

## Directions of improvement of the logistic systems in the forest complex of Belarus

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**Abstract.** The article suggests a conceptual model of the formation and effective functioning of the forest complex enterprise logistics, consisting of macro-and micrologistics subsystems, which builds on the methodological principles (consistency, completeness and integrity, adaptability, specificity, reliability), forestry peculiarities (available sources of raw materials on the territory of belarus, seasonal variations in timber harvesting and selling finished products, a full cycle of timber processing, the possibility of non-waste production). the model includes the organizational-economic mechanism of logistics systems formation (including logistics management techniques, the strategy of the logistics system, building relationships between items), tools to enhance the system functioning (evaluation of its operations effectiveness, modeling different versions of production supply and distribution of finished products, the product line planning methodology). The authoring allows you to take into account the interests of all distribution participants (providers, enterprises, consumers) and aims to increase the effectiveness of materials management and relevant information and financial flows.

**Key words:** logistics system, macro-and micrologistics subsystems, mechanism of formation.

### INTRODUCTION

The enterprises of a forest complex are perspective sector of national economy of Belarus that is caused by a considerable export potential of this branch. Activity of the enterprises is connected with large volume of performance of logistic operations at movement of a material stream from forestry institutions of the country to consumers through a chain of the timber industry enterprises making production with a high added cost. The analysis of logistic activity of the enterprises of a forest complex shows that for them, in the majority of

cases, the ineffective system of distribution of goods, low level of cooperation with suppliers and buyers, high wear of transport and the stocking equipment, low technical and technological level of cargo terminals, weak level of mechanization and automation of logistic operations is characteristic. Permission of the listed problems demands improvement and integration of logistic activity of the enterprises on the basis of formation of effectively functioning logistic systems.

### THEORETICAL PROBLEM RESEARCH

For the first time definition of logistic system as managements of material streams at the enterprises was given in «the concept of material management». World War II has considerable impact on formation of this concept. Military clearly defined the term «delivery», and major product companies of the USA during World War II appeared under strong influence of the Ministry of Defence of the country, interested in creation of new logistic system for full and exact execution of orders.

Thanks to the possibility of management of the material streams by means of computer communications the new concepts of management of the material and information streams were appeared, founding the reflection in such logistic system, as «Planning of requirement for materials» (MRP) developed by O. Wight [21]. In this system for the first time started considering the movement of material streams in whole as a complex of entering and leaving goods. Such approach led to better understanding of interconnection between the business processes happening in the enterprise and directed on management of the material and information streams,

and their coordination. Thus external relations with suppliers of raw materials and buyers of production weren't taken into account.

D. Hammer [12] one of the first in the works attached significance to external relations on the example of implementation of procedures of purchases as one of the elements of decrease in cost price and potential sources of receiving additional profit; V. Poole [17], having emphasized that purchases can reach the same result, became the first who entered the term «active supply».

During 1960-1985 the Japanese companies actively opened up the American and European markets, getting competitive advantages thanks to reputation of producers of high-quality goods and services and use of new management styles. The Japanese companies got additional competitive benefits at the expense of use as standard control systems, for example, control systems of total quality, and absolutely new control systems of chains of deliveries. D. Burt, [6] developed, by its own definition, the integrated systems of supply (ISS) was one of the first researchers of these tendencies in activity of supply.

It defined ISS in the following way: «Integration in supplying activity is presented by results of work of all participants in the case where the whole it is more, than the sum of its components».

D. Burt started developing approach to the organization of multipurpose group which has certain advantages in management of complex material streams and is urged to involve suppliers at a planning and design stage, creating thereby the partnership atmosphere. As a factor of efficiency of logistic system it considered full cost value and emphasized that fact that «the cost of materials – only one and usually not a key factor». The major factors influencing a total cost, the poor quality, inappropriate specifications, non-compliance with terms of deliveries, claims and other reasons influencing financial expenses are. In the researches D. Burt passes from a control system of material streams in the enterprise to a control system leaving out of its limits.

One of serious researchers of logistic systems is P. Witt [22] which gave the general concept about «chain representation» logistics. It the first analysed the movement of a material stream from a source of its emergence to a point of final consumption.

M. Leenders and D. Blenkhom [15] presented 11 stages of process of rapprochement with the suppliers, allowing to lower the general expenses at the expense of optimization of logistic activity. This idea also was developed by H. Fearon [11]. It should be noted that thanks to these works, the movement direction towards a control system of chains of deliveries was defined.

