# ASPECTS OF MECHANIZATION OF THE POSSIBILITIES OF THINNINGS OF THE UP I SÎNIOB, O.S. SĂCUIENI, D.S. ORADEA

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***Abstract***

*The research proposed in the case study aims to extend mechanization, that large-scale introduction of some modern technical means to support yield and the quality of our care young crops and forest stands.*

*It will mainly consider creating premises of execution by increasing labor productivity, reducing costs of improvement cutting in culture and young stands, increasing their quality, ease the effort of workers and the possibility of recovery and the size of the resulting material.*

*Research to be carried out to investigate and aim to centralize in a common knowledge, research and difficulties in mechanization of improvement cutting in culture and young stands.*

*The purpose is to research and reduce the human effort and working time used in the mechanization of improvement cutting in culture and young stands from carrying out such work with mechanized means.*

*In subsequent research will pursue the purpose of obtaining verifiable scientific data, which will allow, finally, appropriate recommendations to be put into production.*

*The purpose of the work is intended to bring substantial contributions to the improvement of mechanization of improvement cutting for young crops and forest stands by the introduction and expansion of production at the cars intended for the improvement cutting.*

**Key words:** thinning, improvement cutting, young stand, moto-saw, mechanization of work, accessibility

## INTRODUCTION

Because of the many factors that influence how some of the papers may be made the improvement cutting and young forest stands using mechanical means was considered statistically as the total area of Romania to be taken with such works could be carried mechanized as an important hub on labor productivity in the work it has the configuration of the land, which determine the accessibility of manual operations and especially the machines.

*Table 1*

Shared improvement cutting on national forest area

| Nr. crt. | Works by improvement cutting | Surface mii ha/an |
|---|---|---|
| ***0*** | ***1*** | ***2*** |
| 1 | Weedings | 45 |
| 2 | Release cuttings | 90 |
| 3 | Cleaning | 125 |
| 4 | Thinnings | 110 |

Data on crop area care improvement cutting and young forest stands were considered only to get the overview of the possibilities of mechanization of the works presented in the table above.

Share knowledge in particular areas of terrain slopes and surfaces that are found following crops and young forest stands to be taken cutting tending is absolutely necessary to establish this technology and technical resources with which to be executed this mechanized operations.

*Table 2*

Shared improvement cutting according to the altitude on the national forest area

| No. crt. | Altitude (m) | % of the total area |
|---|---|---|
| ***0*** | ***1*** | ***2*** |
| 1 | 200 | 1,2 |
| 2 | 200-800 | 35,4 |
| 3 | over 800 | 63,4 |

The altitude is doing work for cuttings tending culture and stand on the mechanization of couples impose regarding access to land, the operation of the engine plant at full capacity.

*Table 3*

System improvement cuttings and young forest stands with technical means operated in place at international and national peak

| Name the category and type of work | Stages of development is carried the work | Hand machines |
|---|---|---|
| ***0*** | ***1*** | ***2*** |
| a). Improvement cutting and youth crop until seedlings completion of the massive state:<br>- Care of the culture- - Seedlings care; | Plantation, seedlings; | - Gyrobiayeur;<br>- Debrosaileurs (cutting machine vegetation and young stand)<br>- Moto-tools (diskes or special knives); |
| b). Improvement cuttings after the realization of solid state:<br>- releases and respacing<br>- weeding;<br>- cleaning;<br>- thinning | -seedling, sapling;<br>- thicket stage, pole stage;<br>-pole forest, young high forest, mature timber stage; | - Moto-tools with flexible shaft;<br>- Moto-tools easy, medium and heavy-equipped with a circular disk;<br>-Moto-saws; |

In Romania, currently most of the improvement cuttings and forest stands younger manually run due to lack of equipment for forestry machines of service but where facilities are used moto-tools permits for cutting trees with active organ in the early stages of development relatively small size (0.2 cm - 6 cm or 8 cm), ex. STIHL FS 300 and moto-saws different capacity depending on the nature of works such as the delayed releases and cleanings are using mechanical saws smaller size reduced mass of active bodies, blades saw chain 30 - 35 cm., Ex. STIHL MS L80, L80 C or MS 2L0 and a series of machines from companies HUSQVARNA, SOLO was., Which have a high yield at completion of the cultivation and improvement cuttings of young forest stands.

