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The Formation of the Organizational and Economic Mechanism of Technological Security of Agrarian Sector

Scientific problem. The increasing economic development, structural changes and innovations that are currently inherent in post-industrial economy are the results of accelerated implementation of scientific and technological development in all sectors of economic. The experience of developed countries, among all of the factors of production, science, high technologies and innovation are the driving force of economic growth and the main factor that determines the course of business processes [9].

Therefore, today building of effective organizational and economic mechanism of technological safety of the agrarian sector should be a priority, which is aimed at promoting innovation processes in agriculture, maximizing the economic effects of the implementation the results of scientific research, the protection of the sector and the national economy from the present and potential threats.

Analysis of recent researches and publications. General theoretical foundations of organizational and economic mechanisms in the economy were researched by domestic and foreign scholars, such as: V. Andreychuk, A. Muzichenko, P. Sabluk, K. Weick [10], M. Glynn [6], J. Dutton [5], B. Papp [8]. The problem of the formation mechanism of technological and economic security is considered by N. Vashchenko [3], L. Donets [3], G. Zhavoronkova [4], V. Ponomarev etc.

In the literature, there are a number of approaches to define the essence of the mechanism, and their analysis is carried out both in dictionary definitions, and in the author's interpretations depending on the subject of study.

Based on the functional approach, K. Weick [10, p. 458], M. Glynn and R. Abzug [6, p. 235], B. Papp [8] the formation of organizational and economic mechanism of development is understood as a process that shows relationships, connections and interdependence in the light of the interests of actors involving in its implementation.

J. Dutton, P. Frost and J. Lilius [5] define organizational mechanism as a dynamic process

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that involves three stages: activation, mobilization and rapid action.

L. Donets and N. Vashchenko [3, p. 69] consider mechanisms of ensuring economic security as a set of tools and a system of organization and control, which can achieve the highest level of economic security.

The original interpretation of organizational and economic mechanism is presented by H. Zhavoronkova [4, p. 139], who suggests to understand the mechanism of technological security of the region as the functional and institutional ways of interaction of elements of the economic system with the aim of coordinating and managing the economic and technological processes to ensure economic interests, prevention from threat to technological security, emergency response and achieving the level of security that would effectively contribute to achieving general economic and technological goals.

However, despite a number of scientific papers, in domestic economic theory the approaches to determining the nature and components of organizational and economic mechanism of technological security of agrarian sector have not been formed yet.

The objective of the article is to develop the key principles of organizational and economic mechanism of technological safety of the agrarian sector.

Statement of the main results of the study. The mechanism of technological security of the agrarian sector consists in finding a set of institutional, economic, institutional, legal ways to harmonize the interests of economic activities in the agricultural sector in accordance with national economic interests, which, taking into account different agricultural production, allows to increase the efficiency of economic activity which is sufficient to ensure economic security, combating explicit and implicit threats.

The main function of this mechanism is to strengthen the capacity of the agricultural sector through the widespread adoption of highly efficient production technologies and resource farming systems, creating a competitive knowledge-intensive agricultural product, which should guarantee the growth of agrarian sector of the economy.

The formation of the mechanism of technological security is presented as a series of interrelated steps (Figure 1).

Creation and implementation of the mechanism begins with the definition of theoretical and methodological, conceptual foundations and principles of technology security of agrarian sector. Further, the priorities and strategically important objectives of security compliance regarding organizational and economic, financial and legal aspects of their achievement, are defined.

The organizational and economic block of guaranteeing technological security includes general government agencies, and entities of enterprises in the agrarian sector, the main executors of scientific and technological projects and institutions directly linked to the creation of intellectual property.

Financial and investment ensuring of security implies the involvement of financial instruments to stimulate technological innovation and development of agricultural production.

Legal support of technological security is based on legislation, programs and policies of the national economy and the basis of scientific, technological and innovative changes of the industry.

After determining the general principles of the formation of technological security of agricultural industry, the analytical assessment of the current state of security in the industrial, technical, financial, technological, ecological and technogenic components is realized. Based on the results of the analysis, the key barriers to the optimal level of security are revealed, basing on which the mechanisms to counter threats are developed and implemented, the implementation of protective measures is monitored and the efficiency of such mechanism is determined.

It is assumed that steps towards the organizational and economic mechanism, will have a positive impact on the level of technological security of agrarian sector through increased efficiency of the introduction of new agricultural techniques, new technologies of livestock and crop production, creation and dissemination of reliable varieties, hybrids of plants, animal species, crosses the birds, and so on.

