

## RESEARCH ON THE ASSORTMENT OF THE TIMBER HARVESTED IN THE FOREST DISTRICT OF ANINA IN 2014

CHIS LI I.<sup>1\*</sup>, BERCEA I.<sup>2</sup>, CÂNTAR I.<sup>3</sup>, CIONTU C.<sup>3</sup>, SIMON-CERNESCU N.<sup>3</sup>

1 – University of Agricultural Sciences and Veterinary Medicine of Banat "King Mihai I of Romania" of Timișoara, Faculty of Horticulture and Forestry

2 – University of Craiova, Faculty of Agronomy

3 – "Marin Drăcea" National Institute for Research and Development in Forestry

\*chisalita\_ion@yahoo.com

**Key words:** industrial assortments, forest harvesting, timber

### ABSTRACT

The paper addresses a topical issue in the analysis and comparison of results from forest harvesting in 4 lots within the Forest District of Anina, by methods of calculation and final measurement result in the warehouse. The research was conducted in the Forest District of Anina in the timber harvesting areas operated by logging services in 4 lots in 2014. After presenting the need, goals and objectives, the paper focuses on the research methods used and the procedure related to the determination of the industrial assortments through different methods, whose outcomes are then compared.

### INTRODUCTION

**The Rationale** of the current paper - "Research on the assortment of timber harvested in the Forest District of Anina in 2014" lies in the constant need that arises in research for mapping the industry, in the estimation methods used in the evaluation of timber in the forest design process with the result of the measured timber.

The calculation methods used to estimate the operated timber should mirror as faithfully and objectively the reality given through comparison with the measured timber process of logging.

**The aim** of such research is to substantiate and improve the methodology for calculating primary assortments of raw wood, obtained on the primary platform and representing the first reporting in SUMAL, and industrial assortments, the end product of forestry activities, based on the volume estimated in the stocking and marking report.

With a view to achieving the aim and meeting the requirements of the research topic, the following objectives are listed:

- Estimation of exploitable and exploited timber by algorithms resulting from the mainstream literature and the experience in production, so as to be applied in all cases and to all species.
- Estimation of industrial assortments by calculations methods used during the centralized economy period to establish the standing timber volume required to achieve the technical inventory assortments used in industrial wood processing mills in the national economy mentioned above.
- Comparison of methods of estimation, and comparison of these methods and the harvested timber volume.
- Last but not least, interpretation of the results between estimation and measurement in the logging process.

### MATERIALS AND RESEARCH METHODS

Research was conducted in the Forest District of Anina in the harvesting areas operated by *contract for services* in 2014, divided into the following lots: 514; 530; 589; 595.

The timber harvest in these lots includes the main species in the territory of the Forest District of Anina: BR, MO, FA, PAM, FR, JU, TE, PAC, PLT, CA, classified by diameter and quality level.

The following research methods were used:

- *Experiment* - based on the template in the stocking and marking report which was used to verify the estimation of the timber volume resulting from logging. Finally, the estimated values were compared to the measured timber volumes as recorded in the technical and economic documentation of the forest district.
- *Reasoning* - based on the data analysis, reaching well-grounded conclusions on the management of timber during its harvesting through contract for services.

Research on the assortment of the timber harvested in 2014 the Forest District of Anina aimed at comparing the results concerning the industrial assortments, using the following methods: experimental formulas, estimated through production tables, measured.

As regards the **determination of the industrial assortments by experimental formulas**, this calculation methodology has been envisaged and used for determining the volume of standing timber so as to achieve the technical stocks necessary for industrial assortments as a resource in the cold season, of a large wood processing mills during the centralized economy period.

Nowadays, based on these formulas, industrial assortments can be determined, and as far as production planning and organization, and technical and economic analyses are concerned, they are still valid.

