

## Application of modified method of beech round wood value pricing

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**Abstract:** *Application of modified method of round wood logs value pricing* Valuation of beech logs in unedged sawnwood processing was made with the use of quantitative data obtained by trail single sawing conducted by prof. dr hab. W. Dzbeński and K. Laskowski [Dzbeński, Laskowski, 2005]. Economic data were taken from the quarterly "Rynek Drzewny" and together with quantitative data from the trail sawing were the basis for pricing the value of round wood with the use of proposed formula and methodology. The calculations confirmed the practical usefulness of the method of raw material in processing valuation. The results showed unsatisfactory profitability of processing low quality raw material to the standard unedged sawnwood, which was also influenced by an unfavourable phase of the cycle of market economy.

*Keywords:* long logs, sawnwood, trail sawing, profitability, wood value.

### INTRODUCTION

This article is a continuation of the Group work of the Division of Organisation, Economics and Designing of Wood Industry Plants (Zakład Organizacji, Ekonomiki i Projektowania Zakładów Przemysłu Drzewnego) in the statutory research on the topic "Methods of raw material valuation in the timber processing industry."

Application of proposed formulas and methods of raw materials and wood products pricing, and discussions on the structure of pricing formulas led to their modification. They tend to clarify formulas, by taking into account relevant factors affecting the results of the calculations, such as an inventory-taking difference, finished goods, that express only the acquirement of materials from wood processing, produced during the analysed period in comparison with the costs incurred in that phase. The income may in fact contain some stocks from the previous period as well as part of the production could go into warehouse at the end of the month. The proposed formula and the method should be applicable to business activities in wood industry, in which central management is familiar with economic data, that can be hard to reach (or even impossible to reach) for people outside the company, because of the trade secret. The data contained in the quarterly "Rynek Drzewny" is valuable and reliable, but is limited to average values with significant spread. The editorial office of the quarterly warns against that fact. Therefore, the application of valuation methods cannot always correspond to the results of calculation of specific companies with different equipment, technology and production assortment. However application of the method gives some understanding of the realities of the raw material economy at different stages of cyclical phase.

### 1. RESEARCH METHODOLOGY

Round wood value pricing in the processing is reduced to the following formula:

$$W_i = A_i - B_i + C_i, \text{ whereas:}$$

$A_i$  – discounted value of cash revenue on sales of sawnwood from  $1\text{m}^3$  of "i" grade round wood processing [PLN/ $\text{m}^3$ ];

$B_i$  – unit costs of transport, raw material sawing and drying of sawnwood together with funds sunk costs in the operating cycle [PLN/m<sup>3</sup>];  
 $C_i$  – unit net income from sale of waste from wood processing [PLN/m<sup>3</sup>].

2.1. Discounted value of cash revenue on sales of sawnwood from 1 m<sup>3</sup> of “i” grade round wood processing is determined by the formula:

$$A_i = \frac{P_i \pm \Delta Z_{pk}}{(1+r)^d (1+m)Q}, \text{ whereas:}$$

$Q$  – volume of raw material sawing covered with the valuation [m<sup>3</sup>];  
 $r$  – rate of discount for one day funds sunk received on the basis rate of two-years bonds (0.048≈0.05);  
 $P_i$  – value of cash revenue on sales of sawnwood from the trail sawing [PLN];

$$P_i = \sum_{k=1}^s T_{ki} C_k, \text{ whereas:}$$

$T_{ki}$  – quantity of sawnwood cut from „i” grade logs processing [m<sup>3</sup>];  
 $C_k$  – sales price of the “k” assortment of sawnwood from sawing [PLN/m<sup>3</sup>];  
 $\Delta Z_{pk}$  – an inventory-taking difference of the “k” assortment of sawnwood [PLN];  
 $m$  – assumed level of gross profitability from the sale of sawnwood ( $m = 0, 0.01, 0.05, 0.10$ );  
 $j \in <1, o>$  – number of days of payment recovery from the sawnwood sale:  $o=30$  is assumed because of infringement of this term results in the possibility of claim for statutory interest chargeable on overdue liabilities.