During 1984-1997 the western researchers directed their efforts to creation of reliable system of material

support, a control system of chains of deliveries. During this period a number of control systems by transport networks and control systems of production time is developed.

One of the first researchers of these directions is W. Copacino [10]. In its works the considerable attention is paid to control systems of transportations and he starts investigating the integrated logistics systems.

L. Hannon [13] and A. Martin [16] in their works emphasize «full integration of channels of marketing» and that the accent in logistics is displaced from systems of the organization of purchases to systems of distribution of finished goods. A. Martin developed the theory version «Fast reaction / continuous replenishment». L. Hannon, investigating «communications» and «need of modernization of a chain of deliveries», and also A. Martin, emphasizes that it is necessary to exclude the intermediary as that he calls strategy No. 1, «the first step (in creation of comprehensive system) for the company consists in including system as the necessary tool in own production and distributive capabilities that will add efficiency to operating systems». The ultimate objective consists in having constant smoothly adjustable system of delivery and to exclude warehousing, using system «precisely in time».

D. Waters [20] in the works pays considerable attention to integration in chains of deliveries by means of creation of partnership with the suppliers that allows the separate organizations which are engaged in production, to increase the profit at the expense of increase of system effectiveness of management by chains of deliveries from a point of emergence of a material stream to a point of final consumption of finished goods and decrease in «the general expenses of logistics».

On the other hand the following definitions of logistic system give a number of researchers of the countries of the former Soviet Union:

1) A. D. Chudakov [9], B. A. Anikin [1] give some definitions to logistic system:

– the logistic system is an adaptive system with the feedback, carrying out these or those logistic functions and the operations, consisting, as a rule, from several subsystems and having the developed communications with environment;

– the logistic system is the system which elements are the material, financial and information streams involved in logistic operations, interconnecting these elements, proceeding from common goals and criteria of efficiency;

– the logistic system is the complete economic system difficult organizationally consisting of elements and links, interconnected in uniform management of material and other accompanying streams, set, borders and which tasks are integrated by specific goals of the organization of business;

2) A. N. Rodnikov, S. M. Rezer [18] in the logistic dictionary define logistic system, as «adaptive (being self-adjusted or self-organizing) system with the feedback, carrying out these or those logistic functions and the logistic operations, consisting, as a rule, from several subsystems and having the developed communications with environment»;

3) K. V. Zakharov [23] defines logistic system as a complex of logistic systems: contract purchasing logistics, transport logistics, logistics of financial streams, logistics of stocks, production logistics, price logistics, marketing logistics, distributive logistics, information logistics.

The analysis presented above researches allowed to conclude that the duality of treatment of concept «logistic system» is observed: on the one hand, the logistic system is the logistic network consisting of chains of deliveries, the enterprises, the intermediaries which purpose of functioning is the full satisfaction of demand at the expense of granting goods with maximum consumer value and rational logistic expenses; from another – the integrated system uniting in all logistic operations in the organizations and with the greatest efficiency providing movement of material and information streams, beginning from purchase of raw materials and accessories and finishing distribution of finished goods.

Considering the examined approaches to treatment of concept «logistic system» and features of logistic activity at the enterprises, the essence of category «logistic system» can be presented as set of the micro and macrologistic subsystems which functioning is connected with management of material, information, financial streams and it is directed on maximizing consumer value of goods at rational logistic expenses. The micrologistic subsystem is the system integrating logistic operations, proceeding in the enterprise. The macrologistic subsystem is the system operating processes, connected with the organization of movement of material, information and financial resources at enterprise interaction with buyers and suppliers.

#### CONCEPTUAL MODEL OF FORMATION OF LOGISTIC SYSTEM OF ENTERPRISES OF A FOREST COMPLEX

The interpretation of category presented in the real work «logistic system» allows to construct conceptual model of its formation and effective functioning at the enterprises of a forest complex (fig. 1).

The concept offered by us includes the methodological principles on the basis of which, taking into account features of a forest complex of Belarus, the organizational and economic mechanism of formation of logistic system of the enterprise of a forest complex is offered. This mechanism is realized in the following sequence:

- the analysis of existing logistic system of the enterprise of a forest complex;
- identification of the main strategic, tactical and operational objectives of functioning of logistic system and development of plans of their achievement;
- definition of elements of logistic system and formulation of communications between them;
- creation of logistic system of the enterprise of a forest complex.

