The Added Value of Products is a Key Factor in the Development of the Forest Industry

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Abstract. The paper presents the results of a study of certain aspects in improving the efficiency of the Russian forest industry. The purpose of the work was, in addition to identifying these factors, to consider a model for improving the efficiency of the functioning of individual timber enterprises, which has a certain system of restrictions. In the course of the study, the key role of added value in the price of products of forest industry enterprises in increasing efficiency (profitability) both individual goods and the entire timber industry. The general dynamics of the development of enterprises in the industry and the production of the most important types of products is shown. The significant role of the logging industry in the efficiency of the entire timber industry of the country is revealed, and the factors of this influence are shown. One of them is the fluctuation of prices for round timber during the year, the principal model of which is also presented in the work. The study is based on statistical information for the period 2015-2019. and it is based on the results previously obtained by the authors of this work and the scientific research of the country's leading scientists in the field of the economy of the forest industry. The resulting system of restrictions to improve the efficiency of LPC enterprises can be used in other industries that use natural resources.

1. Introduction
Improving the efficiency of any industrial enterprise is a priority task of the management and one of the priorities of the state. A strong and sustainable business, with high incomes and, consequently, appropriate contributions to budgets and various funds, is necessary both at the local, regional and federal levels [1-3]. The timber industry complex includes many different enterprises that differ in the profile of their activities and the achievement of economic efficiency. The profitability ranges from minimum values to 40-50 % [4]. An important aspect and priority of state regulation of the industry is the achievement of high added value at enterprises and the increase in deep processing of wood resources. However, for businesses, many aspects of improving their own efficiency involve risks and affect many internal processes, which are often difficult to reform [5-7].

The purpose of the study: to determine the key factors in improving the efficiency of the forest industry, to draw up a system of restrictions that characterize the activities of timber enterprises, and to identify the role of added value in the price of products in achieving their goals by the enterprises of the LPC.
2. Material and methods
As materials for the study, statistical data for 2018-2019 on key indicators of the functioning of the LPC, information on the cost of products of loggers of the Krasnoyarsk Territory for the period 2015-2019, analytical studies of the work of forest industry enterprises by leading scientists of Russia were used. The main research method is analytical. The calculations were performed using the Microsoft Office Excel spreadsheet editor.

3. Results
Practice shows that harvested wood is sold in almost any region of the country, but the feasibility of using different sales channels also varies significantly and a correct assessment of the market prospects of products contributes to an increase in business profitability. It is also important to fill the commodity markets for the region and the country as a whole [8]. At the same time, the maximum price of the company's products sold does not always correspond to the strategic goals of higher levels of government. For example, in the case of selling low-grade wood to foreign partners (for example, China) at higher prices than to Russian firms, there is a possibility of a shortage of raw materials for domestic business [9-11]. At the same time, this situation is quite frequent. For example, in the Krasnoyarsk Territory, small and medium-sized logging businesses are largely focused (directly or indirectly) on the Chinese market. At the same time, foreign partners provide significantly more favorable conditions than domestic enterprises [12-14]:
- payment in cash;
- prepayment (often 100%) of products;
- higher selling price;
- provision of interest-free loans for the purchase of logging, transport and other equipment;
- provision of equipment, personnel, processing facilities of partners, etc. for the implementation of the activities of the domestic enterprise.

Large domestic businesses often cannot provide such conditions. In the conditions of market relations, the main advantage of foreign buyers of forest wood materials is the price they are willing to pay for it. The efficiency of calculations is also important, which for large businesses of domestic LPC has only recently become a priority for the attention of management structures.

Providing raw materials for their own production facilities is a key task of enterprise management. Underloading, downtime entail a number of quite objective problems, the main of which is a decrease in economic efficiency. At the same time, round timber serves as the basic raw material, on the basis of which, in fact, the entire industry is built. In the course of the study, a number of regularities were established regarding the cost of round coniferous timber in the Krasnoyarsk Territory. Seasonal fluctuations in the cost of these resources are caused by market demand, fluctuation of stocks at suppliers, increase in the cost of procurement and delivery in difficult (changing) natural and climatic conditions.

Fluctuations in the price of wood raw materials can be divided into four periods (time) of the year. In this case, the change in the conditional price, the maximum value of which is taken for 1 in the winter period, and deviations from this value for other periods are presented [15].