2.2. Unit cost of raw material transport, its sawing and drying, including carrying costs of capital in operating cycle:

$$B_i = \frac{a_i}{a_{A1}} \left[ k_t + k_p + k_s + 0,5 \sum_{d=1}^{q_1} r_d (k_p + k_s) + \sum_{d=1}^{q_2} r_d \frac{P_i \pm \Delta Z_{pk}}{Q} \right], \text{ whereas:}$$

$a_i$  – productivity in wood processing in “i” grade;  
 $a_{A1}$  – productivity indicator in wood processing of the highest raw material grade;  
 $k_t$  – unit cost of raw material transport to the sawmill [PLN/m<sup>3</sup>];  
 $k_p$  – unit cost of raw material sawing, recalculated for 1 m<sup>3</sup> of sawn logs [PLN/m<sup>3</sup>];  
 $k_s$  – unit cost of sawnwood drying from wood working, recalculated for 1 m<sup>3</sup> of sawn logs [PLN/m<sup>3</sup>];  
 $d \in <1, q_1, q_2>$  – day of the capital commitment in the operating cycle ( $q_1$ ) and sawnwood storage ( $q_2$ ).

2.3. Net revenue per unit from the sale of waste from processing (with income tax deducted):

$$C_i = f(1-a_i)C_0, \text{ whereas:}$$

$$C_0 = U_{ir} \cdot (C_{ir} - k_{0ir}) + U_{zr} \cdot (C_z - k_{0zr}) - \text{unit gross value from waste sale [PLN/m}^3\text{];}$$

$U_{ir}$  – share of sawdust;

$C_{tr}$  – selling price of sawdust [PLN/m<sup>3</sup>];  
 $U_{zr}$  – share of chips;  
 $C_{zr}$  – selling price of chips [PLN/m<sup>3</sup>];  
 $k_{0tr}$  – unit cost of providing sawdust to sell [PLN/m<sup>3</sup>];  
 $k_{0zr}$  – unit cost of processing waste into chips [PLN/m<sup>3</sup>];  
 $f$  – ratio of the company's share in gross profit, in 2009  $f=0.81$ .

#### 2.4. Figures used in the calculations

##### 2.4.1. Data from the trial sawing

Data obtained from trial sawing, published in the article "Effectiveness of further sawmill plant processing (a selected example)" in Annals of Warsaw Agricultural University SGGW. Forestry and Wood Technology, No 56/2005, p. 208-213.

$Q=97.64\text{m}^3$  of long logs, from which obtained logs in the following quantities:

$$Q_{WC(2,3)}=74.54\text{m}^3$$

$$Q_{WB(1,2,3)}=19.49\text{m}^3$$

$$Q_{WD(2,3)}=3.61\text{m}^3$$

As a result of trial sawing the following quantities of unedged sawnwood were obtained (Table 1).

Table 1. Quantity of cut sawnwood obtained from sawing

Timber grade	Quantity [m <sup>3</sup> ]	Share [%]
T <sub>28 I</sub>	21.259	29.1
T <sub>28 II</sub>	43.795	60.0
T <sub>28 III</sub>	2.975	4.1
T <sub>32 III</sub>	4.947	6.8
Total:	72.976	100.0

Source: data from trial sawing [Dzbeński, Laskowski, 2005]

Material efficiency from single sawing is:  $a_i = 72.976/97.64=0.75$ , ie 75%. Such a high efficiency from logs sawing results from established saw set. Wastes are recovered in the form of sawdust in an amount of  $1.00-0.74=0.25$ , ie 25%.

High rate of  $a_i$  ( $a_i=0.75$ ) has been adopted in the calculations.

$\Delta Z_{pk}$  – a sawnwood inventory-taking difference (assuming zero, because of results from the trial sawing where used);

$k_t$  – cost of raw material transport, according to "Rynek Drzewny" data on the basis of which can be estimated as follows from the relation of 1m<sup>3</sup> weight of hardwood and softwood  $k_t=20\text{PLN/m}^3*0.7/0.5\approx 28\text{PLN/m}^3$  (Rynek Drzewny, 4/2009);

$k_p$  – cost of sawing,  $k_p\approx 220\text{PLN/m}^3$ ;

$k_s$  – cost of drying,  $k_s\approx 192\text{PLN/m}^3$  (Rynek Drzewny, 4/2009);

$U_t$  – share of the sawdust is 100% of waste, results from material efficiency counting from single sawing;

$C_{tr}$  – unit selling price of sawdust, maximum value has been adopted,  $C_{tr}=30\text{PLN/m}^3$  (Rynek Drzewny, 4/2009);

$k_{0tr}$  – unit cost of providing sawdust to the sale, estimated at 2 PLN/m<sup>3</sup>.

