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PARTICULARITIES REGARDING THE EXECUTION OF THINNINGS IN TURKEY OAK AND HUNGARIAN OAK STANDS FROM SOUTHERN ROMANIA

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ABSTRACT

The study reveals the results of undertaken research concerning the Hungarian oak and Turkey oak stands in southern Romania, which capture the structural changes following the execution of thinnings in this type of stands.

The obtained results, having a great practicability, show that the present structure of the studied stands is far from the optimal one, established in relation to the set type of management objective and their functions. The study also highlights the importance of systematic covering of stands with thinnings and respecting their cycle.

In the end, the study gives practical recommendations concerning the mode of intervention (in thinnings execution), consisting of choosing the trees to be extracted in order to improve the stands structure, growth and quality and their functional effectiveness, as well as directing their present composition towards the target composition.

1. INTRODUCTION

The thinnings are stand tendings conducted periodically in forest stands, starting with the pole stage and continuing untill high forest stage, in order to improve the forests structure, growth, quality and functional effectiveness. (Florescu, I., Nicolescu, N., 1998, ***, 2000).

The tendings have a pronounced character of individual trees care, of conducting the actual proportion of the species towards the regeneration target, of obtaining an optimal structure in relation to the management objective. By applying the thinnings we reduce, through positive selction, the number of individuals by the surface unit, temporarily lowering the stands density.

It was shown that thinnings have a great influence on the cenotical structure of forest stands, as well as on the stands volume forming and growth. (Rucăreanu, Leahu, 1982, Leahu, 2001).

Considering that by doing the thinnings we modify the frequency of the number of trees by diameter categories, knowing the allure of frequency curve is important, as it allows a characterization of the forest stands. We can observe which diameter categories are surplus, which are poor (by comparison to a theoretical distribution), as well as the presence or the absence of the wolf trees. The trees distribution by categories of diameter offers us data on previous tendings, both on their execution and quality.

At this point one can not say for sure what the optimal distribution of trees on diameteer categories is, but it has to corespond to the biological lawfulnesses of structure of forest stands.

In the research area, for the Turkey Oak and Hungarian Oak stands, structural models were elaborated, by mean of theoretical distributions (Charlier type A and Beta), recognized in the speciality literature for experimental distribution adjustment (Cojoacă, 2010, Cojoacă et.al., 2011).These render, on stand development classes, the theoretical percentage repartition of the number of trees on diameter categories in relation to the stands d_g diameter. The elaborated models also allow automatic processing of data, in order to create optimal structure models in relation to the social-economical functions the forest stands and the forest as a whole exercise.

One of the specific indicators of thinnings, apart from choosing the trees to be extracted, is setting thinning intensity. By cropping the trees a competitional balance is created, which leads to natural elimination and the cohabitation reports both between species as between individuals of the same specie as well. The intensity of the tending in influenced by the stand density, the number and volume of the trees to be cropped, in relation to the situation of the forest stand before the thinning. Because of that, the density must not drop below a critical point, as the negative consequences will show off at felling age. Also, the stand with supraunitary density index (the case of forest stands not covered with thinnings) have a reduced productivity. Considering the thinnings purpose, they modify the cenotic structure of the forest stands.

After thinnings, it is indicated to remain a maximum number of trees for a maximal production as a result of the resulted vegetation conditions.

Researches regarding the quantum of stand extractions by sytematic execution of thinnings (Cojoacă, 2010, Cojoacă et.al., 2012) have shown that till the age of 100 years, we may harvest a secondary production volume by thinnings, representing about 31% for Turkey Oak and 32% for Hungarian oak, out of the total production at that age and bearily 50% (46% for Turkey Oak and 475 for Hungarian oak) out of the final yield. The same studies established that harvesting indexes are between 2.2-7.5% for Tukey oak and between 3.4-7.4% for Hungarian oak out of the total volume.

For the studied area and species, it was established through researches the relation between the mean diameter of the secondary harvest forest stand ($d_{g(sec)}$) and the average diameter of the stand as a whole ($d_{g(T)}$) (Cojoacă, 2010, Cojoacă et.al., 2012).

Therefore, the report $d_{g(\sec)}/d_{g(T)}$ goes between 0,72-0,84 for Turkey oak and 0,79-0,84 for Hungarian Oak, and it is influenced by the thinning type, being in correlation with species temper and ecological attributes. The report value goes higher for the shadow species (for example at fir it goes between 0,61-0,67 (Armăşescu, et al., 1965), and for beech the range is 0,65-0,70 (Armăşescu, et al., 1967).

