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## ДЕТЕРМІНАНТИ ПРОЦЕСІВ У ЛАНЦЮГУ ПОСТАВОК ПРОДУКЦІЇ ПОВСЯКДЕННОГО ПОПИТУ

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Ідентифіковано основні процеси в ланцюгах поставок (ЛП) і окреслено основні детермінанти в ланцюгах поставок продукції повсякденного попиту. Здійснено оцінку впливу на вибір підприємства-лідера конфігурації ланцюга поставок та типу зв'язків, які утворені між учасниками ЛП і характеризують відносини між ними.

Окреслено умови (в масовому виробництві ДП «ДПЗКУ» «Львівський комбінат хлібопродуктів») здійснення логістичної оптимізації виробничої програми, що передбачає прискорення процесу виробництва, формування внутрішнього замовлення і поділ його на партії, максимальне використання обладнання за потужністю, тобто актуалізується розроблення планів-графіків його використання в часі (призупинення на певний час, неперервне виробництво, неповне використання денного, тижневого або місячного робочого часу). Внутрішнє замовлення на підприємстві повинно бути узгоджене з інтересами інших учасників ланцюга поставок за умови оптимізації загальних витрат підприємства.

**Ключові слова:** ланцюг поставок, продукція повсякденного попиту, детермінанти логістичних процесів, виробнича програма, внутрішнє замовлення, виробничі партії.

## DETERMINANTS OF PRODUCTION IN THE SUPPLY CHAIN OF DAILY DEMAND

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Key processes in the supply chain (SC) and outlined the main determinants of the supply chain of products daily demand were identified in the article. The impact on the choice of enterprise-leader of supply chain configuration and type of bonds that are formed between members of SC and that characterize relationships between them were estimated.

Conditions (in mass production of GO "GOFGCU" "Lviv bakeries complex") of implementation of logistic optimization of the production program, which provide acceleration of the production process, formation of the internal order and its division into parties, the maximum use of equipment (by capacity), i.e. development of time schedules and its use over the time (pause for a while, continuous production, partial

**daily, weekly or monthly working time use) were outlined in the article. Internal orders of the company must be coordinated with interests of other members of supply chain on condition of enterprises general costs optimization.**

**Key words:** supply chain, daily demand products, determinants of logistics processes, production program, internal demand, production party

**Problem formulation.** Investigation of the determinants of the supply chain process (SC) is a prerequisite for the formation of supply chain performance. Today, the literature has no single definition of supply chain. Reason of this is the lack of a single definition of concepts such as "logistics", "logistics system", which causes the interpretation of SC that is often equated with supply chain, logistics channel, logistics chain, distribution channels, supply network, etc.

Content analysis of definitions of supply chain and its existing types and models allows to assert the exceptional importance of determination of processes in it. Actually, the construction of supply chain of goods, including daily demand can be enabled through the identification of integrated processes of SC.

**Analysis of current research outputs and publications.** The development of market economy, scientific, technical, informational, communications technologies caused the formation of a specific form of management – a network enterprises that having common goals, cooperate under the terms of independence and voluntary participation of partners, shared functions and responsibilities to each other to minimize their costs and enhance customer satisfaction by providing necessary goods (services) to the required place in the required quantities and at appropriate prices. A special place in those cooperations is occupied by supply chains.

Analysis of the supply chains terms of various authors, both domestic and foreign, indicates subjective approach in the definitions of supply chain [2, 4, 6, 8, 9]. On the one hand, the supply chain describes the process of orderly movement of material flow, accompanying information and financial flows, and on the other hand, SC – linearly ordered set of individuals and entities – suppliers and customers that are directly involved in this movement. From the contents analysis of definitions it is possible to describe the essence of major determinants of the processes that are taking place in the supply chain.