The mechanism presented by us is directed on formation of two subsystems: micro and macrologistic, carrying out the functions connected with purchase, production, information providing, distribution of finished goods and transportation. Thus an indispensable condition of work of these subsystems is their integration at two levels within information system of the enterprise of a forest complex. At the first level there is a process of cooperation of all information streams in the enterprise. On the second – cooperation and coordination of information subsystems of suppliers, buyers with the enterprise of a forest complex [5].

On the third – interaction of information system of the enterprises with information systems of government bodies of the management having impact on movement of information and material streams. Implementation in this way integration will allow to develop administrative decisions which consider interests of buyers, suppliers and the enterprises of a forest complex [2].

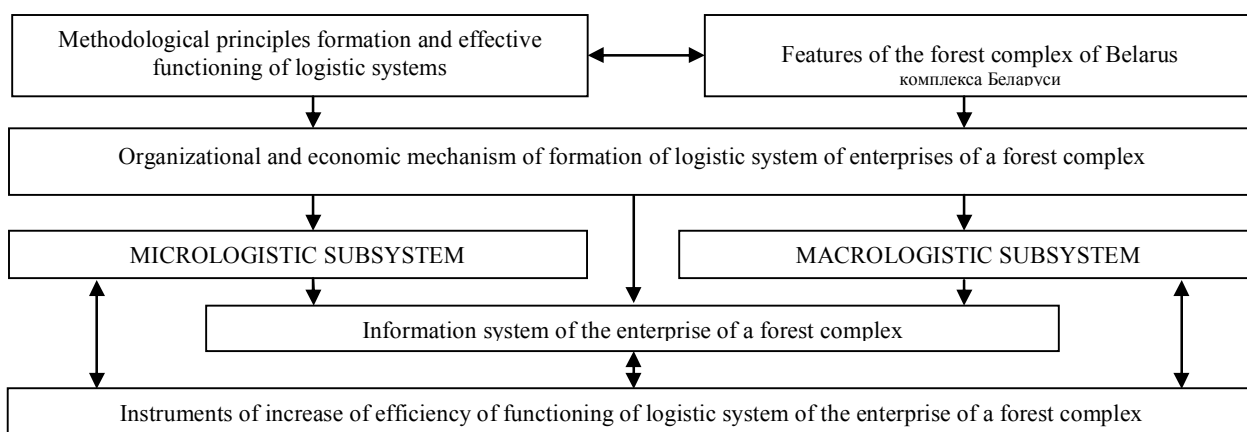


Fig. 1. Conceptual model of formation of logistic system of the enterprise of a forest complex

### INCREASE OF EFFICIENCY OF FUNCTIONING OF LOGISTIC SYSTEM OF THE ENTERPRISES OF A FOREST COMPLEX

Increase of efficiency of logistic system is provided with a number of tools (fig. 2) which is switching on a technique of determination of efficiency of functioning of logistic system, a choice of the rational scheme of supply of production and distribution of finished goods, planning of the commodity range and methods of improvement of performance of logistic operations.

Basic technique is the algorithm of determination of efficiency of functioning of logistic system which provides the complex accounting of factors of marketing and logistics [8]. The marketing aspect is based on determination of size of a cumulative rating of quality of service of buyers. In turn logistic aspect – on the logistic expenses presented at two levels – micrologistic (production, warehouse, information, and also charges of stocks) and macrologistic (costs of the sale organization, supply and storage of freights in a way).

For definition of a cumulative rating of quality of service of buyers a number of the criteria were used by

us, revealed during poll of buyers of finished goods of the enterprises of a forest complex: convenience of transfer of demands, terms of their performance, delivery periods, quality of delivered production, etc. Assessment of their importance are presented in fig. 3.

At determination of economic efficiency of functioning of logistic system logistic expenses which are understood as the expenses connected with performance of logistic operations were used. Average value of indicators of logistic expenses for 2008-2012 is presented in table 1.

The analysis of table 1 showed that for silvicultural establishments large volume of transportation costs which can occupy over 90% in structure of logistic expenses of the separate organizations that is connected with features of technological process of creation of forest cultures and logging is characteristic. For the timber industry enterprises the important group is made by the expenses connected with the maintenance of stocks of raw materials, materials and finished goods. It is caused by organizational problems of supply, production and distribution of finished goods at inside - and intersectoral interaction of the enterprises.