2. MATERIAL AND METHOD

The studies were conducted in two Turkey oak and Hungarian oak mixt forest stands, located across Yield Management Unit (YMU) I Verbicioara, Forest District (FD) Perişor, forest management unit (fmu) 26B, having a surface of 3,75 ha, (figure 1), and YMU II Cezieni, FD Caracal, fmu 74G, having a surface of 0,76 ha (figure 2).

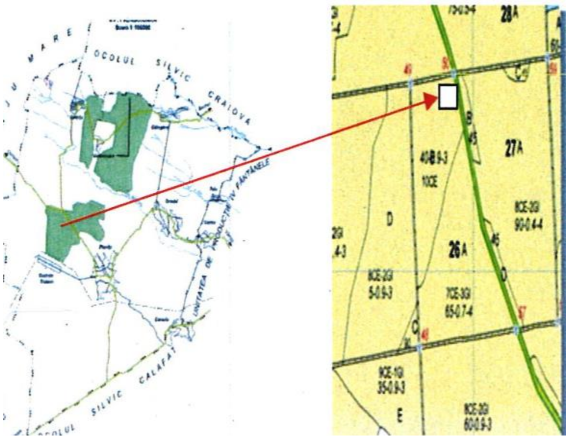


Figure 1 fmu 26B, U.P. YMU Verbicioara, O.S. Perisor

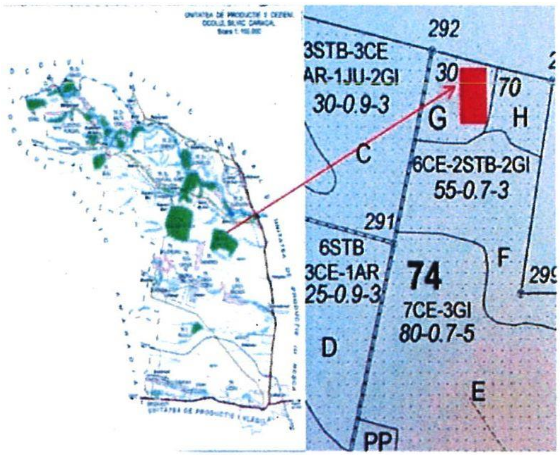


Figure 2 fmu 74 B, YMU II Cezieni, O.S. Caracal

Within the research method, in a representative area inside the studied forest stands, a 2500 m^2 experimental perimeter was located, where one has done e thinning according to the factual situation on the field, respecting the technical norms for this type of tending.

Some office work and field work were made, consisting in observations and measurements inside the two sample plots, followed by centralization, processing and interpretation of collected data.

Some office work and field work were made, consisting in observations and measurements inside the two sample plots, followed by centralization, processing and interpretation of collected data.

On the field:

- One measured the average ($d_{1,3}$) for all the trees inside the sample area, and for a number of 2-5 trees of each diameter range, evenly disposed inside the sample plot, one measured their;
- Demonstrative works on thinning execution were made – one picked the trees to be harvested, taking into account the criteria stipulated in the technicals norms and the speciality literature regarding this type of stand tending. A thinning work was made, respecting the technical norms for this type of stand tending, so that the canopy density (density) did not drop below 0,8.

At office:

- trees were grouped in relation to various biometrical attributes;
- one determined average diameters, basal area, and also the stand volume before and after the thinning was done. The volume was determined by the regression equation of the volumess (Giurgiu, V., *et. al.*, 2004):

$$\log v = b_0 + b_1 \log d + b_2 \log^2 d + b_3 \log h + b_4 \log^2 h \quad (1)$$

where: *v* represents the volume of one tree (m^3);

d – average diameter of the tree (cm);

h – tree height (m);

b0 ... b4 – regression equation coefficient, for each species (Giurgiu *et al.*, 2004).

- The experimental distributions were optimized/adjusted by mean of frequency theoretical functions, specific for even aged and relatively even aged stands, recommended by the speciality literature (Giurgiu, 1979, Leahu, 1994);

- The testing of differences meaning between experimental and theoretical distributions of the nzmber of trees by diameter categories was made through statistical tests Kolmogorov- Smirnov (KS), chi square criteria (χ^2) și Lilliefors.

The data were processed using Microsoft Office Excel 2007, SilvaStat (Popa I., 1999), and for writting the paper one used Microsoft Office Word 2007.