The structure of supply chain is determined by several factors such as the number of participants, their location, capacity of companies, the availability of storage facilities and vehicles in the system. Also equally important factor that affects the formation of supply chain, are strategies of supplying finished products that depend on the type of produced product. Market conditions also affects the structure of the supply chain. Each type of product requires a proper configuration of supply chain, because the length and breadth of supply chain are directly affected by the quality characteristics of the product, its weight, dimensions, the time of preserving its qualitative characteristics, conditions of transportation, storing and so on. Branches of supply chain depend on the content of the tasks it performs and models of value creation processes. There are such supply chain species (VATI) [10]:

- “V” model for companies with a limited number of materials or components that are processed for obtaining various types of finished products for a number of modifications (this is typical for the production of clothing, shoes, alcohol);
- “A” model is suitable for companies with a large diversity of materials and limited number of products. Examples are the enterprises of aircraft-, aerospace-, automotive- and shipbuilding industries;

- Model “T” should be used for companies that produce goods of complex combination using a small number of components. An example might be the electronics industry or household products;
- model “I” – for the companies with constant products from many identical goods. This chain should be formed for chemical enterprises in the sugar and baking industry. Actually this model falls under the projected supply chain of investigated enterprise, which requires the identification of relevant processes and their determinants.

**Article objectives.** The purpose of the article is to investigate the major determinants of the processes in the supply chain of daily demand goods and their identification in case of GO “GOFGCU” “Lviv complex of bakeries”.

**Presentation of main materials.** Formation of the supply chain in the market of daily demanded goods actualizes the problem of studying the determinants of supply chain processes. In addition to the known determinants of the supply chain – the time, space, flexibility, efficiency and quality – an important determinant, which must be provided during the processing, transportation, warehousing at all levels of the supply chain from raw material supplier to the consumer for supply chains of daily demand goods, is food safety.

Today, the House of strategic development of Ukraine developed a draft law "On Amendments to certain Legislative Acts of Ukraine concerning food safety", which involves bringing the system of food safety in Ukraine in line with European standards and practices as well as effective public control. Without the adoption of this law, export of Ukrainian products to European markets is almost impossible. Actual is consideration of the abolition of import permits and permits to re-export products from Ukraine as well as simplifying the process of getting permits to export food products that are of animal origin [5].

In this document it is suggested to amend 13 pieces of legislation including the Codex of Ukraine about administrative offenses, the Criminal Codex, the Economic Codex of Ukraine, the Customs Codex, Laws of Ukraine "On the safety and quality of food", "Child nutrition", "On Protection of Consumer Rights", "On removal from circulation, recycling, utilization, elimination or subsequent use of defective and dangerous products, "On Veterinary Medicine", etc. [5]. These changes should provide an appropriate level of human health and consumer protection.

Content analysis of definitions of supply chain in terms of added cost to the product or service, empowerment of its participants, can identify the determinants of the processes in it. In the supply chain participants are combined by physical movement of goods and by transmission of information about costs, demand, value of reserves, etc., so that time and space are very relevant in these processes. Since supply chain is a network of firms combined to develop a new product and to share resources, achieving economies of scale, reduction of costs, increasing the competitiveness should be considered among the most important determinants in the SC process [2].

There are horizontal and vertical supply chains. The first create a network of producers of similar or identical products. The second – a set of enterprises by “supplier – client” relationships. It should be noted that the supply chain is not identical to “vertical integration” of enterprises. Vertical integration is usually associated with the vertical transfer of ownership on suppliers and distributors. Till recently, this strategy was considered as a desirable, but now more and more companies focus on their core activity, i.e. to focus on activity that performs best and which allows to stand out among its competitors. Other types of activities companies transfer leave for outsourcing. Then the level of expenditures and accepted by the customer service are determinants that characterize processes in the supply chain.

The structure of the supply chain is mostly heterogeneous, consisting of participants who are mining, recycling, trade and service organizations and who carry out various tasks during the way from raw material extraction to end-customers, then the parity achievement by participants of SC their objectives enables partnerships between members. From this point it is possible to distinguish the efficiency of the supply chain and its elasticity, i.e. the flexibility of the system to provide profit for companies that are members of SC.

