

THE BALANCE OF PRODUCTION COST AND PROFIT IN THE CASE OF PRODUCING SPRUCE TIMBER ASSORTMENTS. CASE STUDY - HARGHITA COUNTY

Gábor MOLNÁR

Transilvania University of Brasov, Faculty of Wood Engineering
Str. Universitatii nr. 1, 500068 Brasov, Romania
Tel: 0040 268 419581, Fax: 0040 268 419581, E-mail: molgabor@yahoo.com

Loredana Anne-Marie RĂDULESCU

Transilvania University of Brasov, Faculty of Wood Engineering
Str. Universitatii nr. 1, 500068 Brasov, Romania
E-mail: loredana@unitbv.ro

Abstract:

Spruce wood is a very sought after good in all domestic and international markets, with a beneficial utility for mankind, through the many forms it takes after the processing process, from the simplest objects, to the increasingly complex uses, such as wooden houses, furniture, etc., up to musical instruments.

Spruce wood processing is an art that consists of a series of activities with an engineering character of transformation into the finished products needed for daily living.

The importance of the higher processing of wood is that it generates income, jobs, budget revenues, bioenergy benefits, added value and social value for citizens.

In this paper I have proposed to bring to your attention a very current subject, with pronounced practical valences, namely the choice of using the vertical frame saw or log band saw to cut spruce wood in Harghita County, for use superior in different forms.

Key words: spruce; log band saw; vertical frame saw; processing.

INTRODUCTION

Timber processing in Harghita County has, over time, combined local traditions and modern trends, to meet the increased demands of the internal market, but also to benefit from the benefits of external markets. In addition, the value obtained by selling finished products has been regarded as an advantage for both producers and workers in the area, especially since, for many localities in the mountain area, wood processing is the main economic activity.

From the territory of Harghita county, forests represent 35.6%, a value higher than the national average of 29.56%, and slightly below the European average value of 37.6%. In contrast, if the climate and hydrogeographic data of the county are taken into account, this value can be considered reduced, as forests can occupy up to 45-50% of the county territory.

The species that occupies the largest share in the Harghita County forest fund is spruce (*Picea abies* [L.] Karst.), With 65% of the total area of the forest fund, that is 89% of the woods of forested (Barbu & Barbu 1993), being also the most productive woody species in the county, both due to the favorable climatic conditions and the low altitudes.

A spruce wood processing company, regardless of size, adapts its working and operating strategy according to the evolutions and needs of the consumer society, technologically, economically and socially. In the current period, the strategy has as a priority the satisfaction of customers.

The technical and technological progress of spruce wood processing in general and the development of limitless means of communication, in particular, as well as the increase of the culture level and the expectations of life, practically of the standard of living, determine the rapid evolution of preferences, tastes and diversifying the needs of people, regardless of geographical boundaries.

Under these conditions, wood processing companies become more efficient, which, through the assortments of finished products offered, can ensure the flexibility of this economic sector and can satisfy the customers' requirements.

At the same time, customers, regardless of their standard of living, are becoming more and more demanding regarding the quality of semi-finished or finished products from spruce wood. They formulate a series of requirements regarding the characteristics of the products and their compatibility with similar products, seen in different information channels.

Under the conditions of the global market economy, the entire activity related to the quality of semi-finished or finished products from spruce wood is stimulated by the pressure of competition, so maintaining the quality of the products is a constant concern of the specialists in the field.

OBJECTIVE

The research objectives consist of studying the spruce log cutting, considering the cost of production and the resulting profit, from Harghita county, taking into account the previous studies, supplemented with the research carried out by the author.

MATERIAL, METHOD, EQUIPMENT

At present, due to the specific conditions in the area, in the spruce forests of Harghita the method of masts is used. The mast is the part of the spruce tree, without cracks, between the felling cut and the one practiced for removing the tip, to a diameter. of the spindle about 5 cm.

Spruce wood, in the form of a mast, is subjected to cutting operations to transform into reusable logs, logs and scraps (Radu 1977).

The obtained logs are subjected to the primary cutting operations on vertical frame saws and log band saws, obtaining pieces of timber in the form of unedged boards, edges and semi-planks.

