

Mostova A.D. (2018). *Informatsiina systema monitorynhu prodovolchoi bezpeky* [Food security monitoring information system]. *Modeliuvannia rehionalnoi ekonomiky* [Modeling of the regional economy]. Vol. 1 (31). pp. 348–362.

ISSN 2313-027X

[http://ir.duan.edu.ua/bitstream/123456789/3876/4/Мостова\\_1%2831%29\\_2018.pdf](http://ir.duan.edu.ua/bitstream/123456789/3876/4/Мостова_1%2831%29_2018.pdf)

УДК 338.439

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## **FOOD SECURITY MONITORING INFORMATION SYSTEM**

*The food security monitoring information system as an effective tool for strategic analysis and the formation of the necessary analytical framework for the development of a food security strategy is proposed. The structure of the proposed information system is presented. The subjects of information support for monitoring the food security of the state in the automated mode and the users of the information system have been identified.*

Keywords: information system, monitoring, food security

### **Introduction**

Guaranteeing of Ukraine's food security is a strategic task, the level and quality of population's life depends on its comprehensive solution. For the effective development and implementation of the food security strategy, the coordination of the participants of the food security system (state authorities and management, responsible institutions and organizations, agricultural and food enterprises, market intermediaries, the population), effective organizational and informational interaction between them is necessary. Assessment of the trends of food security, effectiveness of strategic measures and tools for its provision, as well as timely response to challenges and threats requires monitoring.

The existing food security monitoring system in Ukraine is characterized by a sufficiently formed methodological and statistical base at the legislative level. In particular, the Draft Law of Ukraine "On Food Security of Ukraine" No. 8370-1 dated April 28, 2011 contains an article devoted to food security monitoring. At the state level, the main indicators of food security and methodical recommendations for their calculation have been developed [1-3]. The necessary data for the calculation of

indicators, analysis and further interpretation of the results are provided by the State Statistics Service of Ukraine. Consolidation of information and conducting analytical calculations is provided by the Ministry of Economic Development, Trade and Agriculture of Ukraine (Ministry).

However, to date, a single information system has not yet been formed. It would be able to consolidate incoming and outgoing information flows during food security monitoring, organize the coordinated work of all participants in the food security system, and systematize and optimize governmental information resources. The availability of such an information system will allow not only to objectively assess the trends of food security in the reporting period, but also to form strategic plans and forecasts, to respond in a timely manner to possible threats to food security, and to implement corrective measures to counter factors that negatively affect food security. Therefore, an urgent scientific and practical task is to improve the information-analytical and methodical base of food security monitoring through the implementation of an information system.

### **Literature review**

Methodological recommendations for evaluating indicators of food security of Ukraine and their normative values are approved by normative legal acts. Methodical aspects of diagnosing the food security of the state are presented in the works of the authors O.V. Varaksina [9], V.I. Vlasov [5], O.I. Hoichuk [6], P.T. Sabluk [7], O.L. Kardash [14], V.D. Malygina [8] and others.

Scientists such as Z.K. Bondar [4], M.M. Babich [13] studied scientific approaches to information and analytical support for assessing threats to food security. The need for the functioning of the regional food security monitoring system is substantiated in his research by V.F. Proskura [10].

Therefore, modern legal acts and fundamental scientific works contain indicators, coefficients, methodical recommendations for their calculation and interpretation. However, the study of food security monitoring needs further research, methodological and practical developments. It is necessary to use modern information technologies for the collection, analysis of information and the formation of relevant analytical reports, forecasts and recommendations regarding the development of the Ukraine's food security strategy and its implementation.

### **Research objective**

The objective of the article is the development of methodological and practical principles of food security monitoring and the justification of the need to develop and implement an information system.

## **Results**

According to the Draft Law of Ukraine “On Food Security of Ukraine” dated April 28, 2011 No. 8370-1, monitoring and information support of food security are foreseen [1]. According to the specified Draft Law, food security monitoring is a complex system of observation, collection, processing, systematization and analysis of information on production, stock management and food supply, quality and safety of food products, food consumption and nutrition of the population [1].