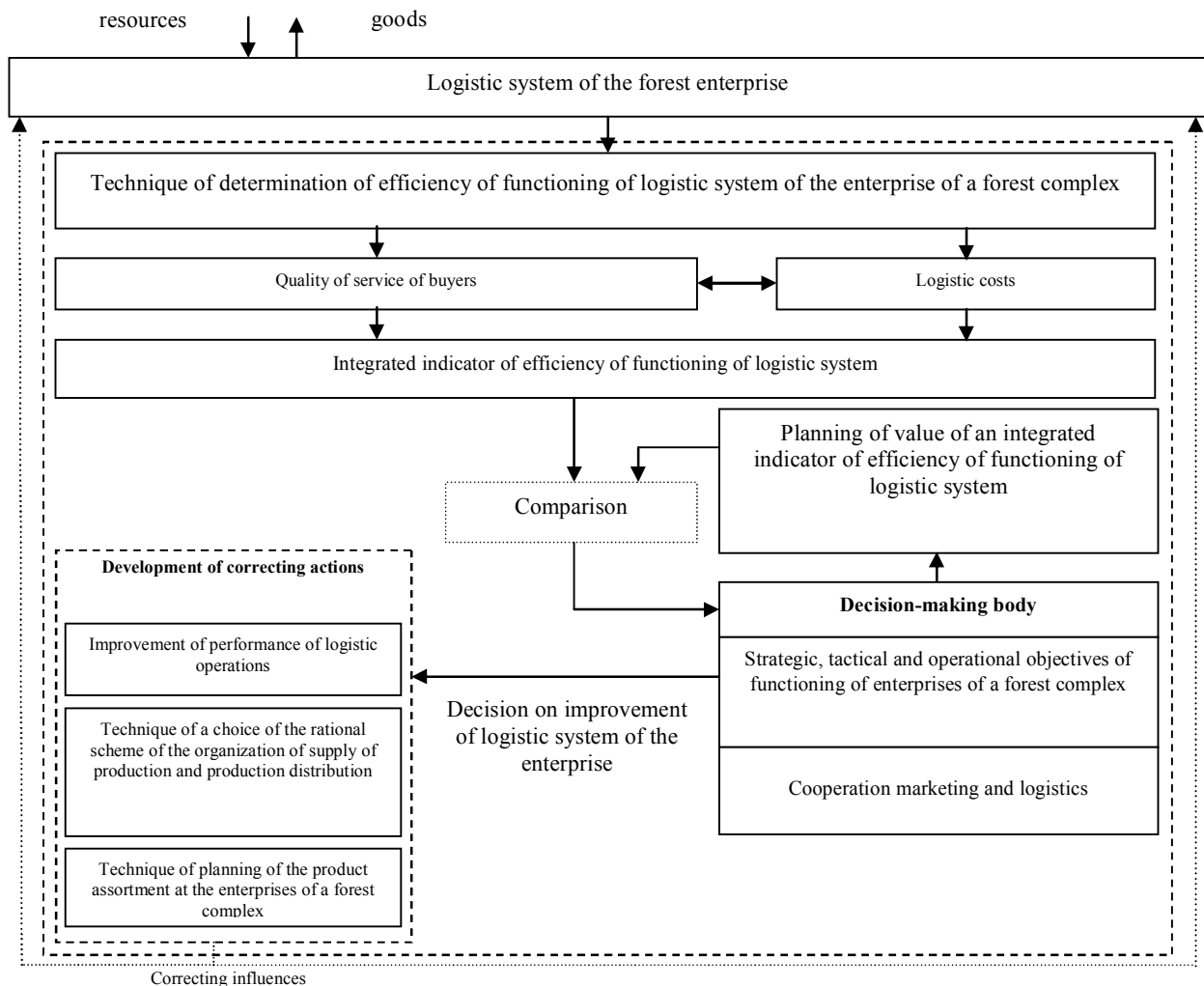
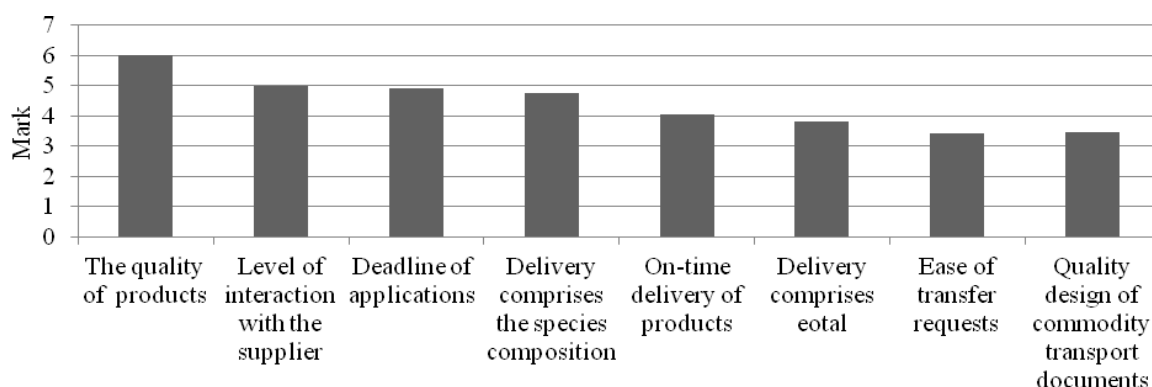