The formulas, using data from the stock and marking report, are specific to each assortment, by groups of species, as shown below:

## I. Coniferous trees

1. Veneer wood FE + FT  
5 % (G<sub>1</sub> + G<sub>2</sub>)
2. Lumber  
(G<sub>1</sub> + G<sub>2</sub> + G<sub>3</sub>) – (FE + FT)
3. Minecraft wood  
2/3 M<sub>1</sub> + 1/2 M<sub>2</sub>
4. Pulpwood  
1/2 M<sub>2</sub> + 70 % Lf
5. Round timber  
S
6. Firewood  
30 % Lf + branches

## II. Beech

$$\text{Dac } 100 \frac{G_2}{G_1 + G_2} \quad 51 \% \Rightarrow$$

1. Esthetic veneer wood FE = 7 % (G<sub>1</sub> + G<sub>2</sub>)
2. Technical veneer wood FT = 25 % (G<sub>1</sub> + G<sub>2</sub>)
3. Lumber = G<sub>1</sub> + G<sub>2</sub> + M<sub>1</sub> + 1/2 M<sub>2</sub> – (FE + FT)
4. CR wood = 1/2 M<sub>2</sub> + M<sub>3</sub>
5. Pulpwood = S + 50 % Lf
6. Fibreboard = 30 % Lf

7. Lf = 20 % Lf + branches

If  $100 \frac{G_2}{G_1 + G_2} = 30-50 \% \Rightarrow$

1. FE = 5 % (G<sub>1</sub> + G<sub>2</sub>)
2. FT = 20% (G<sub>1</sub> + G<sub>2</sub>)
3. Lumber = G<sub>1</sub> + G<sub>2</sub> + M<sub>1</sub> + ½ M<sub>2</sub> – (FE + FT)
4. CR = ½ M<sub>2</sub> + M<sub>3</sub>
5. Pulpwood = S + 50 % Lf
6. Fibreboard = 30 % Lf
7. Lf = 20 % Lf + branches

If  $\frac{G_2}{G_1 + G_2} = 30 \% \Rightarrow$

1. FE = 3 % (G<sub>1</sub> + G<sub>2</sub>)
2. FT = 18 % (G<sub>1</sub> + G<sub>2</sub>)
3. Lumber = G<sub>1</sub> + G<sub>2</sub> + M<sub>1</sub> + ½ M<sub>2</sub> – (FE + FT)
4. CR wood = ½ M<sub>2</sub> + M<sub>3</sub>
5. Pulpwood = S + 50 % Lf
6. Fibreboard = 30 % Lf
7. Lf = 20 % Lf + branches

### III. Oak

1. FE = 20 % (G<sub>1</sub> + G<sub>2</sub>)
2. C = G<sub>1</sub> + G<sub>2</sub> + M<sub>1</sub> + ½ M<sub>2</sub> – FE
3. CR wood = ½ M<sub>2</sub> + M<sub>3</sub>
4. Tannin wood (except Turkey oak) = 25 % Lf
5. Lf = 75 % Lf + branches

### IV. Softwood and hardwood

1. FE = 5 % (G<sub>1</sub> + G<sub>2</sub>)
2. Ft = 16 % (G<sub>1</sub> + G<sub>2</sub>)
3. G<sub>1</sub> + G<sub>2</sub> + M<sub>1</sub> + ½ M<sub>2</sub> – (FE + FT)
4. CR = ½ M<sub>2</sub> + M<sub>3</sub>
5. Pulpwood = S + 50 % Lf
6. Boards = 30 % Lf
7. Lf = 20 % Lf + branches

#### Note:

- The amounts resulting from the calculation are correlated with the value of technological consumption (2% deciduous trees and 3% coniferous trees).
- Logs are partitioned into three categories (C<sub>1</sub> > 40 C<sub>2</sub> 24-40, C<sub>3</sub> 20-24 for deciduous trees, C<sub>1</sub> >34, C<sub>2</sub> 24-34, C<sub>3</sub> 20-24 for coniferous trees) depending on the percentage of participation of the dimensional wood, G<sub>1</sub>, G<sub>2</sub>, M<sub>1</sub>, or G<sub>1</sub>, G<sub>2</sub>, G<sub>3</sub>, respectively, which it generates.

**To estimate the volume of industrial assortments by tables of production**, in the case of lumber the trees that were assigned by quality levels according to the proportion of working wood (I, II, III, IV) are taken into consideration, and in the case of veneer wood only high quality trees belonging to subclasses IA, IIA and IIIA are

considered (unfortunately in the Forest District of Anina the inventory did not include such subclasses).

➤ the unit volume ( $v_u$ ) is taken over from unit volumes by diameter categories (a.p.v.).