The main tasks of food security monitoring are:

- provision of operational assessment of the current trends of food security;
- identification of problems in the field of food security;
- assessment of existing and projected risks and threats to food security;
- forecasting the state of food security;
- informational and analytical support for food security measures.

Monitoring is carried out at the national and regional level according to the specified indicators of food security.

Monitoring of food security is carried out by ministries and other central bodies of executive power within their powers. The Ministry of Economic Development, Trade and Agriculture of Ukraine, which forms and ensures the implementation of the state agrarian policy and guarantees the state food security, summarizes the monitoring results and publishes them in the mass media every year.

Guaranteeing the Ukraine’s food security is ensured by the responsible bodies of state power and management, institutions and organizations and other subjects, which carry out the formation of an information and analytical base for identifying threats, assessing and monitoring the trends of food security and making strategic management decisions based on the results of monitoring. Effective interaction of the specified participants requires timely provision of information for the analysis and assessment of the food security trends and threats based on a system of indicators, the formation of analytical reports necessary for the development of further plans and forecasts of food security at the state and regional levels.

Therefore, it is advisable to propose the development of an information system for food security monitoring, which functionally automates the process of collection,

input of input data, analysis, formation of analytical reports, storage of results and provision of operational access to information [11].

The food security monitoring information system should solve the following tasks:

- automation of the procedure for collecting and processing information about the trends of food security, unification of assessment indicators and coefficients at the state and regional level;

- substantiation of the requirements for input data provided by the relevant subjects of food security monitoring information support, necessary for the calculation of indicators characterizing the situation in food security, and the formation of analytical reports;

- software and technical implementation of national food security monitoring in accordance with several evaluation methods;

- providing users with timely information about the trends of food security at the state and regional levels for timely identification and prevention of threats, development of strategic plans and forecasts, and adoption of operational management decisions in case of deterioration of the situation;

- generation of current analytical reports based on monitoring results and providing them to users in electronic form;

- physical and legal data protection and information security [11].

The main goal of the proposed project is to create practical informational support tools for food security monitoring, development and implementation of the Ukraine's food security strategy and regional food security programs, substantiation of strategic directions and mechanisms for ensuring food security at all levels.

The customer of the development of the information system and the coordinator of the project can be the Ministry of Economic Development, Trade and Agriculture of Ukraine, since it is entrusted with the task of forming mechanisms and tools for regulating the functioning of the food market, strategies, programs and forecasts of food security.

Consolidation, processing and analysis of information can be carried out by responsible structural divisions of the Ministry. In the structure of the Department of Agriculture of the Ministry, it is possible to propose the creation of a structural subdivision – a department of development and implementation of the food security strategy. The functions and responsibilities of the department should include the formation and implementation of the food security strategy, the implementation of

preparatory planning activities, as well as the monitoring and control of the results of the strategy. This department can be the operator of the food security monitoring information system.