Today, when the essence of modern logistics management is the integration and coordination of logistics enterprise system and the main factor that affects the direction and dynamics of changes in logistics is increasing needs and demands of the customer, the key determinant of the processes in the SC will be required level of client satisfaction, that has direct impact on the method of supply chain management. Supply chain should be formed taking into account such features as a process (subject stream) and structure (subjective structure), aimed at achieving goals through well-defined functions and areas of cooperation between organizations [4]. If the material scope of the logistics chain consists of raw materials, auxiliary materials and components that are procured in the market by manufacturing enterprise, their number will depend directly on such determinant as the demand for finished products.

Configuration of SC has direct influence on the choice of SC initiator and its top-level branch, because it can be any enterprise which produces raw materials, processes and manufactures products, provides services in warehousing, transportation or brings goods to the end-customers. Depending on whether they act as senders or recipients of cargo flows and financial information accompanying this activity, their decisive role in the functioning of supply chains is different. Decisive influence on the choice of enterprise-leader have types of relationships that are established between participants the SC and characterize the relationship between the members of SC. Preferably, formation of the SC is not carried out from scratch. Enterprises cooperate, for example, on contractual terms, and the desire to raise the level of competitiveness, profitability, to reduce costs of enterprise activity pushes to optimize the supply chain, in order to use better their own facilities and to increase the level of satisfaction of end-customers.

Finally, in order to provide effective function of the supply chain, participants must use modern management tools, that are updated using modern IT software. Model of Supply Chain SCOR (English: Supply-Chain Operations Reference-Model) is a tool for designing and analyzing supply chain using modern software for business process modeling, that are developed using model SCC model (English: Supply-Chain Council). The area of inherent features in the standard model is very broad – it covers planning, supplying, manufacturing, distribution, warehousing and transportation services. The complexity of SCOR system is compounded by the fact that it supports not only the number of organizations that interact with each other, but also maintain relationships with customers. Using SCOR model allows you to:

- documentarily execute existing processes, to implement the process of making a decision through the evaluation of several scenarios of the supply chain development;
- to use standard SCOR components to identify problems, weaknesses, and SC branches that can be improved;
- to compare processes in SC with the examples of best practices and to evaluate effectiveness of these processes;
- the use of indicators relating to reliability, safety, flexibility and resources costs.

Performance measures in SCOR model of supply chain are formed by three levels for strategic, tactical and operational management.

The second tool, which helps to coordinate the activities of organizations in the supply chain,

is – CPFR (Collaborative Planning, Forecasting and Replenishment), whose purpose is to study the problems associated with common planning, forecasting and stock replenishment [6, 10]. CPFR is one of the most effective tools, because it allows to implement online control that prevents appearance of "bovine stick" effect in the chain.

As the performance of the whole supply chain is influenced by such business operations as demand forecasting, stocks management, order management, supply planning and order processing, this tool is aimed primarily at improving customer service. This tool can include:

- personnel training to control the functioning of SC techniques and procedures of CPFR;
- tracking the movement of product using technology RFID;
- transformation of BPM system (Business Process Management), so that it is possible to track the demand for the final product;
- creating an interface between the software of network simulation and database;
- introduction of tables and maps of key indicators that are updated in real time.

Lets consider activity of GO "GOFGCU" "Lviv complex of bakeries". The main activity of the branch is to provide services concerned with receiving, bringing grain quality to basic conditions, storing , shipping of grain and processing it into the flour. Total working grain capacity of branch "Lviv complex of bakeries" is 18.6 thousand tons. Main crops storing: wheat, corn, rye. Processing power of mill factory of the branch is 48 thousand tons of flour per year, daily production – 240 tons.

Branch receiving / shipping of grain capacity is: reception through rail transport – 300 tons / day; reception through road transport – 160 tons / day; shipment for motor transport – 180 tons / day.