The minimum cost of round timber is typical for the winter period, when the conditions for their harvesting, transportation and storage are optimal. The most unfavorable period for loggers is considered to be spring, when transportation and work in the forest area are significantly complicated due to the thaw. Due to the decrease in supply volumes, the price of raw materials rises significantly and reaches a maximum during the year. In the summer, when the roads are normalized, the price falls again. However, since the billet at this time is significantly lower than in the winter, the price to the annual minimum practically does not fall. In autumn, the cost of raw materials increases again due to a number of factors, including the deterioration of roads. Thus, fluctuations in the price of roundwood can significantly affect the entire forest industry. Fluctuations in the prices of key raw materials in the range of 10-20 % require the management of industrial enterprises to have a balanced policy of purchasing and inventory management [16].
The country's timber industry is developing quite rapidly. The volume of output of key types of products increases annually (or the overall positive dynamics remains relative to the base periods). It is obvious that the most popular products in the market in the near future will be products of the industry with a higher degree of processing – pellets, pulp, paper, etc. It is premature to make forecasts about the impact of the coronavirus infection factor on the production volumes and economic indicators of the industry, but the general trends in world trade and consumption of LPC products are unlikely to change dramatically [17].

The key issue traditionally raised in the scientific and professional community is the need to improve the efficiency of the LPC enterprises. It is obvious that the overall efficiency is higher, the more part of the company's processes can be controlled and optimized. At the same time, while maximizing the cost of the resulting products, the overall efficiency will also increase.

In market conditions, when the impact on sales volumes is limited by the production capabilities of the enterprise, the competitive environment, market demand and other factors, the optimization of internal processes is of the utmost importance, which entails an increase in the added value of a unit of production and an increase in efficiency.

The simplified formula for calculating the efficiency (E) can be represented as

\[
E = \frac{\text{Profit}}{\text{Costs}} = \frac{\sum_{j=1}^{m} V_j (P_j - C_{unit_j})}{\sum_{i=1}^{n} C_i},
\]

where \( V \) is the volume of sales of the \( j \)-th type of product \((j = 1, 2, ..., n)\);
\( P \) - sales price of the \( j \)-th product type;
\( C_{unit_j} \) - unit cost of the unit of the \( j \)-th type of product;
\( C_i \) – costs for the \( i \)-th process of the enterprise \((i = 1, 2, ..., n)\).

In the conditions of increasing the efficiency of the activity, this formula is converted to the following form:

\[
E = \frac{\text{Profit}}{\text{Costs}} = \frac{\sum_{j=1}^{m} (V_j (P_{j max} - C_{unit j, min}))}{\sum_{i=1}^{n} C_{imin}},
\]

where \( P_{j max} \) is the maximum selling price of the \( j \)-th type of product, which is possible with the most efficient internal processes and a corresponding increase in product quality;
\( C_{unit j, min} \) – the minimum unit cost of a unit of production of the \( j \)-th type, which is formed when optimizing all the processes of the enterprise;
\( C_{imin} \) – minimum costs for the \( i \)-th process of the enterprise during optimization.

It should be noted that the optimization (improvement) of internal processes of enterprises is a complex, multi-stage, expensive process. It often affects almost all production and leads to staff reduction, equipment replacement, technology changes, etc. These are significant risks. At the same time, there are also social tensions and confrontations, which can have a very negative impact on the forest business. At the same time, with a competent expansion policy, it is possible to avoid conflicts and cuts by opening additional workshops, sites, and areas of activity that can, among other things, further increase the number of internal processes and processing stages in the overall process of creating products [18]. Thus, the more the company controls the stages and stages in the transformation of products from the moment of harvesting wood to receiving products (preferably expensive), the greater its ability to increase its cost and its own profitability, efficiency.

The value \( (P_{j max} - C_{unit j, min}) \) in formula (2) is nothing but the maximum added value of the \( j \) type of enterprise product. Moreover, if \( n \) is the total number of operations to obtain products, the more the number of such operations is, the higher is its ability to increase the total value added in its production. In the conditions of optimizing their internal processes, the efficiency and profitability of
each product and general efficiency and profitability for the enterprise will only increase. Thus, if we introduce \( n_{\text{total}j} \) - the total number of operations required to obtain the \( j \) product, than the closer \( n_{ij} \) (the number of \( i \) operations to convert wood raw materials into a \( j \) product at the enterprise) is to \( n_{\text{total}j} \), the higher is the efficiency and the value of products added by the enterprise.