The operations of primary cutting respectively the timber assortments obtained can be quantified in costs and revenues. These costs and revenues we calculate for the vertical saw respectively for the log saw band saws.

With tables and graphs we try to study the differences in cost and income using the two methods of cutting.

Cutting with vertical frame saw (GV)

We know that when cutting spruce logs in timber assortments we must also take into account the losses resulting from cutting (Ene and Tătar 2008). These losses or by-products are in the form of sawdust (11.5%), remnants (3%), oversize (5%), edges and sides (1%), etc After cutting we obtain assortments of long timber, short timber, chips, beams and rulers (Other).

Table 1 presents the variation of the gross profit resulting from the manufacture of the timber assortments after their sale, respectively the total gross profit realized after the sale of the timber assortments and the resulting by-products.

To calculate the cost of the bark for one m³ of timber we have the following known data:

- the density of one m³ of bark is 364 kg / m³ (Gryc et. al. 2011);
- at 55% humidity, 75-80 kg / 1st (Petrovici and Popa 1997);
- 92.82 lei a m³ namely 364 kg of bark;

So, 75 kg of bark costs 19.12 lei.

Table 1

The balance of the gross profit realized when selling the assortments of green and dry timber respectively of the by-products

Quality.	Coef quality	Assortment [%]	Production cost of green timber, GV	Production cost of dry timber	Average log purchase in 2016 [lei/m ³]	Average acquisition green timber in 2016 [lei/m ³]	Average acquisition dry timber in 2016 [lei/m ³]
			103	103+100	346,6	675,5	820
Gross profit on the sale of timber assortments							
						675,5-346,6-103 = 225,9 lei/m³	820-346,6-203 = 270,4 lei/m³
Gross profit on the sale of timber assortments according to the quality class							
A	1.4	12				675,5*1.4-346,6-103 = 496,1 lei/m³ = 73.44%	820*1.4-346,6-203 = 598,4 lei/m³
B	1.3	29.5				675,5*1.3-346,6-103 = 428,5 lei/m³	820-346,6-203 = 516,4 lei/m³
C	1.2	26				675,5*1.2-346,6-103 = 361 lei/m³	820*1,2-346,6-203 = 434,4 lei/m³

D	1	10				$675,5-346,6-103 = 225,9 \text{ lei/m}^3$	$820-346,6-203 = 270,4 \text{ lei/m}^3$
Oth ers	0.8	22.5				$675,5*0.8-346,6-103 = 90,8 \text{ lei/m}^3$	$820*0.8-346,6-203 = 106,4 \text{ lei/m}^3$
Sawdust						50 lei/tona	
Remains						300 lei/m ³	
Sideways, edges						300 lei/m ³	
Oversized						300 lei/m ³	
Bark						65 lei/ms or 92,82 lei/m ³ and 19,12 lei* 0,68/75*0,68 kg	
Total Class A						$496,1 + 67,5*0,115 + 300*0,03 + 300*0,01+300*0,05 + 19,12*0,68 = 543,88 \text{ lei/m}^3$	646,18 lei/m³
Total Class B						476,2 lei/m³	564,18 lei/m³
Total Class C						408,78 lei/m³	482,48 lei/m³
Total Class D						273,68 lei/m³	318,18 lei/m³
Total others						138,58 lei/m³	154,18 lei/m³
The gross profit calculated for one m³ of timber taking into account the quality classes							
Class A						$0,12*496,1 = 59,53 \text{ lei}$	$0,12*598,4 = 71,8 \text{ lei}$
Class B						$0,295*428,5 = 126,4 \text{ lei}$	$0,295*516,4 = 152,33$
Class C						$0,26 * 361 = 93,86$	$0,26 * 434,4 = 112,94$
Class D						$0,1*225,9 = 22,59$	$0,1 * 270,4 = 27,04$
Others						$0,225*90,8 = 20,43$	$0,225* 106,4 = 23,94$
Total profit timber for 1m ³						322,82 lei/m³ or 47.78%	388,07 lei/m³ or 47.32%
Sawdust						50 lei/tona= 67.5 lei/m ³	
Remains						300 lei/m ³	
Sideways, edges						300 lei/m ³	
Oversized						300 lei/m ³	
Bark						65 lei/ms or 92,82 lei/m ³ and 19,12* 0,68 lei/75*0,68 kg	
Total for 1m ³ of logs						$= 322,82 + 67,5*0,115 + 300*0,03 + 300*0,01+300*0,05 + 19,12*0,68 = 370,60 \text{ lei/m}^3$	435,85 lei/m³

Cutting with log band saw (FP)

We know that when cutting spruce logs in sawmills with log band saws, we must also consider the losses resulting from cutting (Ene and Tătar 2008). These losses or by-products are in the form of sawdust (1%).