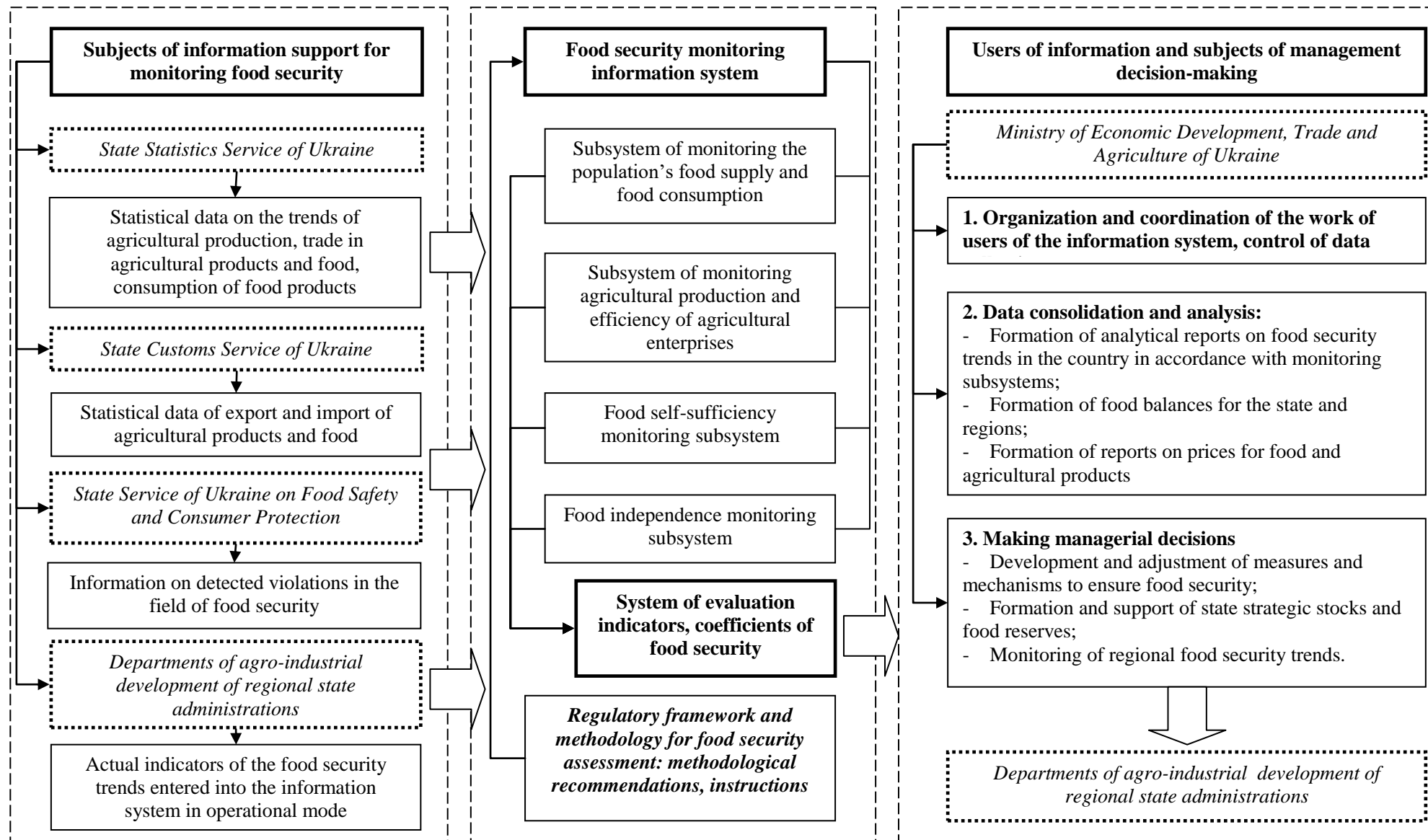
The developer of the technical task for the design of the information system should be the department of development and implementation of the food security strategy. The customer should be the Ministry. The development and implementation of the information system can be carried out by the Department of Development of Information and Communication Technologies, Document Management and Electronic Services of the Ministry [11].

It is expedient to take part in the project also to other state administration bodies, institutions, organizations that participate in the formation of the information and analytical base of food security assessment and monitoring, substantiation of the procedure and requirements for the forms of providing input information for calculations, interim and final reports, for example, The State Statistics Service of Ukraine, the State Customs Service of Ukraine, the State Service of Ukraine on Food Safety and Consumer Protection (SSUFSCP), departments of agro-industrial development of regional state administrations.

The following stages of creating a food security monitoring information system as a new state information system are proposed:

- development of the concept of creating an information system for food security monitoring and its approval in the established order;
- provision of project financing;
- formation of technical requirements for the functions of the food security monitoring information system and its components;
- conducting tender procedures;
- creation of a software and technical complex of the information system of food security monitoring;
- design and development of an information system for food security monitoring;
- transfer of accumulated data from the current database of the State Statistics Service to the food security monitoring information system;
- implementation of an information system for food security monitoring;
- provision of technical support and support of the food security monitoring information system.