3. RESULTS AND DISCUSSIONS

3.1. The attributes of the studied stands

In order to describe the studied forest stands, one determined: age (TA), way of regeneration (MRG), number of trees (n_i), median dbh (d_g), average height (h_g), crop class (CLP), basal area (G), composition, density index (I_D), real volume (V_R), and theoretical volume (V_T), both before the thinning and after it was made (Table 1).

Table 1

Dendrometrical attributes of the studied stands

Caracteristici	Before thinning						After thinning					
	Turkey Oak		Hungarian Oak		Total		Turkey Oak		Hungarian Oak		Total	
	fmu 74G	fmu 26B	fmu 74G	fmu 26B	fmu 74G	fmu 26B	fmu 74G	fmu 26B	fmu 74G	fmu 26B	fmu 74G	fmu 26B
TA, ani	35	40	35	40	35	40	35	40	35	40	35	40
MRG	LT	P	LT	P	-	-	LT	P	LT	P	-	-
ni la ha	808	600	464	436		1036	592	556	308	216		772
n_i	202	150	116	109	318	259	148	139	77	54	225	193
d_g, cm	15,75	17,41	13,11	14,21	-	-	16,31	17,81	13,79	17,02	-	-
h_g	12,84	14,46	11,00	12,49	-	-	13,04	14,61	11,30	14,13	-	-
G, m^2	3,93	3,57	1,57	1,73	5,50	5,30	3,09	3,46	1,15	1,23	4,24	4,69
G/ha	15,72	14,28	6,28	6,92	22,00	21,20	12,36	13,84	4,60	4,92	16,96	18,76
CLP	3	3	3	3	3	3	3	3	3	3	3	3
Composition (%)	71	67	29	33	100	100	72	74	28	26	100	100
V_R, m^3	25,504	26,249	10,585	13,872	36,089	40,121	20,223	25,513	7,831	10,644	28,054	36,157
V_R/ha, m^3/ha	102,016	104,996	42,340	55,488	144,356	160,484	80,892	102,052	31,324	42,576	112,216	144,628
V_T*, m^3/ha	125,538	151,913	113,612	139,128	122,336	147,233	128,622	154,516	118,532	170,342	126,085	158,932
I_D	0,81	0,69	0,37	0,40	1,18	1,09	0,63	0,66	0,26	0,25	0,89	0,91

* - by Giurgiu, et.al., 1972

3.2. Stands structure by the trees diameter

To highlight the stands structure, the trees were grouped on species, diameter classes (categories) of 2 cm, both before and after the thinning.

In order to graphycally represent it, on the abscissa there were registered the diameters in absolute values from 2 to 2 cm, acording to the framing classes, and on the ordered axis one regitered the number of trees in every diameter class, and then one linked the intersection points with a line called frequency curve. This curve reflects trees distribution onto diameter categories, meaning it expresses the structure of the stand by this particular attribute, for the sample areas, based on data from the field. (fig. 3, 4).

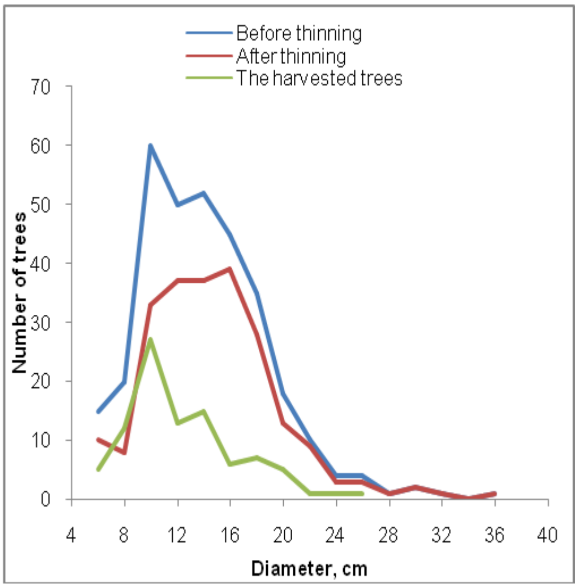


Figure 3 The experimental distribution of the number of trees in diameter classes in fmu 74G