Interventions shown in the table above does not run independently isolated each other they make up a uniform system of improvement cuttings in which each is conditioned by previous works in the same condition for future interventions.

Therefore mechanical means to make improvement cuttings of crops and young forest stands can be grouped according to how the work performed in the following way:

a).Mechanized means for performing improvement cutting operations;

b).Mechanized means for gathering, collection and transportation timber cuttings resulted after improvement cuttings;

c).Technical means to protect trees during improvement cutting or collection resulting material;

d).Processing facilities on the premises of the resulting material.

European countries (France, Germany) is a technology practice that reduces the

cost of improvement cutting and forest stands younger crop by making alternating with strips of color seedling uncut. .

In Germany this color are about 1 m wide and cut strips followed by 0.5 m and in France are about 2-4 m width, distances from strip cut to the width of 8 m.

Use open lanes for easy movement for enforcement of freeing seedlings uncut and in future work - cleanings, thinning, the removal of material extracted lines.

This system is made forest stands accessibility by opening lines of removal of material removed and also reduced injury produced more trees standing.

These colors can be used throughout the production cycle of stand and require regular maintenance that can be done with mechanical means chosen appropriately depending on the conditions imposed by the land configuration (declivity, slope, etc..).

Thinnings are work implementation repeated in phases of pole forest, young high forest, and high forest who are concerned about care of individual trees in order to contribute actively to maximize the value as productive and protective forest cultivation. (Florescu I., Nicolescu N.V., 1998).

They represent a system of interventions that are executed starting from crossing the forest on pole forest and to the exploitation period (in our forestry through recommendations of the technical regulations in force, such interventions must be stopped, generally after completion of second thirds of exploitability stand age), (xxx, l986).

Thinnings are considered for selection generally positive individual concern as directed on the valuable trees that remain in the stands until the time of the operation and not picked by that intervention. (Florescu I., Nicolescu N.V., 1998).

In this way specimens of permanent value to ensure their optimum conditions for growth and development to the prejudice and by repeated extraction of the lower value, which could hamper in any way and which are extracted.

Normal range of performance of large thinning overlaps between actual growth in volume, respectively, over the stages of pole forest and young high forest.

Conventional sets as first thinning will run when done stand average diameter of 8-10 cm and height of 10-12 meters higher.

Usually, thinning are halted when moving forest stands in phase high forest at an age approximately 20 years of age compared to exploatability if it were systematically covered with improvement cuttings.

In high stage of forest will be made thinnings conducted only in forest stands which leads to higher age (over 130-140 years) to produce valuable types (wood veneer, wood resonance, etc.), systematically works to stand improvement cuttings and in some mixed hardwood stands, sessile oak-beech mixed stand or stand in some protection

The stage of high forest will make specific thinnings in forest stands even-aged and relatively even-aged ongoing forest conversion to selection system or cvasi-selection system.

In relation to the characteristics of forest stands and the goal of forest management will apply these methods to extract: top, bottom, schematic, schematico-selective and different combinations of these.

For conditions of our country presents a wide scope combination of method "top" and method "bottom" which consists of selection and promotion of valuable trees (future), intervening as needed both in the ceiling above and in the lower.

This does not exclude the use where applicable, or only the method above, or only the bottom (xxx., 2000)

Schematic and schematico-selective methods will apply only in special cases (for example, in single cultures of poplar clonal selection).

## MATERIAL AND METHODS

Forest fund covered in this study belongs to Ciuhoi and comes from the Forestry Department Sacuieni (UP I Siniob) following reconstitution of ownership to the Law no. 1 / 2000. It is located in the territorial radius of the village Ciuhoi, Bihor County. Geographically, the forests are located in plain Banato - Crisana and fitoclimatic, village forests are part of the floor plain forest (CF).

The actual area of UB I Ciuhoi is 191.51 ha. It was determined by the plans of the planimetration equipped with management plan details. Forest is found in the territorial limits of the UP I Siniob Sacueni Forestry. He formed two bodies of woods and state forest, arable land, ranges and private forests (communal forests and forests belonging to individuals).

Research has had several issues as follows:

-information, the documentation of the specialized technical literature, the themes of scientific research, technical documentation, etc.