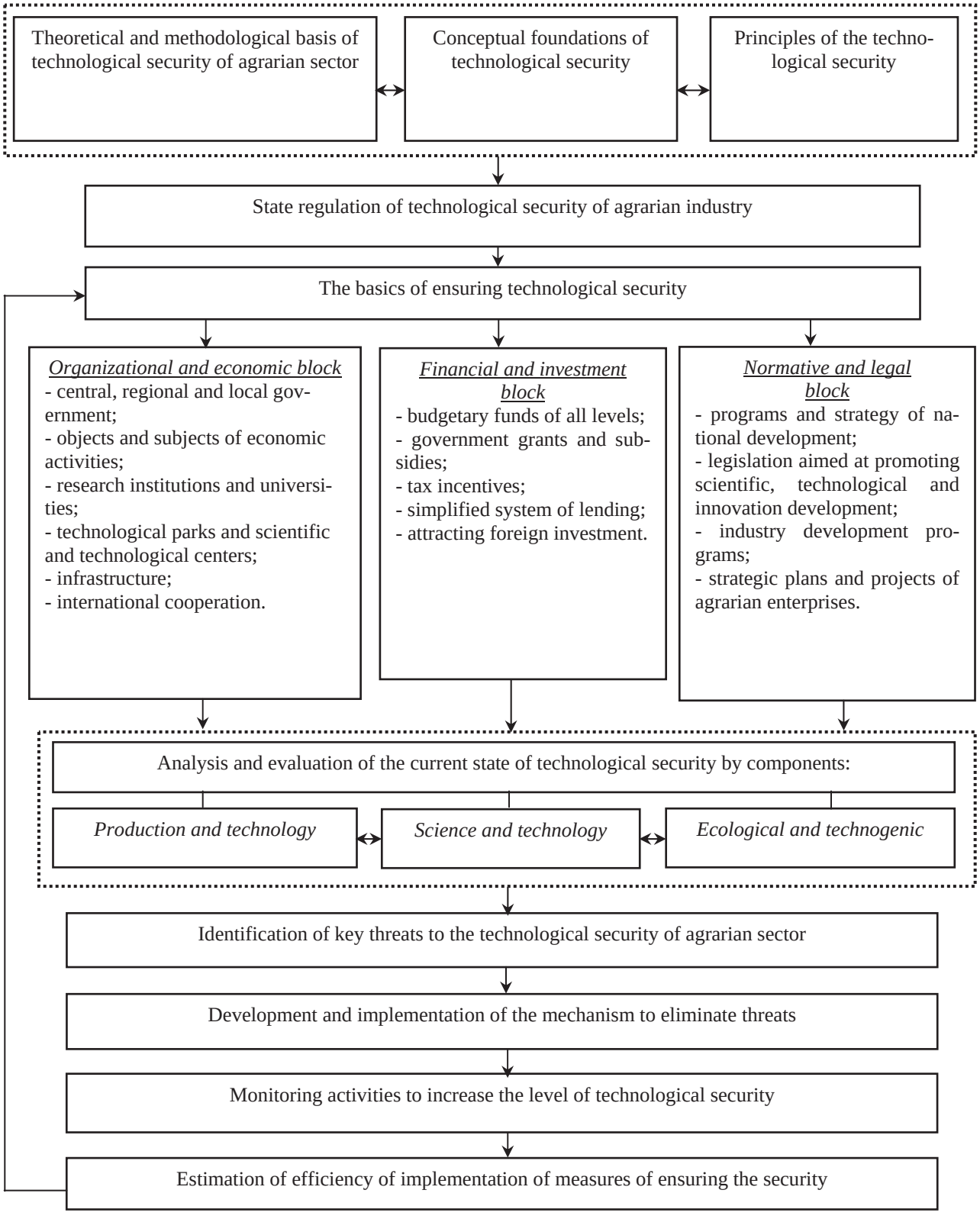

Figure. 1. The Formation of the Organizational and Economic Mechanism of Technological Security of Agrarian Sector

Source: developed by the author.

Taking into account a high degree of uncertainty and difficulty of identifying patterns of technological safety in agriculture, testing hypotheses about the impact of proposed security mechanism on the efficiency of technological upgrading is advisable to use simulation modeling by Monte Carlo method. Initial data of the simulation model are presented in Table. 1.

1. Initial data for predicting the efficiency of the technical and technological modernization of the agrarian sector by Monte Carlo method

Index	Minimum value	Optimum value	Maximum value
Income from the sale of agricultural products, mln. UAH.	26960,8	28308,8	29656,9
Capital investments in agriculture, mln. UAH.	19090,0	19471,8	20044,5
Expenses for implementation of scientific and technical work, mln. UAH.	652,6	665,7	685,2
Expenses for acquisition technical agriculture facilities, mln. UAH.	4347,8	4434,8	4565,2

Source: [2].