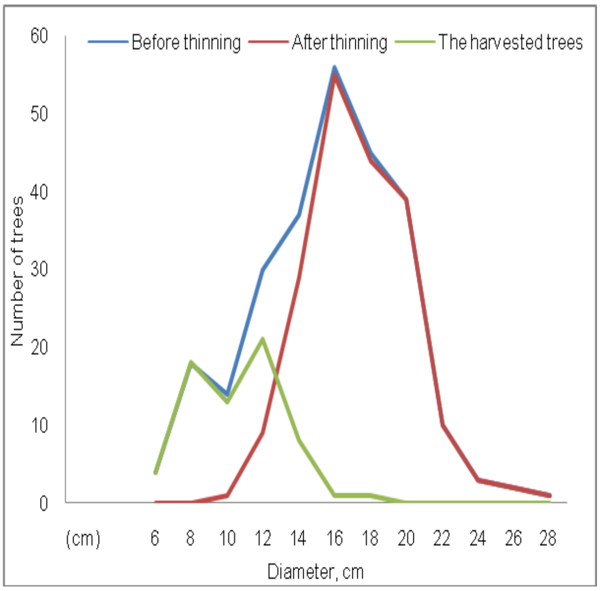


Figure 4 The experimental distribution of the number of trees in diameter classes in fmu 26B

In order to statistically describe the studied stands, one calculated the indicators of experimental distribution of the number of trees on diameter categories, namely: minimum, maximum, amplitude, mean, variance, standard deviation, coefficient of variance, asymmetry and excedent (Table 2).

Table 2

Statistical indicators of the experimental distribution of trees number on diameter categories

Statistical parameters	Before thinning		After thinning	
	ua 26B	74G	ua 26B	74G
Minimum	6,00	6,00	10,00	6,00
Maximum	28,00	36,00	28,00	36,00
Amplitude	22,00	30,00	18,00	30,00
Sample Average	15,61	14,04	17,35	14,70
Sample Variance	16,51	22,88	8,22	23,73
Sample Standard deviation	4,06	4,78	2,87	4,87
Sample Coefficient of variation (%)	26,02	34,08	16,53	33,13
Standard error of the mean	0,25	0,27	0,21	0,32
Skewness coefficient (A)	-0,18	0,95	0,47	0,95
Kurtosis coefficient (E)	-0,15	1,77	0,68	2,00

A fairly diameter amplitude in fmu 74G (6-36 cm) is visible, which indicates, considering the actual age of the stand (35 years), the presence of wolf trees. Extracting those could considerably affect the stands density, by lowering it below the critical value of 0,8, with negative effects both on total production as well as on the stand stability. Therefore, during executing the thinnings, the wolf trees were not harvested.

The presence of small diameter individuals (below 10 cm), related to the average age of the stands (35 to 40 years), justifies their harvesting within the thinnings(they are situated below the uppermost tree layer, belongong to IVth, Vth Kraft classes).

The curve allure, before and after the thinnings, is specifical to even forest stands, with a higher frequency of midrange trees categories.

From the harvested trees curve, we can observe that the intervention targeted mainly the lower diameter classes than the average diameter, basically executing a thinning from below. In both of the studied stands, the mean diameter for Turkey Oak and Hungarian Oak, following the thinning is above the initial one (Table 1), indicating a thinning from below. This aspect is confirmed by the fact that the average height of the stand before the thinning is smaller than the one after it (Table1).

Specifically, the thinning was adapted to the situation on the field. As a thinning from below, it targeted mainly the individuals from the IVth, Vth Kraft classes, in order to create optimal space of developpment and nutrition of the future trees from Ist and IIndKraft classes.

In fmu 74G, the type of thinning is in correlation with the regeneration mode (sprouts), meaning that where we found more than one sprout on a stamp, we reduced their numbers in order to better individualize the future stool shoots.

Analizing the statistical indicators (table 2) we notice that the variance coefficient ($s_{\%}$) in fmu 26B registeres a marked decrease after executing the thinning (from 26,02 to 16,53%), this value showing that the forest stand tends to homogenize, tendece also explainable through the regeneration mode of the stand (planting).

In fmu 74G, the variance coefficeint overcomes 30% (table 2), which is the limit to which the homogenity degree of an even stand is defined. It is explicable if taking into consideration the fact that the forest stand experiences the first thinning.

It is found that, following the execution of thinning in fmu 26B, the distribution on trees numbers on diameter categories have a left positive asymmetry (specifical to these types of stands), opposite to the negative one before the thinning. The arguments are ecological and conditionned by the relations between the individuals of the studied population. In fmu 74G, the asymmetry parameter has a positive left asymmetry, both before and after the thinning.