### 3. ROUNDWOOD VALUE FROM THE LONG LOGS PROCESSING

#### 3.1. Discounted value of revenues from the sale of sawnwood from trial sawing per 1m<sup>3</sup> (A<sub>i</sub>)

Table 2 Discounted unit value of revenue from the sale of sawnwood

No.	Sawnwood		Discounted net revenue from the sale of sawnwood [PLN]			Discounted revenue per 1m <sup>3</sup> of raw material [PLN/m <sup>3</sup> ]
	Assortment	Quantity [m <sup>3</sup> ]	Unit price [PLN/m <sup>3</sup> ]	Value [PLN]		
				Nominal	Discounted	
1	T <sub>28 I</sub>	21.3	925	19665	19587	707
2	T <sub>28 II</sub>	43.8	653	28598	28484	
3	T <sub>28 III</sub>	3.0	425	1264	1258	
4	T <sub>32 III</sub>	4.9	469	2320	2310	
Total:		73.0	-----	51847	51639	

Source: own calculations on the basis of data from trial sawing [Dzbeński, Laskowski, 2005] and data from "Rynek Drzewny" No 4/2009.

The data in Table 2 shows that the cost of deferring the payment of consumer's claims over allowed one month would be 51847-51639=208PLN, at the processing of 97m<sup>3</sup> of round wood – counted for 1m<sup>3</sup> is approximately 2PLN/m<sup>3</sup>, which is of little value, although, when sawing of 25 thousand. m<sup>3</sup>, deferring the payment of consumer's claims would amount to about 50 thousand. PLN.

#### 3.2. Unit cost of transport, sawing and drying of sawnwood together with freezing of capital costs (B<sub>i</sub>)

Relation of material efficiency  $\frac{a_i}{a_{A1}}$  is assumed as 1, because logs of different grades

were sawn and the Authors did not provide the efficiency of the various grades of logs, giving a total yield of sawnwood from the entire consignment of long logs. Efficiency in single sawing of raw material amounted  $72.976/97.64 \approx 0.75$ , ie 75%. Results of B<sub>i</sub> calculations contains Table 3.

Table 3. Unit cost of transport for raw material, sawing and drying, taking into account interest on capital during operating cycle and storage of sawnwood.

Unit costs [PLN/m <sup>3</sup> raw material]				
Transport (k <sub>t</sub> )	Sawing (k <sub>p</sub> )	Sawnwood drying (k <sub>s</sub> )	Expenses interest	Total:
28	220	192	2	442

Source: own calculations

The data in Table 3 shows that share of the sawing cost is surprisingly high, and it seems that cost of drying is real, while the impact of capital interest per 1m<sup>3</sup> of wood working is negligible.

#### 3.3. Unit net revenue on sales of waste from processing (C<sub>i</sub>)

In the single sawing there are no edgings and slabs, for further chips production, but only sawdust at a price 30 PLN/m<sup>3</sup> and bark of which the value is negligible per 1m<sup>3</sup> of raw material.

$$C_i = f(1 - a_i) \cdot C_r = 0,81(1 - 0,75) \cdot 30 \cong 6 \text{ zt/m}^3 \text{ of raw material}$$

3.4. The value of 1m<sup>3</sup> of logs (WCO) from the trial sawing, after manipulation into logs (see p.2.4.1):

As a result of manipulations obtained logs were of various grades, in different market prices, therefore to compare value of the raw material for the unedged sawnwood processing with the supply price has been adopted weighted average market price, which is:

$$74.54 * 231 \text{ PLN/m}^3 + 19.49 * 334 \text{ PLN/m}^3 + 3.61 * 120 \text{ PLN/m}^3 = 17219 + 6310 + 433 = 23962 \text{ PLN, ie average price per 1m}^3 \text{ will be: } 23962 \text{ PLN} / 97,64 \text{ m}^3 = 246 \text{ PLN/m}^3.$$

Calculated values (see p.2.4.1; 3.1; 3.2, 3.3) were used in the computation of raw material value pricing, and the results are given in Table 4.