Hypothetically the profits from sales of agricultural products at the optimum level will increase by 5%, and the maximum – 10%, the cost of production of scientifically based product, respectively, will increase by 2% and 5%. Under these conditions, the target function or the effectiveness of technological modernization (E_t) is equal to 1,15, which proves the economic profitability measures of technical and technological re-equipment of agriculture. The reliability of the hypothesis and the probability of such assumptions is proved by constructing a forecasting 2000 scenario with the set probability level of 95%, a median deviation under normal distribution is less than 10% (Figure 2).

The results of the calculation show the high probability (82%) of receiving positive results of updating of equipment and technologies in agriculture (efficiency rate varies from 1 to 1,44). For the specified conditions the optimal level of Et falls into the range of 1,08 – 1,18. In some cases, Et reaches the maximum index of 1.58. Therefore, it can be stated that the measures for the implementation of organizational and economic mechanism will strengthen the capacity of the agrarian sector and guarantee the growth of technological security.

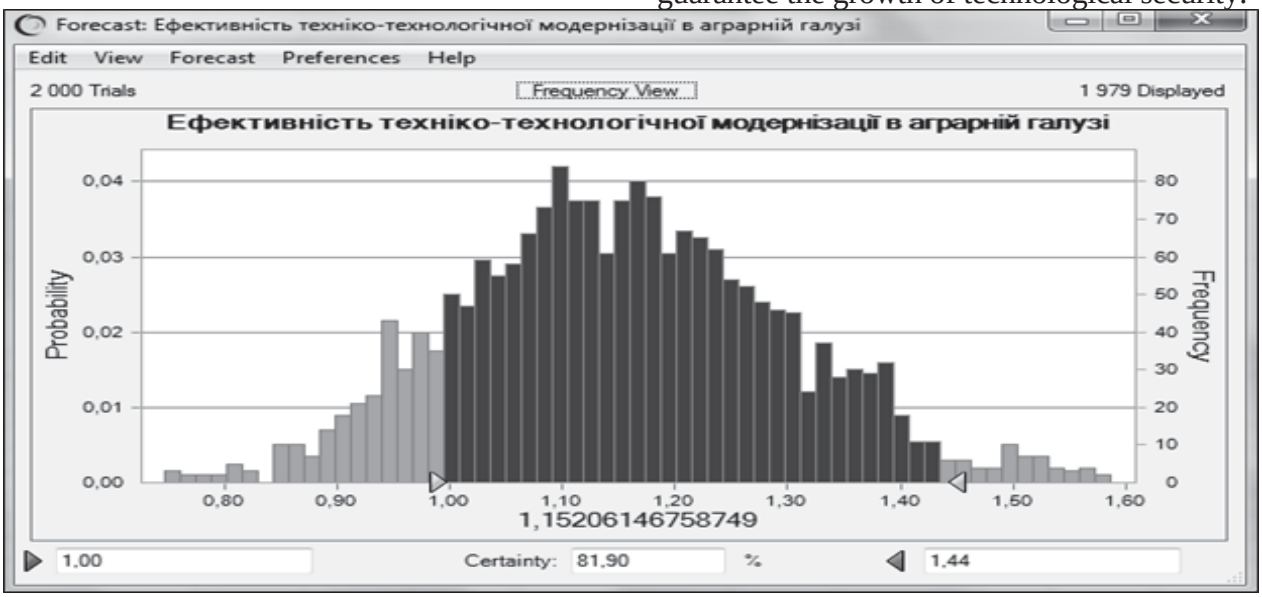

Figure 2. Forecasting of the effectiveness of technical and technological modernization of agrarian sector

Source: calculated by the author.

Moreover, computer simulation makes it possible to identify the nature and degree of the impact of the arguments on the target function. The graph of the relative impact of independent factors on the effectiveness of innovation in agricultural production is shown in Figure 3.

The greatest positive impact on the effectiveness of the modernization of agricultural sector makes a profit from sales of agricultural products, which equals 60.3%. Capital investments (-38,3%) and the cost of acquisition of technical agricultural means (-1,4%) influence negatively the final index. The costs of implementation the scientific and technological projects in agricultural area have no influence on the final results.

Figure 3. The quantitative effect of factors on the efficiency of technical and technological modernization of agrarian sector

Source: calculated by the author.

Thus, simulation helps, with some degree of probability, to describe the regularities of influence changes in production and technical, scientific and technological components of the technological security of agricultural sector at the level of the effect of their implementation.

Conclusions. The formation of organizational and economic mechanism is the main task of the transition process of agriculture to the innovation way of development oriented at the use of advanced scientific and technological achievements in the process of production of scientifically based products. The process of creating and implementing such a mechanism involves a series of coordinated steps, systematic implementation of which will improve safety. Positive results of simulation modeling of efficiency of technical and technological modernization of the agrarian sector prove the effectiveness of the proposed organizational and economic measures of strengthening technological security. However, the problems of implementation and monitoring of the results of the proposed mechanism requires further investigation.

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