The branch "Lviv LCB" takes 22 position with 79 % of targets performance as of 13.03.2014 in rating of targets performance of JSC "DPZKU" branches.

The positive changes in the company that took place in 2013, related to the creation of favorable conditions for processing of raw materials, lowering prices for processing of raw materials, technological process improvement, which allowed to increase output of higher quality flour up to 43%. These measures allowed to conclude contracts with new suppliers. The largest shipment of grain for grinding are imported by EE "Moskvytyn", SE "Brev'yak". Part of imported grain by the suppliers is stored, and the rest is processed into different kinds of flour.

The enterprise works with suppliers, such as LLC "Ahrolendinvest Yukey" LLC "Tradyeks" and on a permanent basis with LLC "Homin", LLC "AhroLV LIMITED", FE "Zhoda". Main buyers with whom enterprise cooperates on a permanent basis are: concern "Hlibprom", JSC "Lviv Confectionery Company "Svitoch" and OJSC "Drogobytsky bakery". Production of enterprise has its own brand "Shchedryk", which is in demand in Western Ukraine. Transportation from suppliers to the enterprise is provided by supplier, but in the link "producer – buyer" – transportation provides the customer. Having large capacity, the enterprise cannot fully use them, and continue to perform unprofitable activity (table 1).

Reduction of planned indicators with regard to storing grain in the first half of 2013 is due to seasonality of this product. The enterprise is able to provide a service to store grain and bring it to the condition, because this product must be available till the next harvest, but the plan for this article is not satisfied, even though there is sufficient capacity.

There is also non-fulfillment of planned indicators for the production of flour. This is because of strong competition, especially in the western regions of Ukraine, where is largescale production of grain, as in central Ukraine, but rather a large number of processing plants.

Measures that must be implemented in the enterprise, should concern more radical changes which primarily concerns the optimization of the supply chain. The enterprise must continue to look for new suppliers to develop existing capacity. First of all, it has to seek new clients and to meet their demand, better than competitors that would be the basis for creation of partnerships (fig. 1).

Table 1

**Main indicators of production and financial activity  
of GO “GOFGCU” “Lviv complex of bakeries”**

| Indicators             | unit of measur. | 12 month of year 2012 | 6 month of year 2013 | Implementation of the plan 2012 / 6 month 2013, % |
|------------------------|-----------------|-----------------------|----------------------|---|
| Recycling of grain     | t               | 15042                 | 12162                | 40 % / 99 %                                       |
| including suppliers    | t               | 15042                 | 9718                 | 40 %/99 %   |
| of agricultural fund   | t               | 0                     | 2444                 | –   |
| Storage of grain       | t/month         | 86160                 | 39617                | 93 %/50 %   |
| Production of flour    | t               | 10991                 | 8907                 | 39 %/ 97 %  |
| including higher grade | t               | 6464                  | 5382                 | 39 %/98 %   |
| 1 grade                | t               | 3721                  | 2743                 | 37 %/96 %   |
| 2 grade                | t               | 805                   | 782                  | 36 %/95 %   |
| Capacity usage         | %               | 13,7                  | 44,4                 |   |
| Income                 | th.UAH          | 4643,7                | 3079,0               | 46 %/77 %   |
| Total Expenditures     | th.UAH          | 7084,5                | 3142,2               | 8 3%/85 %   |
| Net income             | th.UAH          | -2440,8               | -66,2                | -95,81/-21 %                                      |

