

LOGISTIC MODEL OF ORGANIZING PRODUCTION AT FOOD INDUSTRY ENTERPRISES

Introduction. The food industry is one of the few branches of the Ukrainian economy, which is in the stage of steady development. However, the raw material base of food production — the agricultural sector of Ukraine today is in a crisis condition, characterized by a decline in the material and technical base, high costs of production, shortage of working capital. Measures to implement integrated development strategy should be scientifically sound and rely on mathematical models of processes that will take place in a new production system.

Technological peculiarities of the production of agrarian products, as well as the complexity of the processes of its harvesting, accumulation and, if necessary, primary processing, processing into finished products, make a relevant mathematical modeling of the planning of production of raw materials, taking into account possible changes in production volumes.

It should be emphasized that market requirements today require the formation of a complex integrated system of agro-industrial food production, which will enable to realize the reserves of competitiveness of the industry. Consequently, it is necessary to approach the modeling of technological and logistic processes in a complex way.

The necessity of mathematical modeling of the planning of the enterprises of the food industry and its raw material base is caused first of all by the possibility in this case of more rational use of available resources and optimization of commodity-cash flows.

Main part. In the complex of integrated production, a number of small agricultural enterprises and/or primary processing enterprises, one or several enterprises of the food industry are connected. All of them are, as a rule, geographically located in one region or neighboring regions of Ukraine - in the zone of growing of raw materials. Since each enterprise of the next stage is a consumer of raw materials or semi-finished products produced by enterprises of the previous stages, the desired quantities can be represented in homogeneous units of measurement by means of conversion into a single conditional product.

The mathematical model of the optimal development of the food production complex consists of the objective function $F(x)$, which expresses the general minimum expected costs of growing the raw material, its harvesting and primary processing and transportation of products:

$$F(x) = \sum_{j=1}^n \sum_{k=1}^l C_{jk} x_{jk} + \sum_{j=1}^n \sum_{k=1}^l C_{jk}^* x_{jk}^* + \sum_{j=1}^n \sum_{k=1}^l \sum_{i=1}^r S_{jki} x_{jki} + \sum_{j=1}^n \sum_{k=1}^l \sum_{i=1}^r C_{jki} x_{jki} + \sum_{j=1}^n \sum_{i=1}^r \sum_{m=1}^p S_{jim} x_{jim} \rightarrow \min$$

The offered mathematical model allows to carry out planning and programming of processes of development of the new integrated food production system, to estimate influence of changes in system parameters and to make adjustments of plans. The output data for calculating the optimal amount of raw materials for production and processing are given in the table 1.

A real system of production of tomato raw materials (tomatoes → tomato paste → ketchup), localized on the territory of Belozersky district of the Kherson region, was selected to test the model. The system consists of three production steps. The first stage is the raw material base, which is represented by farms (F) “Chaika”, “Lotos”, “Ukraine”, “Druzhba” and “Ahrkom”, which grow tomatoes. The second stage is the primary processing, which is represented by processing enterprises LLC Fruit and Vegetable Plant “Kherson” and PE “Nash Product”, which produce tomato paste. The third stage is the enterprise of the food industry of PICF “Pani Kristina”, which produces the final product — ketchup under the trademark “Holiday”.

Table 1 — The output data for calculating the optimal amount of raw materials

<i>The raw material base</i>								
Farms	Area under crops, ha	Crop capacity, t/ha	Available amount of raw materials, t	Distribution of raw materials (G_{0jk}), t		Unit production costs (C_{jk}), uah/t	Transportation costs (S_{jki}), UAH/t	
				Kherson	Nash Product		Kherson	Nash Product
1. Chaika	10	70	700	700	—	7 000	30	35
2. Lotos	27	60	1 620	800	—	6 000	25	30
3. Ukraine	20	55	1 100	500	—	5 000	20	25
4. Druzhba	50	40	2 000	—	2 000	5 000	30	24
5. Ahrkom	35	30	1 050	—	1 000	4 000	20	15

End of table 1

<i>Primary processing</i>				
Processing enterprises	Need for raw materials (G_{ijk}), t	Output products, t	Unit production costs (C_{ji}), UAH/t	Costs of transportation to the food business (S_{jim}), UAH/t
1. Kherson	2 000	350	11 000	15
2. Nash product	3 000	500	10 000	25
<i>Production of finished products</i>				
Enterprises	Volume of consumed raw materials (G_{njm}), t	Unit production costs (C_{jim}), UAHt	Price of the finished product, UAH/t	Total cost $F(x)$, UAH
1. Pani Kritina	850	5 000	40 000	39 431 750

The calculation of the model was made using the SAS Model Manager software. Results of optimization of the model are presented in the table 2.

According to the results of the calculation, optimal volumes of production and supply of raw materials and semi-finished products in the technological chain of production and processing of tomatoes were determined. In the basic, actually existing (non-optimal) version of production, the total amount of expenses is 39431750 UAH, the optimal amount of expenditures $F(x) = 38025050$. The obtained data allow to reduce expenses for production and transportation of products, increase production efficiency. In particular, the cost saving is 1406700 UAH.