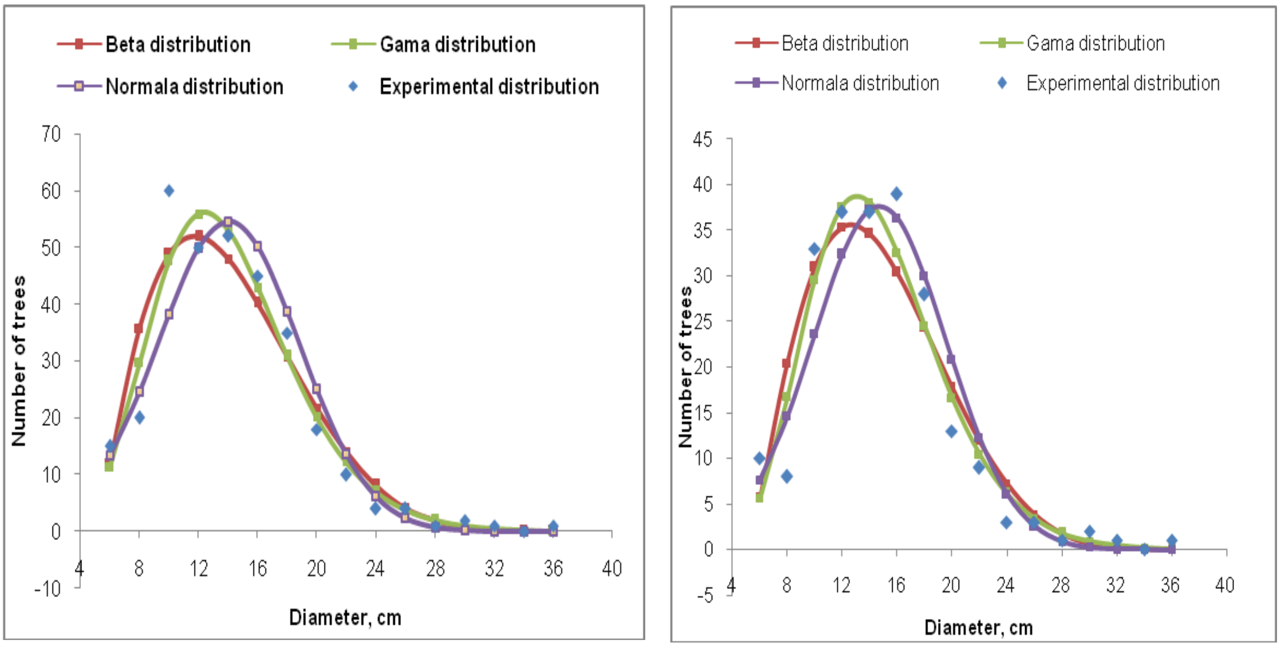
The asymmetry and excess indices must be taking into account at choosing the type of theoretical distribution.

The values of these indices are influenced by theintensity and nature of the stands tendings. It should be noted that ***the left positive asymmetry*** remains as an attribute of even and relatively even forewst stands, in relation with the distribution of the trees numbers on diameter classes and this is „explainable through ecological bases *[…]; the vigurous trees gradually occupy more and more favourable positions to an undisturbed growth by forming some well developped and efficient crowns by reffering to accumulation of wood biomass. Thereby, a small number of favourized trees get to large diameters by harming a much larger number of small diameters individuals*"(Giurgiu, 1979, Leahu, 1994).

It can be said that by performing thinnings the forest stands can be led to a normal structure from the perspective of trees numbers distribution on diameter categories.