➤ the indices of industrial sorting ( $vsin$ ) are taken over from the tables in "Metode și tabele dendrometrice" ("Dendrometrical Methods and Tables") by V. Giurgiu, I. Decei, D. Dr ghicioiu, București: Ceres, 2004 (Tables 5.17, 5.18, 5.19, 5.20).

➤ the volume of industrial assortment ( $vsin$ ) is calculated based on the following formula:

$$vsin = 0,01 psinv_t$$

$vsin$  – volume of industrial assortment

$psinv_t$  - percentage of industrial assortment

$v_t$  –total volume

➤ In the case of superior assortments of trees belonging to subclasses IA, IIA, IIIA, the difference between the lumber percentage and veneer wood concern the IA, IIA, IIIA trees, thus, calculating the lumber amount in this category.

In the case of species for which industrial sorting tables were not drawn up, as well as in the case of assortments other than resonance wood, veneer wood (lumber, pulpwood, rural construction, etc.) which are not discussed in "Metode și tabele dendrometrice" ("Dendrometrical Methods and Tables") by V. Giurgiu, I. Decei, D. Dr ghicioiu, București: Ceres, 2004, " Biometria arborilor și arboretelor din România " ("Biometrics of trees and stands in Romania") by V. Giurgiu, I. Decei, S. Arm escu, București: Ceres, 1972, Chapter "Calculul volumului pe sortimente industriale la arborete" ("Calculation of the volume of volume industrial assortments in stands") using dimensional sorting tables is a valuable reference book.

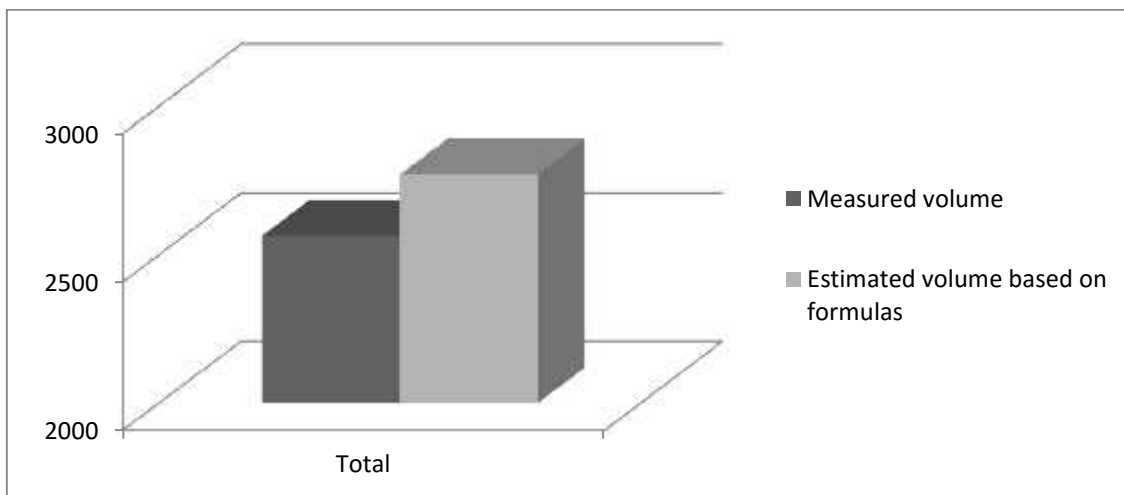
**The measured industrial assortments are those resulting from timber harvesting** in the targeted lots - warehouse of the Forest District of Anina.

## FINDINGS AND INTERPRETATION

The results obtained by measuring the timber harvested and marketed by the Forest District of Anina with reference to the production in 2014 and the estimated volume of primary and industrial assortments using different methods lead to the following conclusions.