Table 2 shows the variation of gross profit resulting from the manufacture of timber assortments, with log band saws, after their sale respectively the total gross profit realized after the sale of the timber assortments and the resulting by-products.

Table 2

The balance of the gross profit realized when selling the assortments of timber, obtained by cutting on log band saw, green and dry respectively the by-products

Quality	Coef. quality	Assortment %	Production cost of green timber, FP	Production cost of dry timber	Average log purchase in 2016 [lei/m ³]	Average acquisition green timber in 2016 [lei/m ³]	Average acquisition dry timber in 2016 [lei/m ³]
			80	80+100	346,6	675,5	820
Gross profit on the sale of timber assortments							
						$675,5 - 346,6 - 80 = 248,9 \text{ lei/m}^3$	$820 - 346,6 - 180 = 293,4 \text{ lei/m}^3$
Gross profit on the sale of timber assortments according to the quality class							
A	1.4	12				$675,5 * 1.4 - 346,6 - 80 = 519,1 \text{ lei/m}^3$ = 76,8%	$820 * 1.4 - 346,6 - 180 = 621,4 \text{ lei/m}^3$
B	1.3	29.5				$675,5 * 1.3 - 346,6 - 80 = 451,5 \text{ lei/m}^3$	$820 - 346,6 - 180 = 539,4 \text{ lei/m}^3$
C	1.2	26				$675,5 * 1.2 - 346,6 - 80 = 384 \text{ lei/m}^3$	$820 * 1,2 - 346,6 - 180 = 457,4 \text{ lei/m}^3$
D	1	10				$675,5 - 346,6 - 80 = 248,9 \text{ lei/m}^3$	$820 - 346,6 - 180 = 293,4 \text{ lei/m}^3$
Others	0.8	22.5				$675,5 * 0.8 - 346,6 - 80 = 113,8 \text{ lei/m}^3$	$820 * 0.8 - 346,6 - 180 = 129,4 \text{ lei/m}^3$
Sawdust						50 lei/tona	
Bark						65 lei/ms or 92,82 lei/m ³ and 19,12 * 0.795 (lu) lei/75 kg	
Total class A						$519,1 + 67.5 * 0.01$ $19,12 * 0.795 = 534,98 \text{ lei/m}^3$	637,27 lei/m³
Total class B						467,39 lei/m³	555,30 lei/m³
Total class C						399,88 lei/m³	473,28 lei/m³
Total class D						264,79 lei/m³	309,28 lei/m³
Total others						129,69 lei/m³	145,29 lei/m³
The gross profit calculated for one m³ of timber taking into account the quality classes							
Class A						$0.12 * 519.1 = 62,29 \text{ lei}$	$0.12 * 621,4 = 74,56 \text{ lei}$
Class B						$0.295 * 451,5 = 133.2 \text{ lei}$	$0.295 * 539,4 = 159.12$
Class C						$0.26 * 384 = 99.84$	$0.26 * 457,4 = 118.92$
Class D						$0.1 * 248,9 = 24.89$	$0.1 * 293,4 = 29.34$
Others						$0.225 * 113.8 = 25.60$	$0.225 * 129,4 = 29.11$
Total profit timber for 1m ³						345.82 lei/m³ or 51,1%	411.05 lei/m³ or 50,1%
Sawdust						50 lei/tona = 67.5 lei/m ³	
Bark						65 lei/ms or 92,82 lei/m ³ and 19,12 * lu, lei/75 * lu, kg	
Total for 1m ³ of logs						345,82 + 67,5 * 0,01 + 19.12 * 0.795 = 361,70 lei/m³	426,89 lei/m³

RESULTS AND DISCUSSION

Cutting with vertical frame saw (GV)

What we can see is that if we make a correct sorting of logs, we can get a higher gross profit. At the same time, if we make a qualitative sorting of the timber, correct, knowing that from a m³ of logs we can obtain timber of different qualities, in different percentages, at the same time capitalizing on the resulting by-products we can obtain a higher gross profit, which of course will be taxed.