-conceptual studies, analysis, and develop technical solutions;

-application, putting into practice the technical solution;

Working method for the technical means to works tending of crops and young forest stands has been tested in natural conditions of laboratory-stand:

-for determining fuel consumption in different working conditions used method greatly to the fuel tank.

-main technical parameters determining the structure of working time and productivity chronometrical method used and number of specimens cut, the actual measurement of the surface where the cuttings were made of sections of material cut, but other research methods as follows:

- Dimensional measurement method;
- Method of direct observation;
- Similarity method;
- Analysis method;
- Method comparison;
- Photograph method;

Inventorying statistics of forest stands studied (Giurgiu, V., 1972)

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

where:

-n- number of surveys;

-d- distance between sampling;

-F- stand area;

-$\Delta_{\%}$- allowable tolerance;

-t-coverage probabilities corresponding coefficient taken into account;

-f- place the sample size;

-$s_{\%}$- coefficient of variation of volumes on the stand (the statistical unit instead of sample).

In this context all samples plot (SSpi = E) is the sample selection or a community that is extracted from the population.

Statistical-mathematical analysis carried out on observations obtained by sampling is to inform the closeness of the sample and the population in terms of a sample plot and the population.

The main aspects of statistical inventories are:

- the form of the sample plot;
- size of the sample plot;
- number of sample plot;
- module location of the sample plot.

Type of sample surfaces

In form or plot of the sample experienced a series of forms as follows: square, rectangle, circle. It was found that the most commonly used is the circular, it is the optimal solution to implement due to the following features (Giurgiu, V., 1972):

- perimeter circle of the sample surface is less equal than other forms of survey area which means a lower possibility to encounter the limits of their trees;
- cost of inventory works through strip solution is higher than the circular perimeter;
- the same area coefficient of variation for circular sample plot is less than the coefficient of variation if rectangular area;

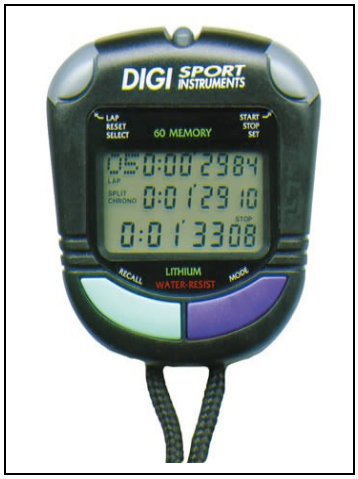
Optimal size of the sample plot

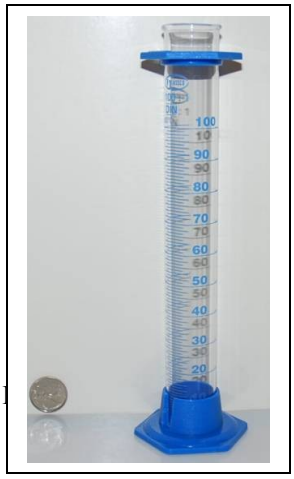
About the optimal size of the circular sample plot was shown that the value of such areas should be between 100-500m$^2$ If this case study of the surface of the sample size will be 100 m$^2$.

Equipment used

To obtain the data required to develop the work we used a range of modern equipment:

a). Tape measure metric is used to determine the samples plot (Fig. 1);
b). Sliding used to measure cut sections of trees extracted (Fig. 2);
c). Stopwatch - device used to measure working time (Fig. 3);
d). Graduated cylinder is capable of determining fuel consumption (Fig. 4).

Saws,, STIHL" MS 180 (Fig. 5)

Saw with easy chain tensioner fast acting, can be used in the forestry sector to work for the improvement cuttings of young forest stands and especially delayed cleanings at thinnings.


Fig. 5. Saws,, STIHL" MS 180

*Table 4*

Technical characteristics Saw,, STIHIL" FS 300

| NO. CRT. | PARAMETER | VALUE |
|---|---|---|
| ***0*** | ***1*** | ***2*** |
| 1 | Cylindrical capacity | 31,8 $CM^3$ |
| 2 | Power | 1,5 Kw/2 CP |
| 3 | Fuel tank capacity | 0,64 l (640 $cm^3$) |
| 4 | Weight | 3,9 kg |
| 5 | Specific weight | 2,6 Kg/Kw |
| 6 | Cutting length | 30 cm |

The data in table 4 were extracted from catalog presentation STIHL products company since 2009.