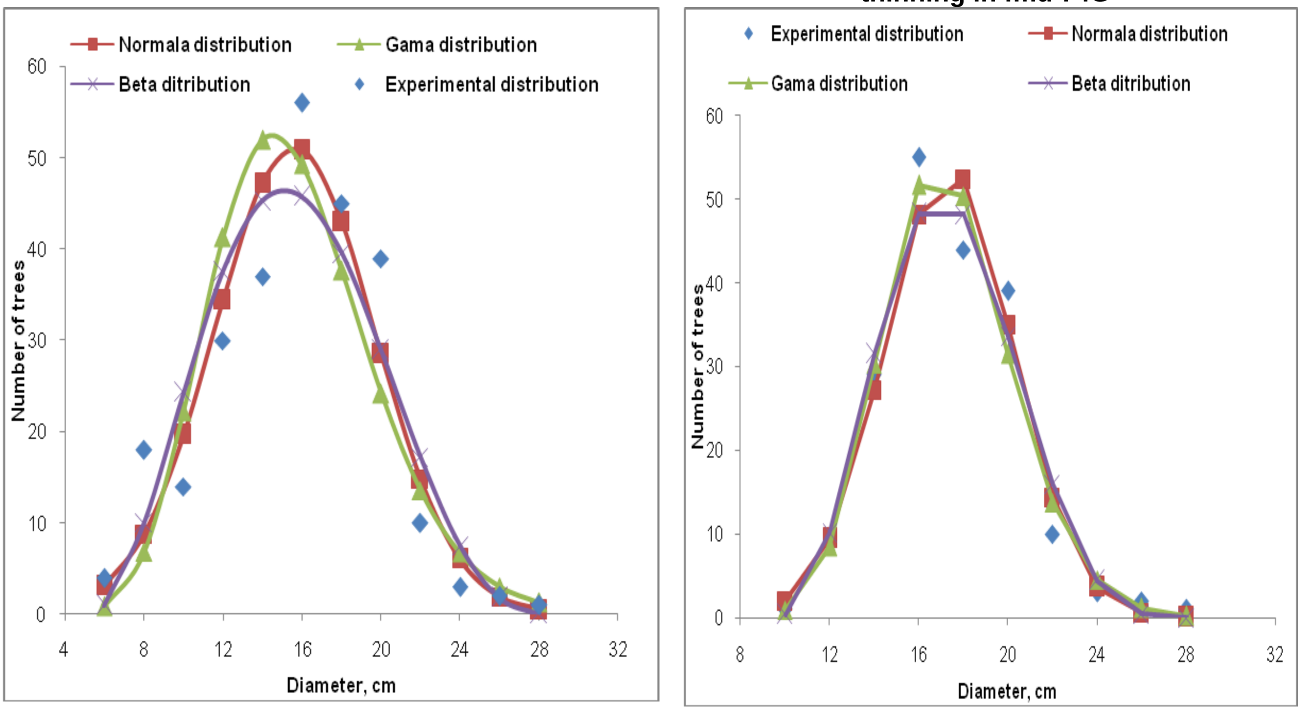
3.3. Adjusting experimental distribution of the numer of trees by diameter categories

Following the analysis of the experimental distribution of the nuber of trees by diameter categories, we procedeed to compare and adjust them by mean of theoretical frequency functions specifical for even and relatively even forest stands, namely Beta, Gamma and Normal, both before and after the thinning was performed. (fig. 5, 6).



a) before the thinning b) after the thinning

Figure 5 – Adjusting experimental distribution of the numer of trees in relation to their diameter, by applying the teoretical frequency functions Normal, Beta and Gamma, before (a) and after (b) the thinning in fmu 74G



a) before the thinning b) after the thinning

Figure 6 – Adjusting experimental distribution of the numer of trees in relation to their diameter, by applying the teoretical frequency functions Normal, Beta and Gamma, before (a) and after (b) the thinning in fmu 26B

From the analysis of the teoretical distributions we can notice that the tress from the two sample areas follow a normal curve, which indicate we are dealing with even stands, with regular structure, most of the trees belonging to midrange diameter categories.

Comparing experimental distributions to theoretical ones obtained by applying frequency functions was realized using statistical check tests Kolmogorov-Smirnov(KS), chi square criteria (χ^2) and Lilliefors (tab. 3, 4).

It is noticeable that for both of the studied stands, ***the experimental values are lower than the teoretical ones, before and after the thinning and also for all of the teoretical functions tested. This means that experimental data follow teoretical lawfullnesses, and the distributions are not significantly different.***

Table 3

The results of experimental distributions tests of trees number by diameter categories using various theoretical functions in fmu 74G

Statistical test	Normal			Gamma			Beta		
	Experimental values		Theoretical values p = 0,05	Experimental values		Theoretical values p = 0,05	Experimental values		Theoretical values p = 0,05
	Before thinning	After thinning		Before thinning	After thinning		Before thinning	After thinning	
Chi2	1,957	1,141	22,362	1,070	0,849	22,362	1,553	1,469	23,685
Kolmogorov – Smirnov	0,060	0,054	0,331	0,020	0,032	0,331	0,030	0,046	0,331
Lilliefors	0,060	0,054	0,212	0,020	0,032	0,212	0,030	0,046	0,212

Table 4

The results of experimental distributions tests of trees number by diameter categories using various theoretical functions in fmu 26B