If we study this table above as a percentage or Fig. 1, and taking into account the quality class, we can see that the gross profit on the green timber assortments, when using the vertical sawmill, is higher than with the dry timber assortments.

At the same time, by simulating the gross profit, depending on the quality class, when selling the green and wet timber assortments (Fig. 2), we notice that the profit obtained after the sale of the dry timber assortments is higher. So these two aspects must be balanced, the gross profit and the gross profit percentage (Fig. 3).

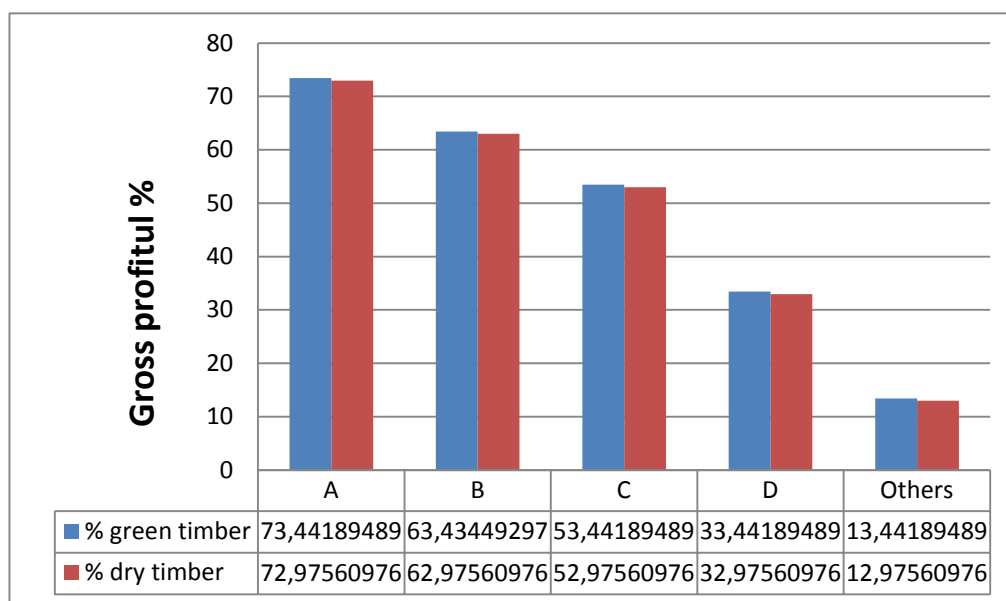


Fig.1.

Variation of gross profit in the production of green and dry timber assortments.

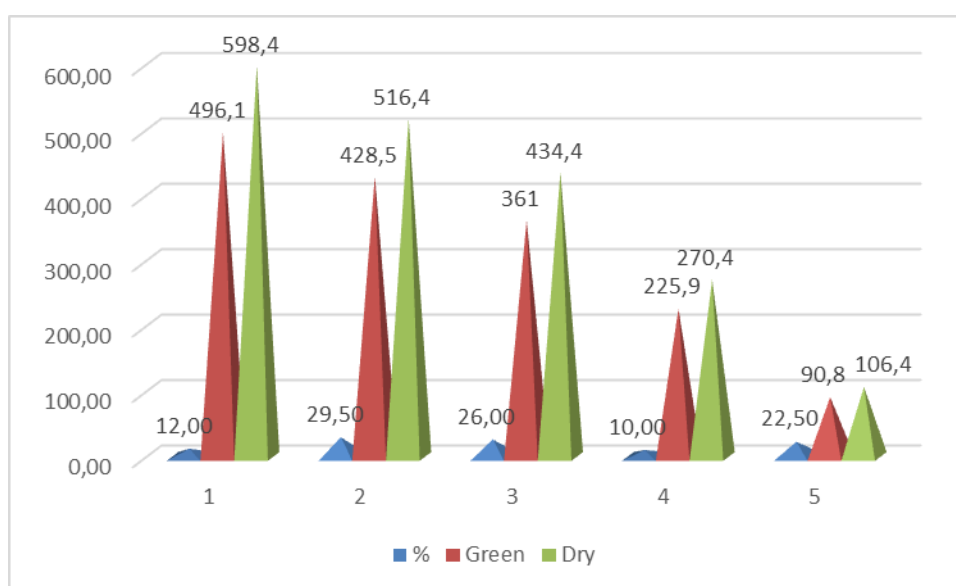


Fig. 2.