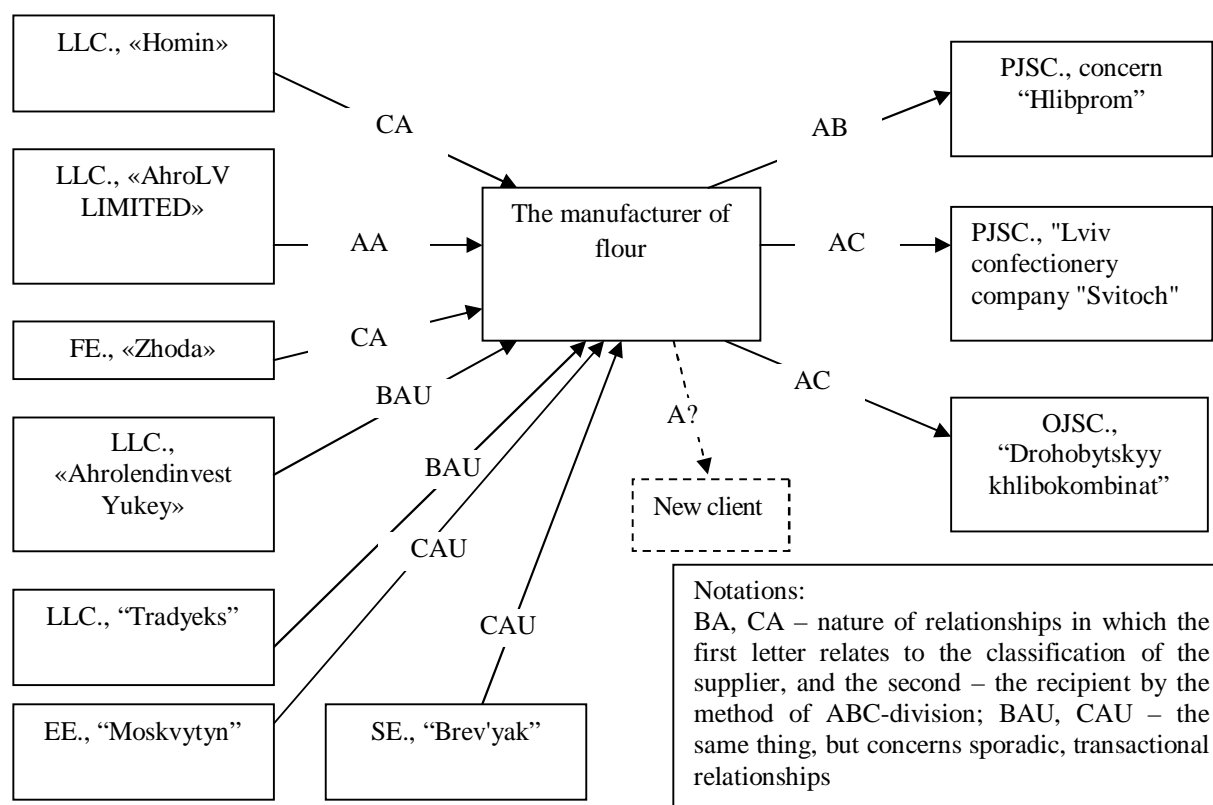


Fig. 1. Relations in supply chain of GO “GOFGCU” “Lviv complex of bakeries”

—————▶ Existing connections  
 - - - - -▶ Projected connections

If there are connections with suppliers such as BA or CA, it is advisable to choose a comprehensive supplier to achieve integration at the level AA, and to select those that will supply

sufficient large amounts of grain. Today, in the world practice we can see the tendency to limit supplier base, even usage of a single source of supply. Among the profits of this approach can be distinguished: quality improvement of raw materials, exchange of innovations, cost limitation, usage of integrated supply and production schedules.

Connections type VAU, SAU – are connections in which participants do not seek to create partnerships, i.e., are reluctant to share information concerning the cost structure, technology, are not inclinable to the integration processes and, possibly, to lower prices. In this situation, it is necessary to analyze the market and, in the long term, to seek new partners, if the company wants to be a leader in the SC, to gain competitive advantage and increase profitability of the process for all participants. Otherwise, the company will remain subordinate element in another network. These links do not worth paying so much attention because their share in turnover are low.