It should also be borne in mind that an enterprise can only produce a certain volume of products. It is limited by the production capacity (capabilities) of the enterprise (\( N \)), which allows processing only a certain amount of resources (\( R \)). This limitation may affect various production processes of the enterprise. Thus, the limitations will be different for different processes. In this case, in order to achieve the economic effect, the resources may not be consumed in the production process in full, that is, \( R \leq N \). However, in practice, the enterprises try to use the resources to the maximum due to a deterioration in the quality of raw materials (albeit insignificant, for example, of wood), storage costs, utilization of production capacities, etc.

An important limitation when optimizing the activities of an enterprise and introducing any transformations is the assessment of their economic efficiency. Standard methods are suitable for this process – NPV, PI, IRR calculation etc. For timber industry enterprises, especially large ones focused on advanced processing, where profitability is traditionally not very high, the benchmark may be the internal rate of return, which exceeds the value of the key interest rate set by the Central Bank of the Russian Federation (Ikey). At the same time, taking into account the synergistic effect of activities optimization and increase in overall efficiency, the actual income of the business will be significantly higher.

Summarizing the aspects described above, it is necessary to indicate a number of conditions (restrictions) for improving the efficiency of timber enterprises for equation (1):

\[
\begin{align*}
P_j & \rightarrow \max, \\
C_{ya j} & \rightarrow \min, \\
C_l & \rightarrow \min, \\
n_{ij} & \rightarrow n_{\text{total}j}, \\
R_l & \leq N_l, \\
\text{IRR} & \geq 1_{ICL}.
\end{align*}
\]

After conducting a study on the formation of product cost and efficiency in the LPC, a number of indicative results were obtained.

1. The value added to the price of products increases with the increase in the depth of processing of wood resources.

2. Raw materials occupy 20-35 % in the structure of the cost of products of LPC enterprises.

3. The involvement in the production of secondary wood resources (wood chips, bark, sawdust, branches, twigs, etc.) significantly affects the reduction of production costs, and also leads to an expansion of the range of enterprises. With a significant modernization (the allocation of separate areas of activity) of production, secondary raw materials can bring higher incomes in comparison with the main profile of work.

4. The logging industry is one of the key sectors in the entire LPC, which is due to a complex of factors:
   - high-quality round timber allows you to get high-quality lumber and other products, reduce the percentage of secondary wood resources (crocheted, chipped, sawdust, flakes, etc.) and vice versa;
   - seasonal fluctuations in the cost of logging products directly affect the cost of woodworking enterprises, as well as the multiplicative increase in the cost of raw materials at all enterprises that consume primary and secondary products (Fig. 3);
   - the distance of the logging base from large processing facilities observed in recent decades leads to competition for resources, an increase in their value, and illegal activities in the forest area;
   - the increase in the export leverage also entails the need to optimize the timber industry enterprises in terms of providing themselves with raw materials: the creation of vertically integrated structures,
the use of various modern organizational and economic tools when working with suppliers, the development of the technical base and the use of modern technologies, etc.

- as a supplier of raw materials (initial) for all other sub-sectors of the LPC, logging enterprises directly affect their added value in the final price of products.

One of the important problems in the industry is the supply of raw materials to enterprises. Large-scale investment projects are often supported by the lease of large forest areas. At the same time, the main goal of the presented projects is the development of deep processing of wood, which is characterized by high cost of final products and added value. In practice, a significant part of such projects is limited to the implementation of the sawmill direction (as a key one) and one or two directions of deep processing as a minor (both in volume and cost indicators) direction of activity [19]. It is obvious that when the state policy is focused on stimulating the development of areas of production of high-value-added wood products, proper control and measures of effective restrictions are necessary for the incorrect use of both leased forest plots with more favorable conditions, and other measures (for example, of an organizational and financial nature).

4. Conclusion

Thus, as a result of the study, the key role of the logging industry in the LPC of Russia is established. A model of constraints for improving the efficiency of timber enterprises is proposed. It is determined that the optimization of processes at timber enterprises is aimed at stimulating the development of the forest business, but it is associated with a number of tangible risks. To neutralize them, a competent and well-founded policy of the company's management is necessary. A key aspect in the development of LPC enterprises and increasing their efficiency is the added value in the price of products, an increase in the share of which increases the ability of the enterprise to influence both the overall efficiency of the enterprises and the efficiency of the production of individual products.

5. References

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