Fig. 2. Methodical scheme of increase of efficiency of functioning logistic system of the enterprise of a forest complex



**Fig. 3.** Value of the criteria characterizing the quality of service buyers

**Table 1.** Structure of logistic expenses at the enterprises of a forest complex of Belarus in 2008-2012, %

Indicator	Silvicultural establishments	The timber industry enterprises
Charges of stocks of finished goods	3,55	12,10
Charges of stocks of raw materials and materials	6,43	12,70
Warehouse expenses	1,14	1,41
Information expenses	1,47	1,00
Costs of the sale organization	6,45	4,42
Transport expenses	54,74	40,56
Costs of the supply organization	0,71	10,06
Costs of payment to the third-party organizations for transportation of freights (the railway, motor transport, sea etc.)	22,37	17,72
Costs of payment to the third-party organizations for customs cleaning of freights	3,14	0,03
Total	100,00	100,00

Criterion for determination of efficiency of functioning of logistic system is the indicator which calculates on the following formula:

$$K_e = \frac{I_n - L - \sum_{m=1}^M \frac{I_m}{T_{ul m}}}{I_n} \cdot 100\%, \quad (1)$$

where:  $K_e$  – an indicator of efficiency of functioning of logistic system, %,  $I_n$  – enterprise proceeds without indirect taxes, dollars,  $L$  – total logistic expenses, dollars,  $T_{ul m}$  – the period of use of logistic fixed assets, years,  $I_m$  – an investment into logistic fixed assets, dollars,  $m = \overline{1, M}$  – quantity of investment in the logistic equipment.

For an integrated assessment of marketing and logistic components we offered an indicator reflecting size of a cumulative rating of quality of service of buyers, falling on unit of efficiency of functioning of logistic system of the enterprise of a forest complex. On the basis of comparison of the actual value of an indicator with the planned management of the enterprise of a forest complex the decision on improvement of logistic activity of the enterprise [4] is made.

In our opinion the main directions of improvement of functioning of logistic system are: rationalization of structure of micro and macrologistic subsystems, streamlining of the commodity range, taking into ac-

count features of logistic system of the enterprise, improvement of performance of logistic operations in micro and macrologistic systems.

For definition of structure of macrologistic system of the enterprise of a forest complex we suggest to use a technique of a choice of the rational scheme of supply of production and distribution of finished goods (fig. 4) [19].

The essence of the technique offered by us consists in an integrated assessment of subsystems of supply and distribution on the basis of maximizing a value added. It is directed on rationalization of material streams in chains of deliveries (the supplier – the enterprise – the buyer) that allows to define the detailed plans of purchases, production and sale of finished goods, to carry out a choice of suppliers of raw materials and buyers of finished goods, to determine the admissible prices of realization of production and bought raw materials and materials.

The important direction of improvement of functioning of logistic system of the enterprise of a forest complex of Belarus is ordering of the commodity range. We offered a technique of planning of the commodity range (fig. 5) [3].