**RESULTS AND DISCUSSION**

This work was carried thinning mechanized with mechanical saw STIHL MS 180 in U.B. I Salard,. u.a 41 A, in a stand of hardwood in the age of 44 years an average slope of 150 on a sample plot 300 $m^2$,

Having provided these data by extracting specimens marked with much discernment of staff with higher education in Forest district.

*Table 5*

Data obtained after the execution of mechanized work in thinnings u.a. 41

| **No. crt.** | **Specia** | **$D_c$ (cm)** | **$h_c$ (m)** | **L (m)** | **$t_e$ (h)** | **$C_b$ (l)** | **$t_d$ (h)** | **$C_{bg}$ (l)** | **$C_{ua}$ (l)** | **$C_{uu}$ (l)** |
|---|---|---|---|---|---|---|---|---|---|---|
| ***0*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***6*** | ***7*** | ***8*** | ***9*** | ***10*** |
| 1 | Prn | 18,5 | 9 | 13 | 00:01:25 | 0,04810 | 00:01:04 | 0,00185 | 0,00100 | 0,02020 |
| 2 | St.bl | 24 | 8,3 | 18 | 00:01:50 | 0,06240 | 00:01:23 | 0,00240 | 0,00130 | 0,02621 |
| 3 | Prn | 23 | 8 | 16 | 00:01:45 | 0,05980 | 00:01:19 | 0,00230 | 0,00124 | 0,02512 |
| 4 | Prn | 17 | 8 | 12 | 00:01:18 | 0,04420 | 00:00:59 | 0,00170 | 0,00092 | 0,01856 |
| 5 | Prn | 16 | 7 | 13 | 00:01:13 | 0,04160 | 00:00:55 | 0,00160 | 0,00086 | 0,01747 |
| 6 | St.bl | 20,5 | 6 | 18 | 00:01:34 | 0,05330 | 00:01:11 | 0,00205 | 0,00111 | 0,02239 |
| 7 | Prn | 13 | 5 | 11 | 00:01:00 | 0,03380 | 00:00:45 | 0,00130 | 0,00070 | 0,01420 |
| 8 | Prn | 15,8 | 10 | 19 | 00:01:12 | 0,04108 | 00:00:55 | 0,00158 | 0,00085 | 0,01725 |
| 9 | Prn | 15,8 | 9 | 22 | 00:01:12 | 0,04108 | 00:00:55 | 0,00158 | 0,00085 | 0,01725 |
| 10 | Prn | 21 | 9,9 | 10 | 00:01:36 | 0,05460 | 00:01:13 | 0,00210 | 0,00113 | 0,02293 |
| 11 | Prn | 15 | 10 | 16 | 00:01:09 | 0,03900 | 00:00:52 | 0,00150 | 0,00081 | 0,01638 |
| **Total** | | | | | **00:15:14** | **0,51896** | **00:11:30** | **0,01996** | **0,01078** | **0,21796** |

$D_c$ - Diameter section cut, $h_c$ Height stump, L - Shaft length felling, $t_e$ - time of cutting / copy, $C_b$ - -Consumption benzine/ section cut, $t_d$ - Time of changing place from one tree to another, $C_{bg}$ benzine consumption idling (liters), $C_{ua}$ Oil consumption STIHL; $C_{uu}$ Lubrificating oil consumption chain.

Analyzing data from Table 5 is seen as working time differs depending on the diameter trees picked and fuel consumption was determined separately for each tree removed.

For an explicit analysis as were calculated to get your land and were represented by the graphs below.