T a b l e 2 — Calculating the optimal amount of raw materials

<i>The raw material base</i>								
Farms	Area under crops, ha	Crop capacity, t/ha	Available amount of raw materials, t	Distribution of raw materials (G_{ijk}), t		Unit production costs (C_{jk}), uah/t	Transportation costs (S_{ji}), UAH/t	
				Kherson	Nash Product		Kherson	Nash Product
1. Chaika	10	70	700	—	—	7 000	30	35
2. Lotos	27	60	1 620	850	—	6 000	25	30
3. Ukraine	20	55	1 100	1 100	—	5 000	20	25
4. Druhba	50	40	2 000	50	1 950	5 000	30	24
5. Ahrkom	35	30	1 050	—	1 050	4 000	20	15
<i>Production of finished products</i>								
Processing enterprises	Need for raw materials (G_{ijk}), t	Output products, t	Unit production costs (C_{ji}), UAH/t	Costs of transportation to the food business (S_{jim}), UAH/t				
1. Kherson	2 000	350	11 000	15				
2. Nash product	3 000	500	10 000	25				
<i>Primary processing</i>								
Enterprises	Volume of consumed raw materials (G_{njm}), t	Unit production costs (C_{jim}), UAHt	Price of the finished product, UAH/t	Total cost $F(x)$, UAH				
1. Pani Kritina	850	5 000	40 000	38 025 050				

It is possible to recommend “Chaika” to refuse to produce raw materials in favor of other types of products, due to economic impracticability. It is recommended to reduce volumes of tomato crop area for Lotus, and it is advisable to revise programs for the supply of raw materials to processing plants. In particular, the part of raw materials from “Druzhiba” should be sent to the processing plant LLC Fruit and Vegetable Complex “Kherson”.

Conclusions. The construction of a cost management system in integrated food production should be based on the principle of feedback, that is, on the needs of food industry enterprises, which are conditioned by the market conditions. The resource management cycle, like the whole system of control of the technological chain, should cover all stages of product creation.

The offered model of the technological-logistic integrated structure of food production should be used in practice in the activity of the enterprise of the food sector.

With the help of Statgraphics, Statistica, Excel software, and based on the enterprise data array, it is possible to plan and program the development processes of the integrated food production system, to evaluate the impact of changes in the parameters of the system, to make adjustments to the plans.

These programs are most user-friendly for beginners due to the lack of targeting a specific subject area, a wide range of statistical techniques, and a user-friendly interface. They are more accessible to practice and can be used by a wide range of specialists of different profiles.

Using the proposed model will significantly reduce the need for raw materials in the enterprise. In addition, a significant reduction in the likelihood of errors when making managerial decisions.

The presented model allow to specify the technological complex of works and the need for raw materials, provide an opportunity to establish boundaries between the complex of works, for which the producers-executors are responsible and, in general, the responsibility of the entire corporate structure of food production.

References

1. *Mokhnenko, A.* Integration of the Supply Chain Management and Development of the Marketing System / A. Mokhnenko, I. Perevozova, L. Horal, N. Hrechanyk, A. Ustenko, O. Malynka, Mykhailyshyn // *International Journal of Supply Chain Management* . — 2020. — № 9 (3). — P. 496—507.
2. *Naumov, O. B.* Strategic planning of marketing activities of an agricultural enterprise / O. B. Naumov, L. M. Naumova, P. V. Voronzhak // *Ukrainian Journal of Applied Economics*. — 2017. — №2 (1). — P. 77—84.

УДК 338.1

A. A. Zvereva, M. A. Levchenko

Russian customs Academy Rostov branch, Rostov, Russian Federation

NEW ECONOMIC MODEL FOR PROTECTION OF COMPETITION IN GLOBAL MARKETS

Introduction. The digital revolution, which has taken over the world economy, every year changes the tendencies of management, economic activity. Specialized management agencies, digital boards and programs are being established to facilitate the synthesis of the two real and virtual worlds. There is no doubt that even at the third industrial revolution stage, the role of digital economy and digitization as a whole can be assessed. But nevertheless, for a more full implementation of these processes, certain strategies are needed that ensure economic development and eliminate imbalances in different areas of public life, because digitalization was like a panacea for the 21st century, penetrating into the world community and affecting all its spheres — from social to economic.

Breakthrough digital economy technologies are actively restructuring the foundations of economic activity. The main development trends in the digital economy are fast: platforms, sharing and development of “hygeconomy”. These dynamics along the entire value chain provide a high level of adaptability for producers and consumers through quick response and high adaptability. The latest business-related strategies improve performance and facilitate ease of entry into global markets through the use of connectivity and accelerated data processing. But competition from new business processes also encourages conventional enterprises to implement innovations in order to preserve their economic performance and prevent the lag.

In order to maintain their position, policymakers need to ensure effective regulation of consumer protection and appropriate oversight and enforcement measures.

Main part. The Organization for Economic Cooperation and Development (OECD) has started a public consultation on tax implications of digitalization. The reforming of tax policy in the framework of digitalization is also discussed by the European Union policy makers in an effort to solve tax problems for the digital market.

An effective approach to many conflicts and disputes, as well as to managing economic imbalances, has been the creation of specialized platforms operating within the public and private sectors. Using such virtual platforms, the government plays a coordinating role in business activities, ensuring cooperation and predicting models of public service delivery in the future.

Electronic commerce platforms allow small and medium business participants to facilitate job creation and allow them to get the most out of economic activity. Experts estimate the increase in the cost of e-commerce to \$994 billion. up to \$994 billion by 2020.

An example of the idea to create such a business framework is the new product of the world largest Asian company Alibaba in China — Taobao. This market platform is the biggest in the world to use peer-to-peer (P2P) decentralized networks for sales and purchases. The formation of this platform allowed economically inactive regions to become producers and sellers using the new platform. The increase in investment in the development of such areas allowed for the creation of a huge number of jobs, becoming a new strategy for the restoration of rural areas and their integration into the digital economy. As a result of this impact, the number of poverty and joblessness rates has fallen, and Taobao’s villages have now become a national policy priority for China’s rural recovery. Alibaba Group has invested 10 billion yuan in building maintenance centers in the remote areas, expanding logistics and building networks, thus increasing the competitiveness of individual regions.

The example of this company shows how the creation of digital platforms affects inclusive economic growth by involving different regions in economic activities.