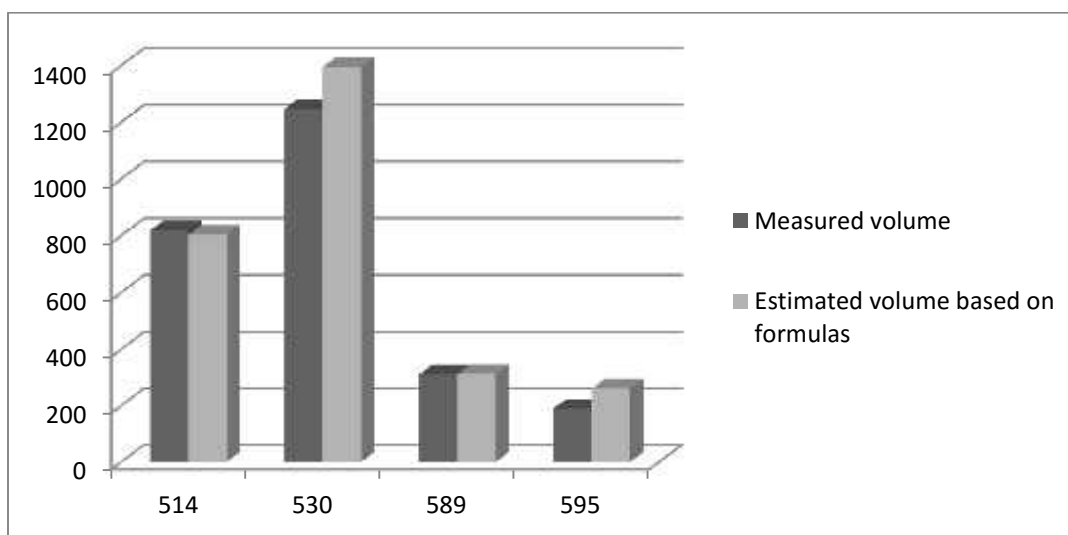
The stocking and marking of high quality trees do not reflect the subclasses IA spruce, IA and IIA sycamore and IA, IIA, IIIA beech in the production phase, contrary to the specifications of the technical norms for timber evaluation and sale. Accordingly, the methodology for estimating industrial assortments of raw materials of the veneer wood type is inadequate, and the results are inconclusive.

The value of timber in relation to the production of 2014 based on "contract of service" at the Forest District of Anina is smaller than the estimated value a.p.v. of 207 m<sup>3</sup> (estimated 2771 m<sup>3</sup> - 2564 m<sup>3</sup> capitalized), representing 9% above the specifications (Figure 1).



**Figure 1. Timber production in 2014**

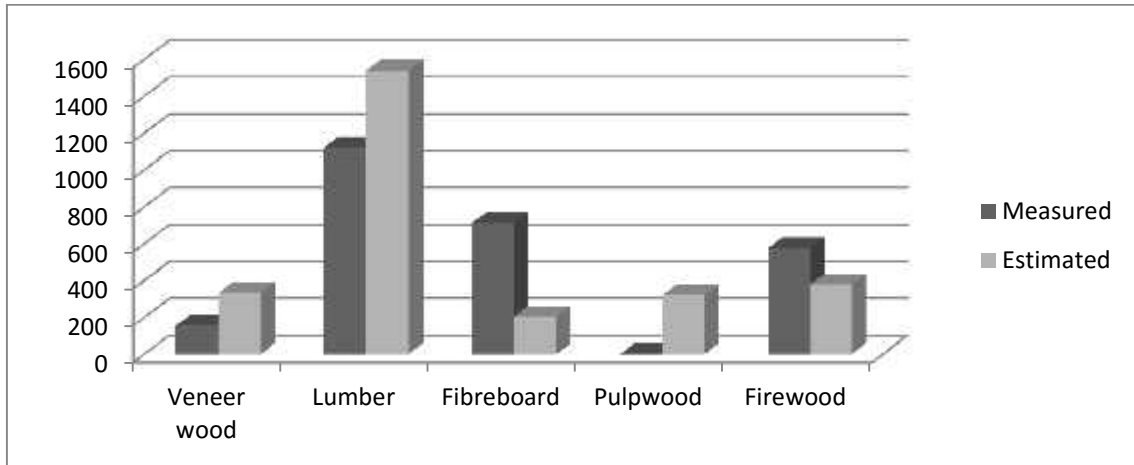
The extra timber in Lots 514 and 589 is insignificant compared with the operating losses in Lots 530 and 595, the final difference being of approx. 207 m<sup>3</sup> (Figure 2).