At the first stage of planning there is a process of collection of information about production and the realization of production which is including: stocks of raw materials and materials, possibilities of suppliers on raw

materials delivery, stocks of semi-finished products, possibilities of production, demand from buyers, a portfolio of orders etc. At the second stage the analysis existing and definition of perspective structure of the

commodity range taking into account the marketing and financial purposes of functioning of the enterprise of a forest complex and features of its logistic activity is carried out [7].

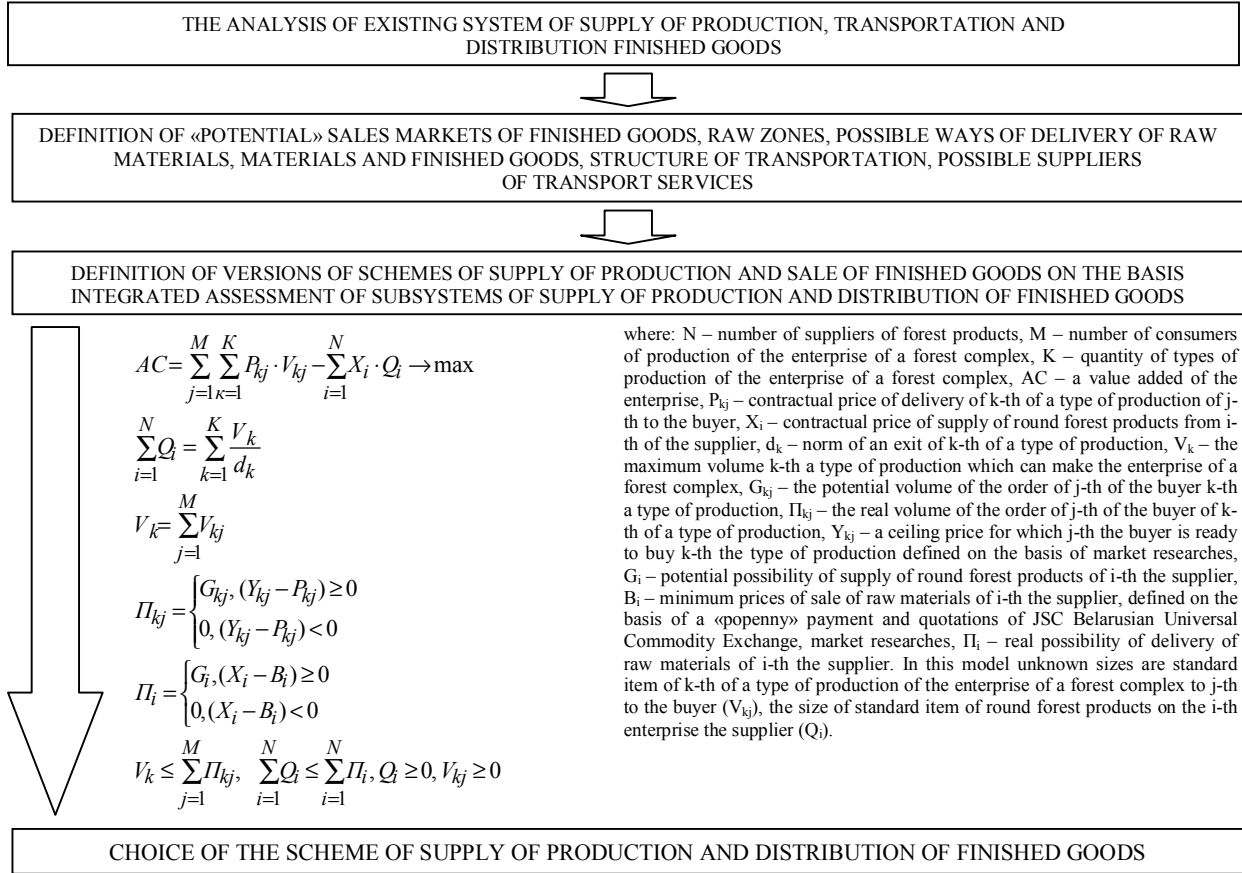


Fig. 4. Technique of a choice of the rational scheme of supply of production and distributions of finished goods