Testul statistic	Normala				Gamma				Beta			
	Experimental values		Theoretical values p = 0,05		Experimental values		Theoretical values p = 0,05		Experimental values		Theoretical values p = 0,05	
	Before thinning	After thinning	Before thinning	After thinning	Before thinning	After thinning	Before thinning	After thinning	Before thinning	After thinning	Before thinning	After thinning
Chi2	1,599	0,831	16,919	14,067	3,476	0,659	16,919	14,067	2,368	0,727	18,307	15,507
Kolmogorov – Smirnov	0,039	0,037	0,376	0,405	0,055	0,019	0,376	0,405	0,042	0,025	0,376	0,405
Lilliefors	0,039	0,037	0,242	0,260	0,055	0,019	0,242	0,260	0,042	0,025	0,242	0,260

3.4. Calculating the felling indices and the $d_{g\ (SEC)}/d_{g\ (T)}$ report

In order to settle the execution of the thinning one has determined its intensity in relation to the number of trees as well as by mean of basal area and volume. Also, it was determined using the relation between the average diameter of the extracted individuals ($d_{g\ (SEC)}$) and the stand average diameter before the performing of thinning ($d_{g\ (T)}$), as the results are presented in tables 5-8.

Table 5

Establishing the felling indices through thinnings in fmu 74G

Composition	Number of trees/ha				Basel area (G)/ha				Volume, m^3			
	Before thinning	After thinning	Extracted trees	Intensity %	Before thinning	After thinning	Extracted trees	Intensity %	Before thinning	After thinning	Extracted	Intensity %
7 TO	808	592	216	27	15,72	12,36	3,36	21	102,016	80,89	21,13	21
3 HO	464	308	156	34	6,26	4,60	1,66	27	42,340	31,32	11,02	26
Total	1272	900	372	29	21,98	16,96	5,02	23	144,356	112,21	32,15	22

Table 6

The report between the average diameter of the extracted trees ($d_{g\ (SEC)}$) and the average stand diameter before performing the thinning ($d_{g\ (R)}$) in fmu 74G

Composition	Average diameter		$d_{g\ (SEC)})/ d_{g\ (T)})$
-	$d_{g\ (T)})$	$d_{g\ (SEC)})$	
7 Turkey Oak	15,75	14,08	0,89
3 Hungarian Oak	13,11	11,66	0,89
Total	14,84	13,12	0,89

Table 7

Establishing the felling indices through thinnings in fmu 74G

Composition	Number of trees/ha				Basel area (G)/ha				Volume, m^3			
	Before thinning	After thinning	Extracted trees	Intensity %	Before thinning	After thinning	Extracted trees	Intensity %	Before thinning	After thinning	Extracted	Intensity %
7 Turkey Oak	600	556	44	7	14,28	13,84	0,44	3	104,996	102,052	2,944	3
3 Hungarian Oak	436	216	220	50	6.92	4,92	2,00	29	55,488	42,576	12,912	23
Total	1036	772	264	25	21,20	18,76	2,44	12	160,484	144,628	15,856	10

Table 8

The report between the average diameter of the extracted trees ($d_{g\ (SEC)}$) and the average stand diameter before performing the thinning ($d_{g\ (R)}$) in fmu 26B

Composition	Average diameter		$d_{g\ (SEC)})/ d_{g\ (R)})$
-	$d_{g\ (R)})$	$d_{g\ (SEC)})$	
7 Turkey Oak	17,41	11,28	0,65
3 Hungarian Oak	14,21	10,76	0,76
Total	16,45	11,12	0,68

By analyzing the thinnings from the perspective of the harvest indices (their intensity), the following conclusions may be drawn:

- in fmu 74G, the intensity of the thinning overall the stand measures 22% per volume, 23% per basal area and 29% per trees number, while in fmu 26B the intensity counts 20% per volume, 12% per basal area and 255 per trees number. It is found that the intensity expressed by the basal area is very similar to the one determined by the volume, a fact that can be explained by the volume variatind directly proportionally with the basal area. As shown above, the thinnings being mainly from below, it is confirmed also by a higher intensity per trees number (29% in fmu 74G and 25% in fmu 26B), comparatively to the intensity per volume (22% in fmu 74G, 10% in fmu 26b);

- per species, the thinning intensity keeps the same trend as overall the stand, although it can be noticed that it goes higher for the Hungarian Oak in relation to Turkey Oak. This twill can be explained by the fact that some of the Hungarian Oak specimens, on the background of not executing the first thinning at its due time, they belong to the Iv^th^ or V^th^ Kraft classes, losing ground innnnnnn the competition for the solar energy with the Turkey Oak individuals, the growth rate of which is more active.