**Figure 2. Comparison of lots - measured volume vs. estimated volume**

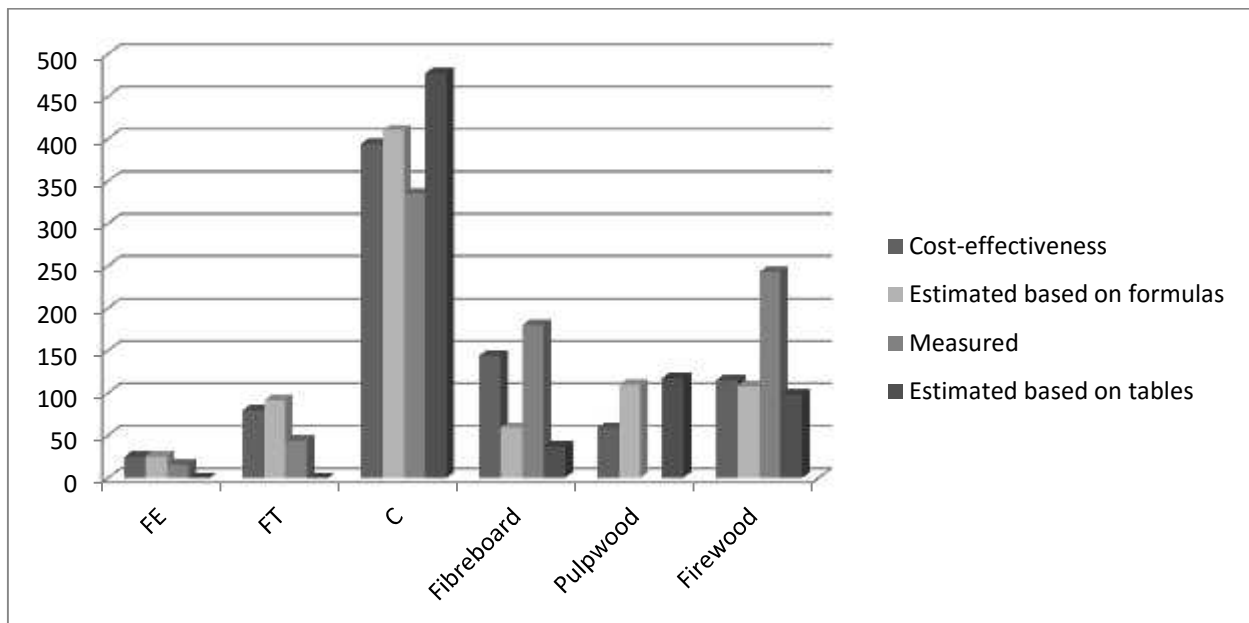
With respect to the sorting of wood in industrial assortments on delivery (veneer wood, lumber, fiberboard, pulpwood and firewood) compared with estimates of timber in relation to the production of 2014 based on "contract of service", the total volume is the following:

- Veneer wood, lumber and pulpwood are degraded in favour of inferior varieties (fibreboard and firewood).
- The estimated volume of veneer wood is of 34 m<sup>3</sup>, whereas after exploitation the volume is of 146 m<sup>3</sup>, representing only 43% (Figure 3).
- The estimated volume of lumber is of 1,537 m<sup>3</sup>, whereas the obtained volume is of 1,210 m<sup>3</sup>, representing 79% (Figure 5).