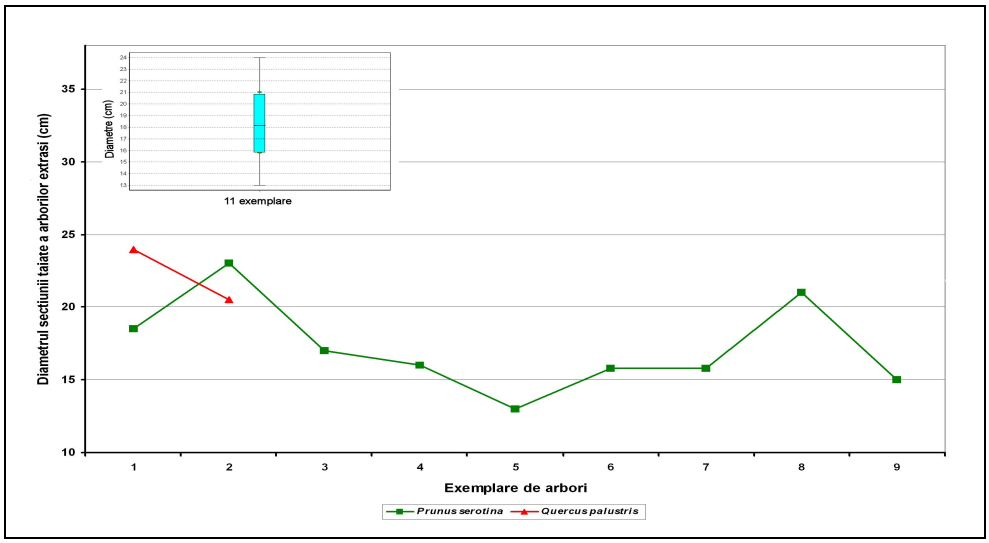


Fig. 6. Variation of sections cut diameters (cm) in the works thinning species and represent BoxPlot for 11 specimens of the species Prunus serotina and Quercus palustris, the O.S . Sacuieni, U.B. I Salard, u.a. 41 A

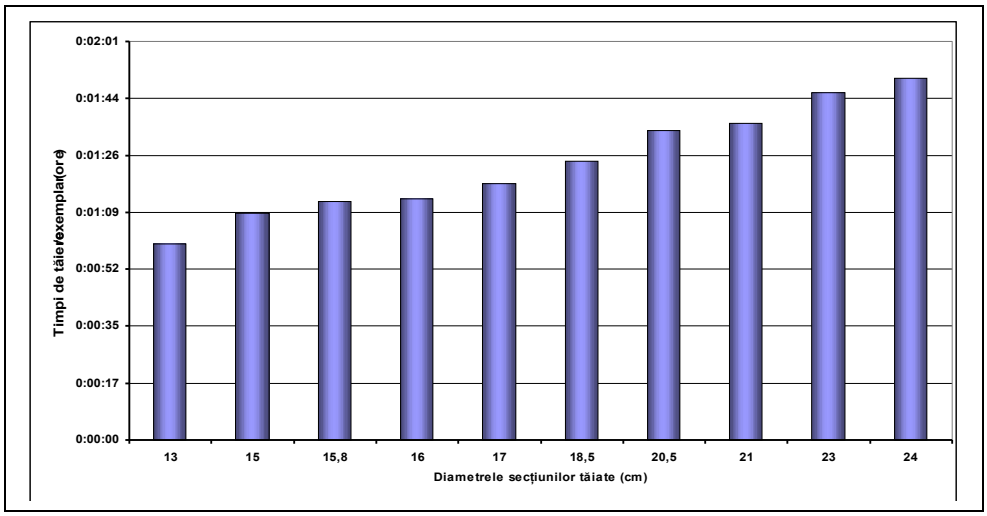



Fig. 7. Variation of cutting times (hours) for classes of tree diameters within the O.S. works thinnings made Sacuieni, U.B. I Salard, u.a. 41 A