Keeping those individuals inside the stand is not justified anymore, especially for fitosanitary reasons;

- looking by comparison to the harvest index provided by the technical norms of forest management and by which one determines the volume to be harvested through thinnings in the current works of forest management, which has a value of 12% of the main crop volume, for the the Turkey Oak – Hungarian Oak forest formations, the calculated index is almost double in value (22%). The explanation consists of the fact that the value of 12% of the index provided by the technical norms applies for forest stands with a density index of 1,0, systematically went through with tendings, unlike the studied forest stand (with a density index of 1,18), although the situation demanded it, if we consider the stand s developpemenent class and the cycle of tending operations. If we take note of the fact that the norms provide a 13% harvest index for a Turkey Oak – Hungarian Oak stand having its age in a 21-30 years old range, one would get a 25% overall harvest index, relatively close to the real one, resulted from performing the thinning (22%). This is why tending operation must be performed at the right time (optimal time), regardless of their economical efficiency. Any delay may negatively influence the quality structure of the future stand (such as it happened with the studied case). Also, not operating the tending works at the optimal time makes harder, or even impossible, achieving the composition target provided by the forest management plan. In fmu 26B, the harvest undex provided by the technical norms is about 9% of the mains crop volume, for the Turkey Oak – Hungarian Oak forest formation, while the calculated index through the present study stand very close to it (10%).

It is expected that by future thinning operations Hungarian oak will be promoted in spite of Turkey Oak, so that at its maturity the composition of the stand to be 6TO4HO.

- The operated thinnings were analized by means of the relation between the average diameter of the cropped trees ($d_{g\ (SEC)}$) and the mean diameter of the forest stand before the thinning ($d_{g\ (T)}$). For the species in the study, known as light temper species, the $d_{g(\sec)}/d_{g(T)}$ has a value between 0,68 in fmu 26B and 0,89 in fmu 74G, in a close connection to the factual situation of the two forest stands and the operated thinnings.

Knowing the raltion between these diameters is the basis of the yield tables for the secondary stand.

4. CONCLUSIONS

This study studies the particularities of operating thinnigs in mixed Turkey Oak – Hungarian Oak forest stands in southern Romania, therefore some conclusions may be drawn:

- the researched stands are homogeneous, with a structure specific to the even and relatively even forest stands. It is confirmed by the diameter variance coefficients ($s_{\%}$), which go 30% or less;

- the structure of the studied stands in relation to trees diameters, are graphically described through a slightly asymmetrical and flatened curve for which there are ecological reasons. As the curve asymmetry per diameter categories goes generally, the experimental distributions of the trees numbers on diameter categories were modelled (adjusted) by theoretical distributions provided by ther speciality literature (Normal, Beta and Gamma);

- establishing the meaning of the difference between the experimental distributions and the three theoretical functions, Beta, Gamma and Normal were made with the help of checking statistical tests Kolmogorov-Smirnov (KS), chi-square criteria (χ^2) and Lilliefors. It was found that real distributions dont significantly differ from the theoretical ones, which means taht experimental frequencies respect theoretical lawfulnesses expressed through the three functions above mentioned;

- the factual state of the stands led to operating a thinning from below (the extracted trees are mainly part of lower stand layer, in the IVth and Vth Kraft classes). This is obvious by noticing the increase of dbh and average height of the post thinning stand;

- the performed thinnigs were described through their intensity and the relation between the dbh of harvested trees ($d_{g\ (SEC)}$) and the one of the stand before the thinning **($d_{g(T)}$)**. Both thinnings intensity and the **$d_{g\ (SEC)}$/ $d_{g(T)}$** relation are the result of the management method until present days, showing not complying with thinning cycle of operation in fmu 74G. That led to the Hungarian oak being overwhelmed by Turkey Oak (which has a more active growing rate). As a result the Hungarian Oak individuals lowered their quality, being necessary to extract them.

It can be concluded that choosing the method of operatin thinnings must take into consideration the factual state and structure of the forest stands, and by performing this type of tending works one must aim adjusting the structure of the stand and increasing its quality through promoting final crop trees and also by leading them towards a composition similar to the targeted one. Therefore, in Turkey Oak and Hungarian Oak mixed stands, the thinnigs will target promoting Hungarian Oak as a more important economical species. It will be taken into account that in its early stages of life, the Turkey Oak has more active growing rates and more frequent frunctifications, resulting in an Hungarian Oak individuals elimination tendency.

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