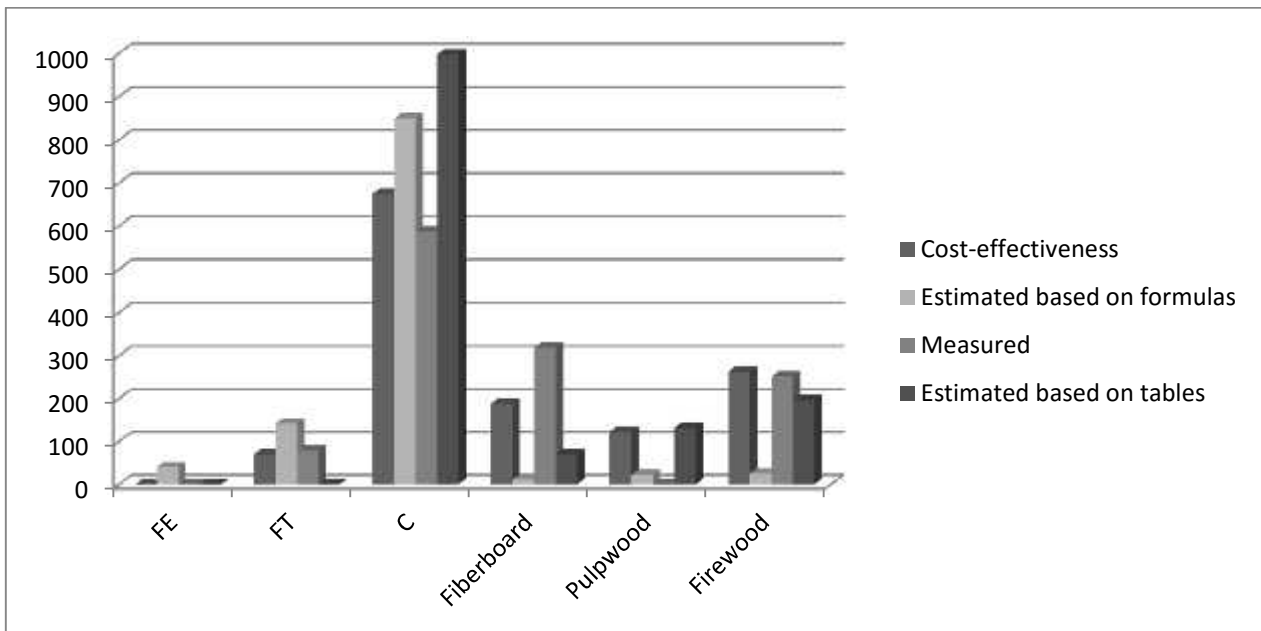


**Figure 3. Comparison - measured timber volumes vs. estimated volumes by assortments**

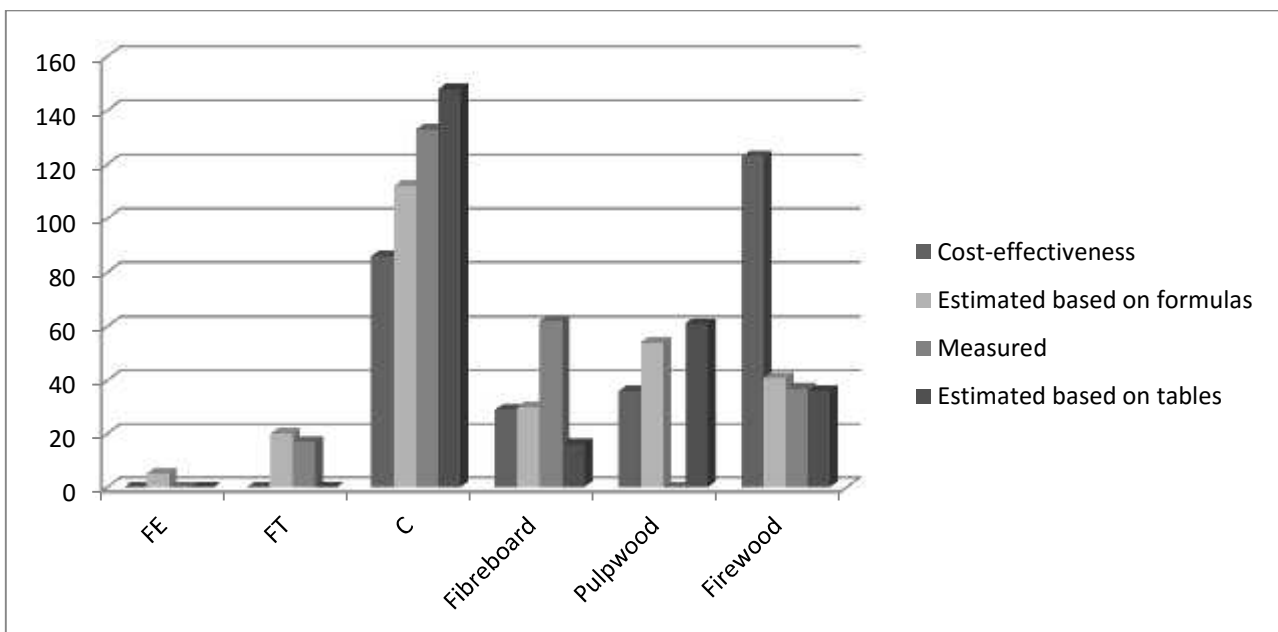
- This decreasing trend in production and delivery - veneer wood and saw lumber (superior) to inferior wood (fibreboard and firewood) is maintained in all lots exploited based on contract of service in 2014 (Figures 4, 5, 6, 7).