The structure of the project of the proposed food security monitoring information system is presented in fig. 1.



**Fig. 1. Food security monitoring information system**

Source: developed by the author

In accordance with the given scheme, it is proposed to form a logical structure of the information system of three levels with relevant databases and software modules.

The first level includes *subjects of information support for monitoring food security of Ukraine* in an automated mode, in particular, the State Statistics Service of Ukraine, the State Customs Service of Ukraine, the State Service of Ukraine on Food Safety and Consumer Protection, departments of agro-industrial development of regional state administrations. The main task of the specified subjects is to provide the input data necessary for the calculation of indicators and indicators of food security and their further continuous monitoring during the period of strategy implementation in accordance with the developed calendar plan-schedule.

Input data for monitoring and further substantiation of the main strategic directions and priorities of ensuring food security are statistical indicators, on the basis of which the assessment of food security is carried out. The State Statistics Service of Ukraine provides statistical data on the trends of agricultural production, trade in agricultural products and food, and food consumption. The State Customs Service of Ukraine provides statistical data on the export and import of agricultural products and food. The State Service of Ukraine on Food Safety and Consumer Protection informs about detected violations in the field of food quality assurance. Departments of agro-industrial development of regional state administrations provide information on actual indicators of food security by entering data into the information system.

The responsible structural units of the departments of agro-industrial development of the regional state administrations ensure that the actual data of indicators and coefficients of food security are entered into the information system for their further consolidation.

The results of monitoring indicators and coefficients describing the current trends of food security in the regions must be entered into the information system in an operational mode by the responsible divisions of the specified information support entities in accordance with the developed calendar plan-schedule for the implementation of monitoring works, which must be placed in the appendix to the state food security strategy.



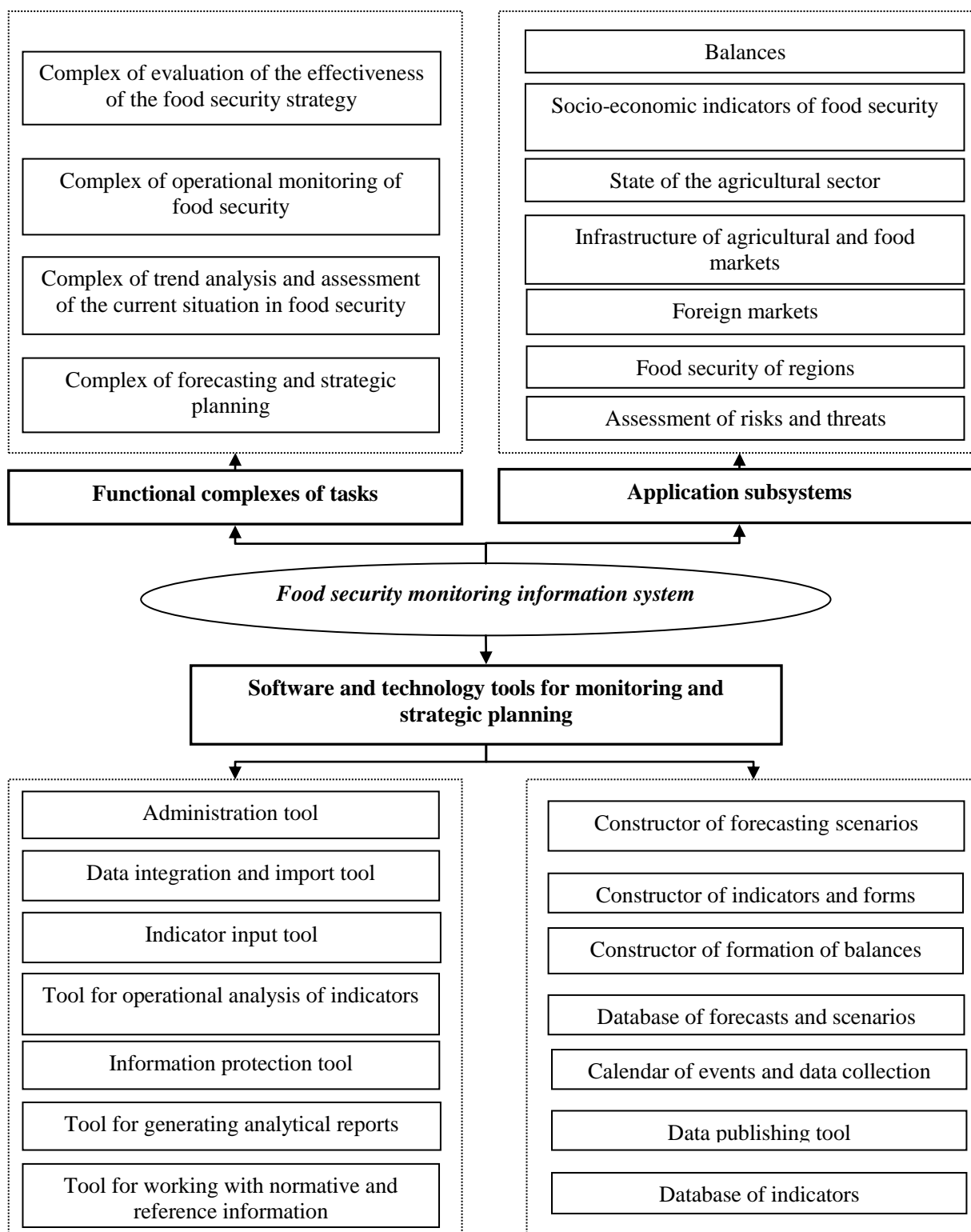
Information necessary for assessment, analysis and monitoring must be provided in an automated mode according to the relevant regulations of the Ministry of Economic Development, Trade and Agriculture of Ukraine.