Gross profit simulation.

Below, in Fig. 3, the variation of the gross profit appears, taking into account the price differences calculated between the assortments of the respective dry green timber according to quality.

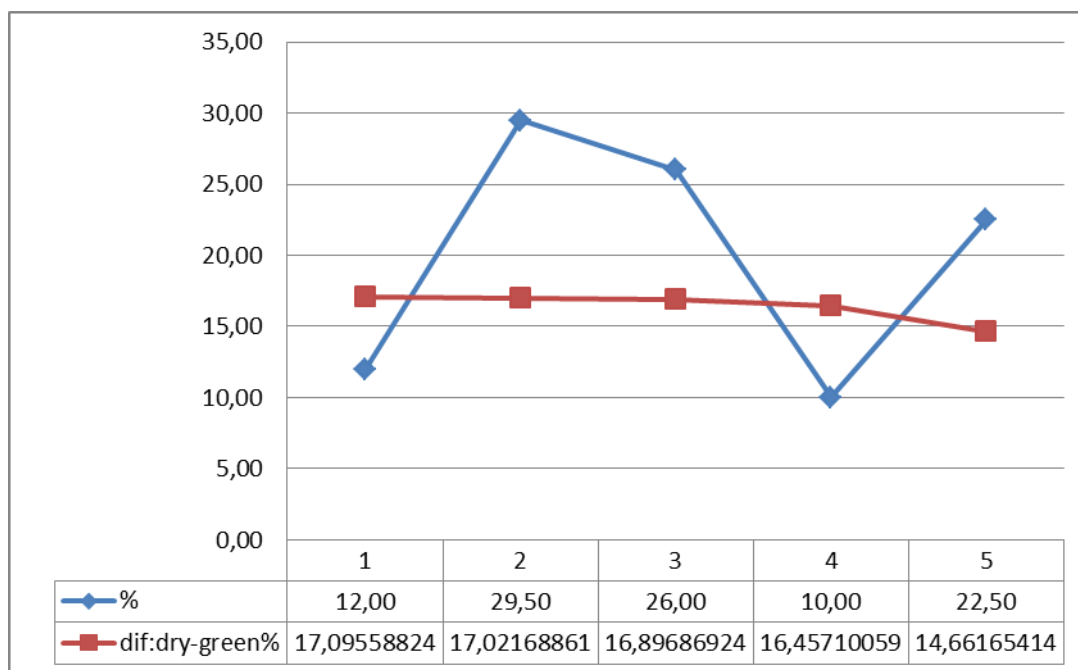


Fig. 3.

Variation of gross profit in the manufacture of timber assortments with vertical frame saw.

Cutting with log band saw (FP)

What we can see is that if we make a correct sorting of logs, we can get a higher gross profit in this case. At the same time, if we make a qualitative sorting of the timber, correct, knowing that from a m³ of logs we can obtain the timber of different qualities, in different percentages, at the same time capitalizing on the resulting sawdust but also the bark, we can obtain a higher gross profit, which of course will be taxed.

If we study this table or the data in Fig. 4, and the quality class is taken into account, it can be observed that the gross profit on the green timber assortments, in the case of using the log band saw, is higher than with the dry timber assortments.