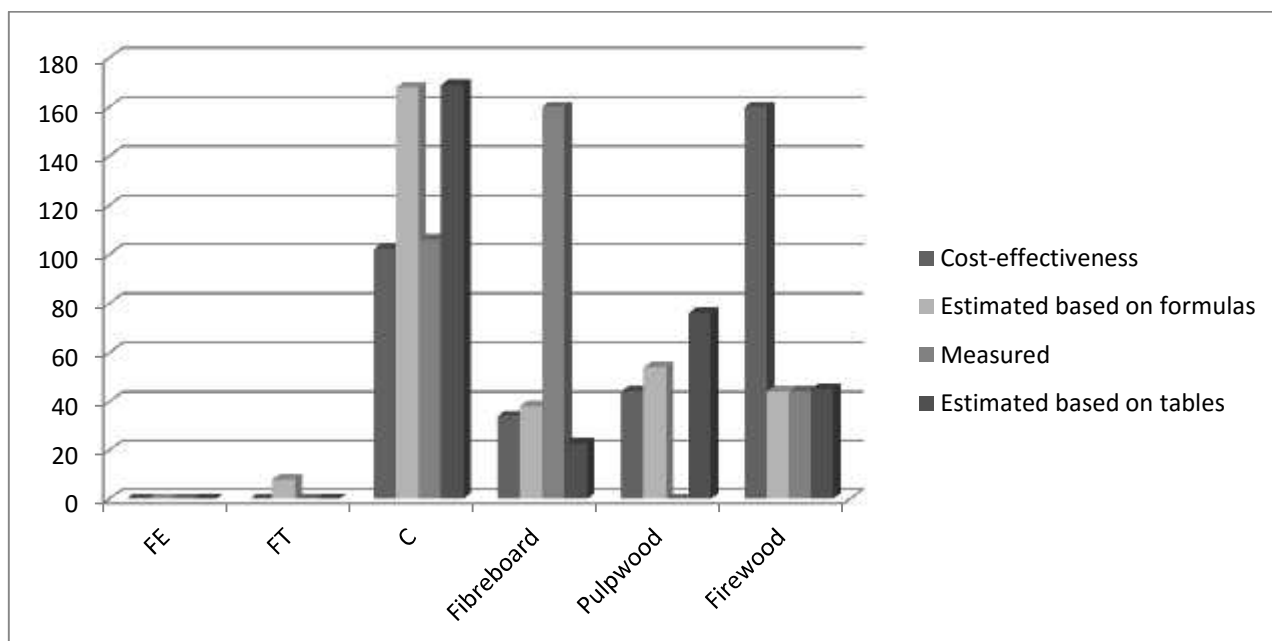
**Figure 4. Comparison of volumes of industrial assortments in Lot 514**



**Figure 5. Comparison of volumes of industrial assortments in Lot 530**



**Figure 6. Comparison of volumes of industrial assortments in Lot 589**



**Figure 7. Comparison of volumes of industrial assortments in Lot 595**

For all lots saw logs from all categories (C1, C2, C3) is estimated, and on delivery, some Lots (530 and 589) only from category C1 and C3 log; the middle category C2 (D = 24-40) is downgraded to category C3 (D = 20-24). This fact led to the decrease in timber cost-effectiveness by low-priced sale.

## CONCLUSIONS

It is imperative to classify trees by quality subclasses: IA; IIA; IIIA, in all situations that require this and in compliance with the legislation in force.

It is mandatory for every harvesting plot to estimate the results, similarly to the estimation of timber volume of a.p.v., which is compared to the marketed volume. This is the net volume (marketable) calculated in exploitable timber structure. The result must not be compared to the gross volume of a.p.v.!

To calculate the cost-effectiveness of a lots, it is necessary to relate the stocking and marking report to the volume of primary raw wood, as well as the volume of industrial assortments of raw wood, through the methods presented in the paper.

Based on the calculation of the cost-effectiveness of each lot, calculated in terms of industrial assortments of raw wood (veneer, lumber, fibreboard, pulpwood, firewood) market prices can be well defined:

- the initial price of standing harvested timber set by economic agents, and the cost of the economic agents, forest suppliers
- performance indicators of teams operating under own management set by forest districts;
- quantitative and qualitative performance indicators set by the specifications for logging;
- last but not least, in all timber harvesting situations, the quantitative and qualitative laid down in the stocking and marking report, estimated by the methods presented in the paper, are the most important and reliable way of tracking timber management from a.p.v. to the quantitative and qualitative delivery of building lumber.