Table 4. The value of sawnwood from the trial sawing from the manipulation of the long logs (WCO).

Discounted revenues on sales of A <sub>i</sub> sawnwood per 1m <sup>3</sup> [PLN/m <sup>3</sup> of raw material]	Cost of transport, sawing, drying and interest (B <sub>i</sub> ) [PLN/m <sup>3</sup> of raw material]	Net revenues on sales of waste (C <sub>i</sub> ) [PLN/m <sup>3</sup> of raw material]	Accepted gross margin (m)	Value of raw material W <sub>i</sub> =A <sub>i</sub> -B <sub>i</sub> +C <sub>i</sub> [PLN/m <sup>3</sup> ]	Weighted average market price of raw material [PLN/m <sup>3</sup> ]
707	442	6	0	271	246
			0.01	268	
			0.05	258	
			0.10	246	

Source: own calculations

Analysis of computation results of round wood (long logs) value shows a satisfactory profitability of wood processing into unedged sawnwood, because computed wood value was equal with weighted average price of the raw material at the margin m=0.10, which seems to be suitable.

#### SUMMARY

The results of the value calculations of beech round wood long logs (WCO) after manipulation into logs of different grades (see p.2.4.1) showed a fully satisfactory profitability of wood processing, because at the assumed margin m=0.10 weighted average price of the raw material equal with its value, and with less sawmill requirements with assumptions of the expected margins in the processing, it could pay a bit more for raw material. By processing beech wood for example on strips sold to the parquetry block factory, or even manufacture them on site, we can certainly achieve a significantly better financial results.

Influence of capital interest per  $1\text{m}^3$  is negligible, but noticeable with considerable wood processing of the plant (see p.3.1) or recovery of payment extension and storage of wood materials in anticipation for the buyer.

#### CONCLUSIONS:

1. Value of beech round wood long logs (WCO) is higher than weighted average market price of long logs obtained from raw material manipulation in trial sawing. It is equal at net margin 0.10 in processing.
2. Unedged sawnwood market price provides moderate profitability of beech long logs processing.
3. Influence of interest of capital frozen in accounts receivable of buyers, as well as in the stock of sawnwood, is negligible per  $1\text{m}^3$  of wood, but with larger quantities of sawmill scale is noticeable.
4. The results of calculations of the raw material should be treated with moderate caution due to the spread of data provided by the quarterly "Rynek Drzewny". Exact calculation of the raw material value in the processing is possible in a particular plant, with the use of proposed method.

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**Streszczenie:** *Zastosowanie zmodyfikowanej metody wyceny wartości drewna okrągłego przy próbnym przetarciu kłód z manipulacji dłuźyc bukowych WCO. Wycena wartości dłuźyc bukowych w przerobie na tarcicę nieobrzynaną została dokonana z wykorzystaniem danych ilościowych uzyskanych w wyniku próbnego przetarcia na ostro przez prof. dr hab. W. Dzbeńskiego i K. Laskowskiego [Dzbeński, Laskowski, 2005]. Dane ekonomiczne zaczerpnięte zostały z kwartalnika Rynek Drzewny i w zestawieniu z danymi ilościowymi z próbnego przetarcia stanowiły podstawę wyceny wartości drewna okrągłego według proponowanej formuły i metodyki. Obliczenia potwierdziły praktyczną przydatność metody wyceny surowca w przerobie. Wyniki wykazały niezadawalającą opłacalność przerobu surowca niskiej jakości na standardową tarcicę nieobrzynaną, na co istotny wpływ wywarła również niekorzystna faza cyklu gospodarki rynkowej.*

*Słowa kluczowe:* dłuźyce, tarcica, próbne przetarcie, opłacalność, wartość drewna.

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