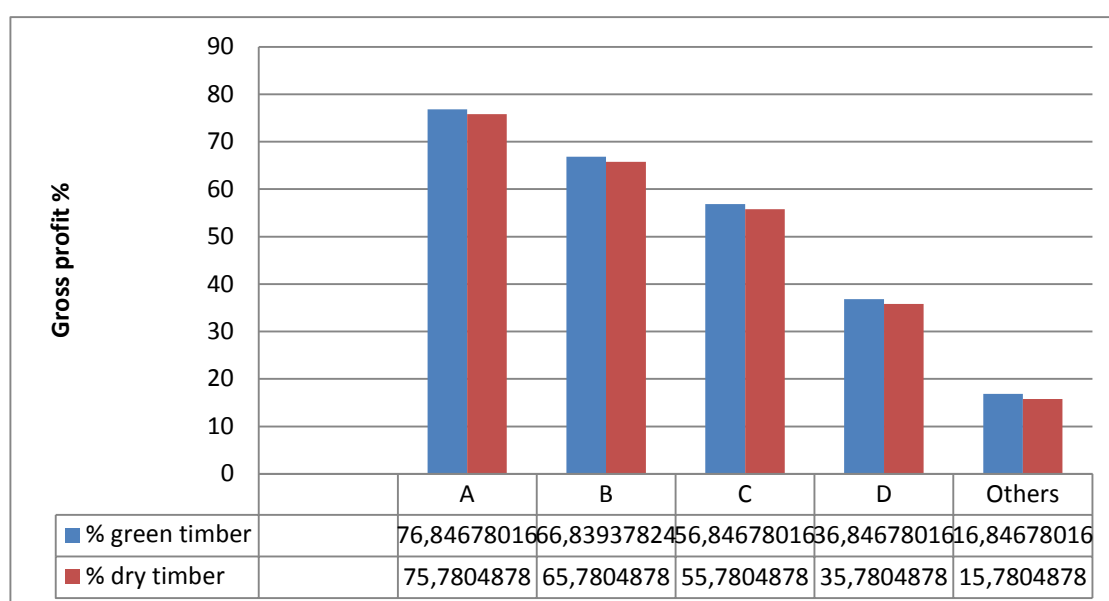


Fig. 4.

Variation of gross profit in the manufacture of green and dry timber assortments with log band saw.

At the same time, by simulating the gross profit, depending on the quality class, when selling the green and wet timber assortments (Fig. 5), it is observed that the profit obtained after the sale of the dry timber assortments is higher.

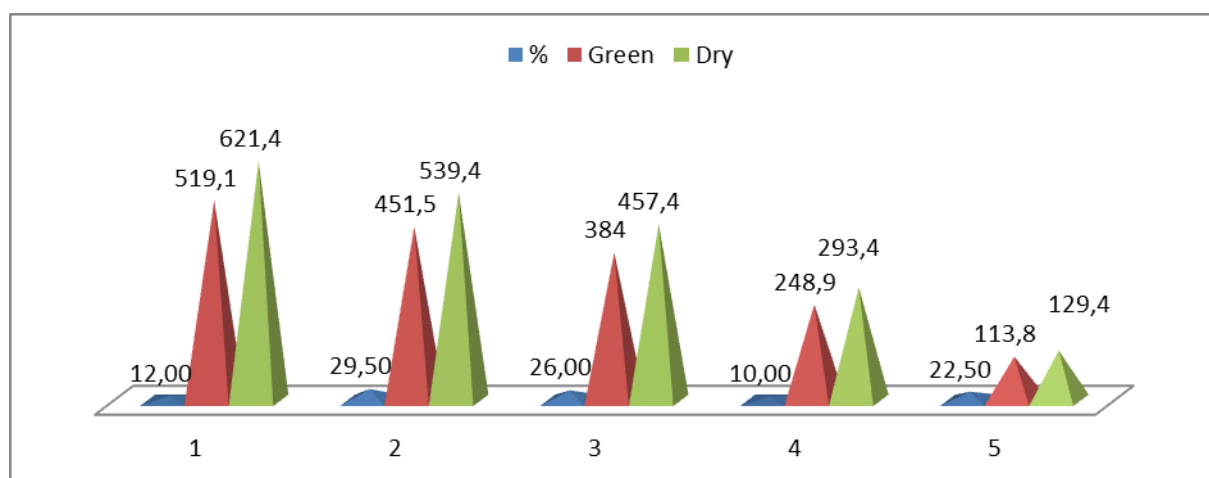


Fig. 5.

The simulation of the gross profit, in the case of the manufacture with the log band saw.

So we have to balance these two aspects, the gross profit and the gross profit percentage. Below, in figure 6, the variation of the gross profit appears, taking into account the price differences calculated between the assortments of the respective dry green timber according to quality.