Technical standards in forestry that are required as soon as possible should include estimation methods regarding:

- timber structure;



- timber structure in raw wood assortments (thick round wood; thin round wood, stere wood, branch bundles).
- the timber structure in raw wood industrial assortments (veneer logs, saw logs, fibrewood, pulpwood, firewood, etc.).

## BIBLIOGRAPHY

- Bercea, I.**, 2007: *Cercetări privind regenerarea arboretelor de gârni și cer din partea vestică a Podiului Getic*. (Research on the regeneration of Turkey and Turkey oak seed trees in the western part of the Getic Plateau). Doctoral Thesis. "Transilvania" University of Brașov.
- Chisliș, I.** 2011, *Exploatarea forestiere (Forest ecosystems)*, Timișoara: Eurobit.
- Chisliș, I.** 2011, *Tehnologii ecoproductive în exploatarea forestiere (Eco-productive Technologies in Forest Exploitation)*, Timișoara: Eurobit.
- Chisliș, I.** 2014, *Exploatarea forestiere. Îndrumar de proiectare și organizare (Forest Exploitation. Handbook of design and organization)*, Eurostampa.
- Ciubotaru, A.**, 1997, *Sortarea și prelucrarea lemnului (Wood sorting and processing)*, Brașov: Lux Libris;
- Constantinescu, Gh., Dnil, Gh., Smda, G.**, 1981, *Centre de sortare și preindustrializare a lemnului (Centres of wood sorting and pre-industrialization)*, București: Ceres;
- Giurgiu, V., Decei, I., Drghiciu, D.**, 2004, *Metode și tabele dendrometrice (Dendrometrical methods and tables)*, București: Ceres;
- Niculescu Mariana, Nicolin Alma Lioara, Bercea Iulian, Stnescu tefan, Niculescu Lauren iu, Nu Ilie Silvestru**, 2013, *The corology, ecology and phytosociology of the woody plant communities of the Lapu nic Valley, part of the National Park Nerei-Beu ni a Gorges* <http://agronomie.administrativ.ucv.ro/aamc/index.php/aamc>
- Niculescu Mariana, Bercea Iulian, Nicolin Alma Lioara, Stnescu tefan, Nu Ilie Silvestru, Niculescu Lauren iu, Neag Ovidiu**, 2013- Diversity, distribution and ecology of the dacian beech forests in the u ara Valley- part of the National Park Nerei-Beu ni a Gorges, <http://agronomie.administrativ.ucv.ro/aamc/index.php/aamc>
- Giurgiu, V., Decei, I., Arm escu, S.**, 1972, *Biometria arborilor și arboretelor din România (Biometrics of trees and stands in Romania)*, București: Ceres;
- Pavelescu, M.**, 1972, *Organizarea tehnică a exploatarea forestiere (Technical organization of forest harvesting)*, București: Ceres;
- Timofte, A., I.**, 2008, *Îndrumar de lucrări practice și de proiectare (Handbook of practical and design works)*, Cluj-Napoca: Academic Press;
- \*\*\* R.N.P.Decision No. 341/01.07.1998, *Consumuri tehnologice (Technological consumption)*;
- \*\*\* 1955, *Manualul Inginerului Forestier (Guide of forestry engineer)*, vol. 83 – 86, București: Editura Tehnic ;
- \*\*\* 1989, *Norme și normative de muncă unificate în exploatarea forestiere (Unified labour norms and regulations for forest units)*, București: CEL;
- \*\*\* 2000, *Norme tehnice pentru evaluarea volumului de lemn destinat comercializării (Technical norms for the evaluation of the marketable wood volume)*, Ministerul Apelor Pdurilor și Protecției Mediului;
- \*\*\* 1972, *Tehnica amplasării și recoltării materialelor lemnoase (Techniques of timber sitting and harvesting)*, Institutul de Cercetări Studii și Proiectări Silvice București;
- \*\*\* *Amenajament Ocolul Silvic Anina (Management of the Forest District of Anina)*.