Considering the level of sales of finished goods – flour, we can see that there are not so many patrons of GO “GOFGCU” “Lviv complex of bakeries”. Trying to be competitive and profitable company should, on the one hand, with the potential capacity, provide new customers and, on the other hand, review their expenses, analysis of which shows that in 2012 and in the first half of 2013, despite the decrease of net cost, accordingly, by 36 %, 31 %, there is an increase of administrative expenses accordingly, by 19 % and 7 %, cost of sales more than in 2.5 times, other operating expenses by 17 % and 24 %.

Therefore, we conclude that there is still a big question of profitability improvement of an enterprise. Enterprise, cooperating with many business partners may be a link of its own supply chain as well as a link of contractors SC. To be competitive, it must meet needs of customers in terms of quality, price, availability, and timeliness of delivery, which is very important in the food industry. As for the storage of grain, GO “GOFGCU” “Lviv complex of bakeries” in 2013 improved the elevator load degree from 40 % in the first quarter to 80 % in the third, and concerning the production of flour, there is a failure to fulfill the target indicators. Therefore, objects of logistic management should be searched in the supplying, production and marketing (table 2).

*Table 2*

**Grouping of determinants of the supply chain by field of activity**

| № | Field of activity | Main determinants   | Elements of optimization   |
|---|-------------------|---|--|
| 1 | Supply            | The level of production specialization<br>Volumes of supplies<br>Information about raw materials<br>Relationships with suppliers<br>Number of suppliers<br>Intermediate and final storage<br>Transport type, transport technology | Volumes, time, technology,<br>movement of materials in time and<br>space, stocks   |
| 2 | Production        | Type of production<br>The level of production specialization<br>Market demand for finished goods<br>Technology of production<br>The production cycle<br>Production party  | Production Program<br>Production capacity<br>Orders for warehouse<br>Customer orders<br>Logistics costs of material flows<br>movement<br>Technological time<br>Stocks in production<br>Party volumes |

Table 2

| № | Field of activity | Main determinants  | Elements of optimization  |
|---|-------------------|--|---|
| 3 | Sale              | Market conditions<br>Market consumption strategy<br>Forecast for stocks in the distribution<br>Solvency of consumers | Expenses and temporal characteristics of order fulfillment<br>Party volumes<br>Cycle of the order<br>Terms of Payment<br>Transport capacities<br>Insurance stocks |

The main thing for managers is to find processes that can be improved from logistic point of view. In the production sector logistics solutions should be used in selecting the optimal production technology, determining the optimal production party and optimization of technological time, that concerns reduction of total costs, on the one hand, and duration of the production cycle, on the other. It should be noted, that in the case of mass production node objects are the projection channels of material resources movement from the first workplace to the final- workplace, optimization of internal movement and formation of stocks.

Prominent place in mass production takes logistics optimization of the production program, that can be focused on acceleration of production process, then an important thing is to form internal order and its division into parties, or focus on maximum capacity usage of equipment that involves decisions about the development of plans for usage of equipment for a certain time (pause for a time, continuous production, partial usage of daily, weekly or monthly working time). Internal orders of an enterprise must be consistent not only with the interests of customers, but should also optimize overall expenditures.

In the case of GO "GOFGCU" "Lviv complex of bakeries", when there is no full usage of capacities, the optimal size of production party should be determined by the formula:

$$N_{opt} = \sqrt{\frac{2 \cdot P_y \cdot B_f}{s \cdot \frac{r}{100} \cdot k_u}},$$

where  $P_y$  – annual order;  $B_f$  – fixed costs per batch;  $s$  – cost per unit of output;  $r$  – annual rate of expenditures;  $k_u$  – coefficient of capacity usage of enterprise.

Inasmuch as the studied company works on a sales order, then in the preparation of the production programs and the internal orders, should be taken into account other regulatory factors, especially technical and technological nature of production and consolidation of orders.

Logistics Solutions should be taken also for optimizing the usage of technological time that concerns coordination in time as well as in the sequence of individual manufacturing operations for certain variants of parties division using the principles of sequence parallelism and combination.