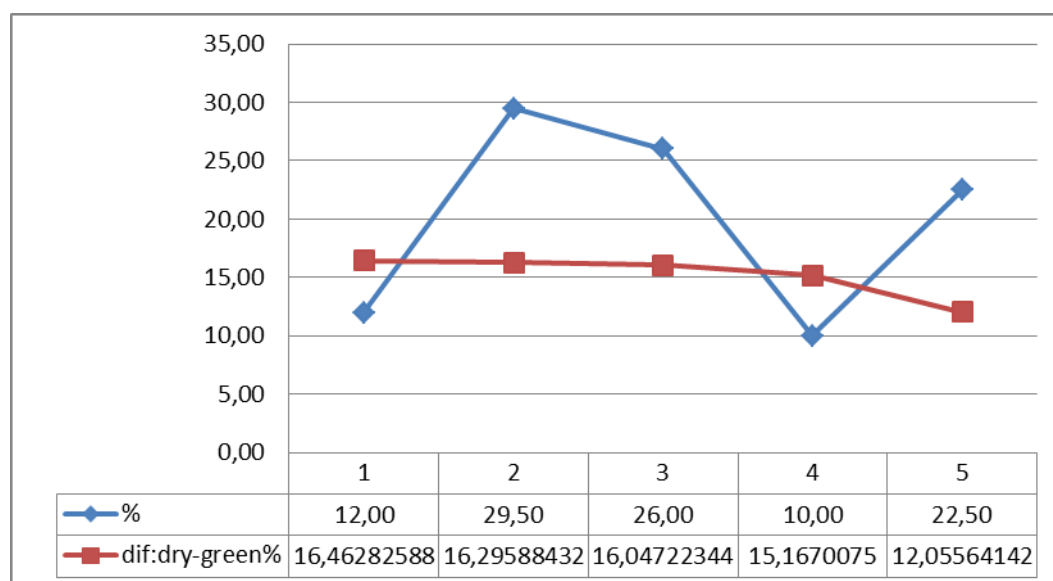


Fig. 6.

Variation of the gross profit in the manufacture with the log band saw of the assortments of timber.

CONCLUSIONS

As a conclusion, regarding a cubic meter of timber, obtained by cutting on vertical frame saw regarding the figures we can state that:

- even if the quantitative percentages of the timber, depending on the quality demanded differ and have a significant fluctuation, the blue line, the gross profit obtained does not fluctuate intensely, the red line,
- if we do not take into account the marginal values, the minimum and the maximum, we see a very small variation, within 0.60% of the gross profit, the red line,
- even if the quantity is a big difference between class A, D and classes B respectively C, the resulting gross profit is about the same, so the difference is in the cost of processing quantities larger than the timber in class B respectively C,
- we notice that it is more profitable in this case to manufacture assortments of dry timber.

As a conclusion, regarding a cubic meter of timber obtained by cutting on log band saws, regarding the figures above we can state that:

- even if the quantitative percentages of the timber, depending on the quality demanded differ and have a significant fluctuation, the blue line, the gross profit obtained does not fluctuate intensely, the red line, even has a linear tendency to decrease with the decrease of quality,
- if we do not take into account the marginal values, the minimum and the maximum, we see a small variation, in the interval of 1.13% of the gross profit, the red line;
- what can we see that the manufacture of quality class A timber is the most profitable, even if the quantity is low;
- even if the quantity is a big difference between class A, D and classes B respectively C, the resulting gross profit is about the same, so the difference is in the cost of processing quantities higher than the timber in class B respectively C;
- we note that even in this case it is more profitable to manufacture dry timber assortments.

At the same time, regarding the two types of processing for obtaining the timber assortments presented, we can conclude that:

- the gross profit is higher using the vertical saw, but with the handling of several by-products which consumes us a higher cost with handling, storage, transport;
- even if the profit is lower in case of the use of the log band saw, smaller by 0.5%, we think that it is more useful to use this type of processing due to the fact that the secondary assortments do not result, so the costs of handling, storage are lower;
- the sale of the by-products helps to alleviate the social problems existing in the localities, at the same time it is a source of raw material for briquettes, pellets and plates;
- with the log band saw we can cut larger diameters using other types of cutting diagrams, for example radial cutting of the resonance spruce.

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