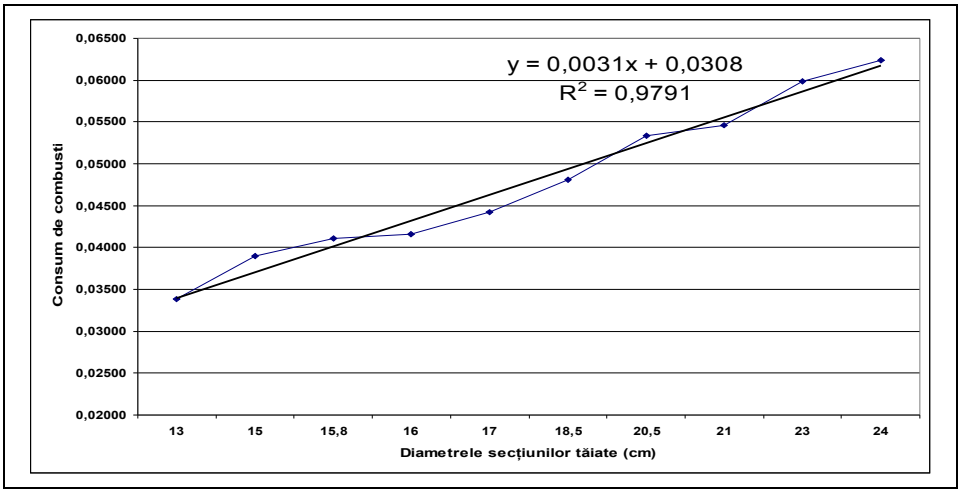



Fig. 8. Variation of cutting times (hours) for classes of tree diameters and regression equation were extracted within the O.S. works thinnings made Sacuieni, U.B. I Salard, u.a. 41 A

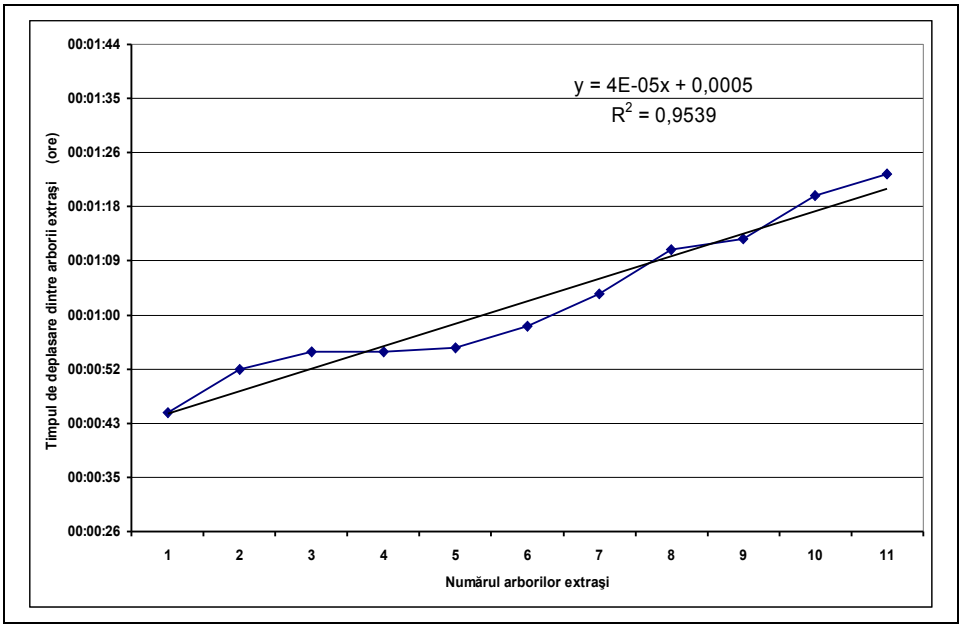



Fig. 9. Variation times between trees exctacted travel (hours) and regression equation, within the O.S. works thinnings made Sacuieni, U.B.I Salard, u.a. 41 A

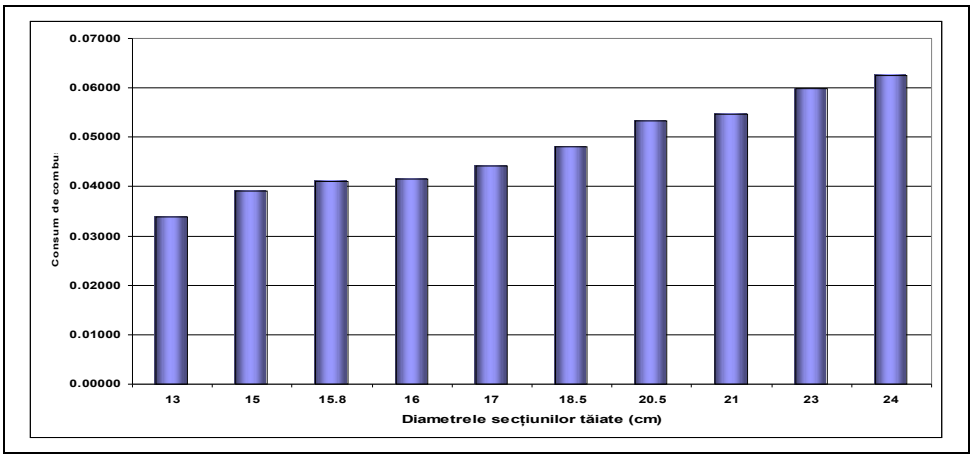



Fig. 10. Variation of fuel consumption (liters) of tree diameter classes in the thinnings works made the O.S. Sacuieni, U.B. I Salard, u.a. 41 A