As for the stocks of finished products, it is necessary to ask questions about the availability of so-called excess stocks, i.e. should be made logistics solutions that will help to reduce level of stocks at an acceptable cost growth in other sectors such as manufacturing, transportation, informational support and system management. There are key factors that can motivate the creation of reserves: savings in savings in purchasing, manufacturing or transportation; reduction of risks, i.e. insurance through deviations from projected demand, usage of seasonal discounts on purchase prices, etc. Therefore, it is necessary to calculate costs for different scenarios and identify optimal. That all comes down to the integrated management of logistics processes not only within the company, but the whole supply chain, because the client wants the supplier to implement his own expectations, to



meet his needs and defined service level. All these determinants demand from business flexibility, creativity and “being on time”. Exactly an effective system of electronic data exchange EDI helps enterprise to communicate with trading partners, select certain size of output according to needs of consumers and market situation, allows a significant reduction of stocks for supplier and customer.

In practice, in most cases, supplies are realized in bulk, because of economic considerations, since the client who buys large quantities of goods, can expect a discount from the supplier, that additionally increases the size of the order. As a result, both the supplier and the customer has large stocks that can be risky for the food industry, where products tend to have a short shelf life and keeping them in stock can lead to serious losses. A well-functioning supply chain should lead to the desired model JIT (just-in-time), where synchronized actions from both sides (customer-supplier) are performed expediently to current needs of supply. Because of that we can see the decrease of stocks for sale, facilitated planning and calculated capacities of production to actual needs. The need to reduce stocks is balanced by growth of needs in the amount of data exchanged between IT systems. Detailed information provided for counterparties causes the situation where interconnected circuit elements operate more efficient, meeting the needs of the market in the best way.

### **Conclusions and further research prospects**

1. Was established that besides the known determinants of the supply chain – time, space, flexibility, efficiency and quality – an important determinant, which must be provided during the processing, transportation, storing at all levels of the supply chain from raw material supplier to the consumer for the supply chains of daily demand goods, is food safety.

2. To improve the state of Ukrainian exports to the European markets it is in time to adopt the bill “On Amendments to Certain Legislative Acts of Ukraine concerning food safety”, which provides bringing the food safety in Ukraine in line with European standards and practices, and also the establishment of effective system of government control.

3. A network of firms consolidated to develop a new product, collateral usage of resources, achieving economies of scale, reduction of costs, increasing competitiveness, which are called the supply chain, should be considered among the most important determinants of processes in SC.

4. Configuration of supply chain has an influence on the choice of SC initiator and his top-level link, because it can be any enterprise which produces raw materials, processes and manufactures products, provides services in warehousing, transportation or delivering a product to the final consumers. Decisive influence on the choice of enterprise-leader has such types of relationships that are established between participants of SC and characterize the relationships between the participants.

5. In order to provide effective functioning of the supply chain, participants have to apply modern management tools such as SCOR to project and analyze the supply chain in order to make decisions by assessing multiple scenarios of the supply chain, and CPFR, to implement current control and prevent the effect of “bull whip” in SC.

6. GO “GOFGCU” “Lviv complex of bakeries” has to search for new partners in the long term perspective, if the company wants to be a leader in the SC, gain competitive advantage and increase profitability of the process for all participants. Otherwise, the company will remain subordinate element in another network and generally in unprofitable activities.

7. Prominent place in mass production takes logistics optimization of the production program, that can be focused on acceleration of production process, then an important thing is to form internal order and its division into parties, or focus on maximum capacity usage of equipment that involves decisions about the development of plans for usage of equipment for a certain time (pause for a time, continuous production, partial usage of daily, weekly or monthly working time). Internal orders of

an enterprise must be consistent not only with the interests of customers, but should also optimize overall expenditures.

8. In the case of GO "GOFGCU" "Lviv complex of bakeries", when there is no full usage of capacities, the optimal size of production party should be determined by taking into account the factor of enterprise capacity usage.

9. In the future, it is necessary to consider possible scenarios of stocks formation and their impact on other processes of the supply chain.

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