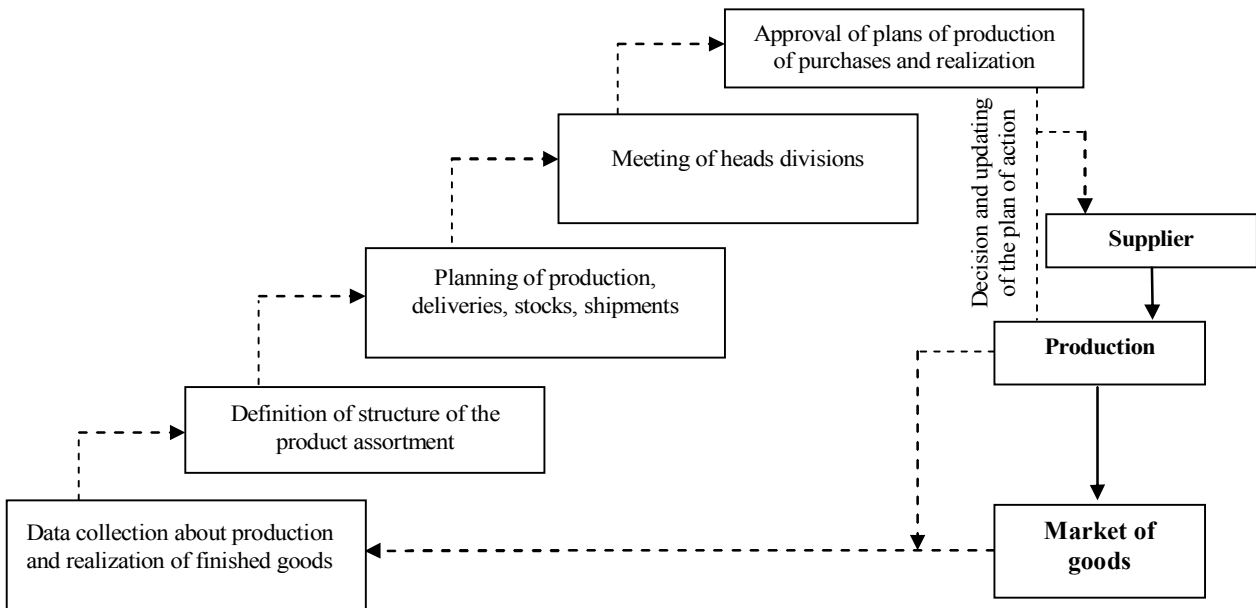


Fig. 5. Technique of planning the product assortment of enterprises of a forest complex

At the third stage there is a development of plans of sale, production and supply. The fourth stage includes discussion of the developed plans by the staff of the various divisions connected with production, supply and production realization.

During discussion the analysis of the obtained data is carried out, the disagreements arising between various divisions are leveled, discrepancy of supply and demand is estimated, the monthly plan of production is developed. At the fifth stage of planning there is a consideration and adoption of the solution proposed at preliminary meeting on each group of products for which the decision wasn't accepted yet: the adoption of change in outputs and purchases, comparison of the cost version of a sales plan with business plan data, solution of problems in which participants of preliminary meeting didn't come to a consent [14].

The offered technique will allow to operate quickly the commodity range of the enterprise of a forest complex on the basis of the accounting of factors of marketing and logistics that is expressed in increase of efficiency of interaction as the enterprise of a forest complex with suppliers and buyers, and between divisions in the enterprise. It promotes increase of competitiveness of the enterprise and, respectively, will lead to increase of efficiency of its functioning.

#### CONCLUSIONS

Now the Belarusian economy endures the formation period when search of ways of increase of efficiency of functioning of the enterprises is necessary. One of such ways as shows world experiment, creation of effective logistic systems is. For Belarus formation and development of logistic production, trade, transport and information systems has paramount value as will allow to accelerate integration of the country into world economic and information space. Speaking about a logistics role at the enterprises of a forest complex of Belarus, it is possible to emphasize its optimizing and integrated character. Use of logistic concepts and systems allows to optimize resources of the organizations (material, financial, labor), connected with management of material and accompanying streams.

The concept offered by us is directed on integration of various elements in uniform logistic system. It consists of two large blocks: formation of system and increase of its efficiency. Realization of the first block is directed on formation of micro and macrologistic systems communication between which is carried out by means of three-level information system. The second block is focused on increase of efficiency of functioning of logistic system which has to function on the basis of marketing system of the enterprise, and directed on improvement of the commodity range, structure of systems of distribution and supply, performance of logistic operations. It will allow to improve quality of service of buyers, to rationalize logistic expenses and to increase

productivity of activity of the enterprises of a forest complex as a whole.

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