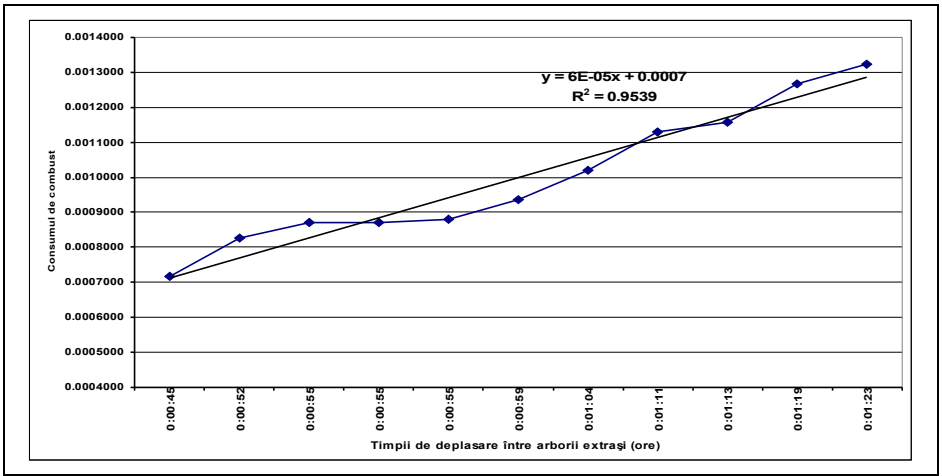


Fig. 11. Correspondence between the times of travel between trees extracted (hours) and fuel consumption (liters) and the regression equation within the thinnings work made at O.S.Sacuieni, U.B. I Salard, u.a. 41 A

## CONCLUSIONS

Mechanization of thinnings is important in a planted forest management. When mechanized thinnings can achieve this kind of work through significant areas in most of cases the realized color and accessibility of forest stands. Regardless of species incorporated into the stand (hardwood, softwood, weak essence) thinnings of technically does not involve special equipment.

In some thinnings who often have the character of mass selection (negative selection) Moto-saws may be used for low capacity, which favor and makes the mechanization of these works.

It is recommended that material be withdrawn in multiples of sorts wrought in stump to facilitate full-tree logging and to avoid residual stand damage. With the case study can propose rules of time that consumption norms and standards for the production of stand thinning works studied.

## REFERENCES


1.Constantinescu, N., 1976: Conducerea arboretelor, Editura Ceres, Bucuresti;

2.Daia, M., 1996: Perspective privind ameliorarea telmicilor de aplicare a degajarilor si curatirilor in padurile de cvercinee. In: Lucrarile sesiunii stiintifice "Padurile si protectia mediului", Facultatea de Silvicultura si Exploatari Forestiere, Brasov, 27 octombrie 1995;

3.Enescu V.,2002, Silvicultura durabila, Editura Agris – Redactia Revistelor Agricole;

4.Florescu Gh., Abrudan I.V.,2003, Impaduriri, Seminte, Pepiniere, Editura Universitatii Transilvania din Brasov;

5.Florescu, I.I., Nicolescu, N.V.,1998, Silvicultura, Vol. II, Silvotehnica, Editura Universităţii Transilvania din Braşov;

6.Giurgiu V., Decei I., Armăşescu S., 1972, Biometria arborilor şi arboretelor din România, Editura Ceres, Bucureşti;

7.Popescu I.,1984, Mecanizarea lucrarilor silvice, Editura Ceres Bucuresti;

8.Popescu I., Popescu S.I., 2000, Mecanizarea lucrarilor silvice, Editura Universitatii Transilvania din Brasov;

9.xxx., Tema B 21/2000., Cercetari in vederea experimentarii de utilaje in cadrul unor tehnologii noi, pentru deschiderea mecanizata a culoarelor de acces in arborete tinere si intretinerea acestora in scopul executarii lucrarilor de ingrijire, ICAS Bucuresti, 2000.