary;

- the average diameter to the stands which can extract by thinning represents, in average 78% to the average diameter to the stand ($d_{g(T)}$) to Quercus cerris and 82-83 to Quercus frainetto. The knowledge to that diameter presents a big importance for the research and for making sorting and yield tables for the extras stand by tending operations and practical purposes too. So, when the practitioner to the forest district makes a thinning, in the complex process to structural-functional management to the forests, it have an orientation for the average diameter to the trees which will be extract. So, the forests will be gone to the condition to a maximum functional efficacy in concordance with the social-economical purposes and the ecologicical purposes.

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