The second level is the *food security monitoring information system*, which is proposed to be designed in the form of a logical structure to solve the problems of: monitoring of food security of the population and food consumption, production and efficiency of agricultural enterprises, monitoring of food self-sufficiency, monitoring of food independence.

Fig. 2 shows the architecture of the software solution, which includes functional complexes of tasks, application subsystems, and software and technology tools for monitoring and strategic planning.

The regulatory framework and methodology for food security assessment in the monitoring information system should be digitized and contain methodological recommendations, instructions, etc. The legal and methodological basis for calculating indicators of food security is represented by the main national methods (Methodological recommendations for calculating the level of economic security of Ukraine dated 29.10.2013 No. 1277 [2], Methodology for determining the main indicators of food security dated 05.12.2007 No. 1379 “Some issues of food security” [3], the Draft Law of Ukraine “On Food Security of Ukraine” No. 8370-1) [1], as well as some author’s methods [4, 5, 6, 7, 10, 12]. The information base for assessing food security includes statistical data, in particular, indicators of the sale of agricultural products by enterprises and households, the dynamics of crop and livestock production, the movement of agricultural products at processing enterprises, household incomes and expenses, household food consumption, market prices, etc.; as well as data from the Ministry of Economic Development, Trade and Agriculture of Ukraine, analytical and consulting agencies, in particular, balances of supply and demand for agricultural products and food, prices for agricultural products and food, and other information.

As a result of the operation of the information system, a system of evaluation indicators, coefficients of food security, which is the basis for making management decisions, will be created.



**Fig. 2. Software solution architecture**

*Source: developed by the author*

The third level is the *users of the monitoring information system and subjects of decision-making*, namely the state administration bodies of all levels, responsible for making management decisions and strategic measures to guarantee food security, primarily the Ministry of Economic Development, Trade and

Agriculture of Ukraine, as well as departments of agro-industrial development of regional state administrations.

Monitoring and control of the state's food security is carried out by the department of development and implementation of the food security strategy of the Ministry. The Ministry based on the generated analytical reports in the information system related to the trends of food security, in an operational mode forms appropriate conclusions regarding threats to food security, the effectiveness of strategic measures and substantiates proposals for their possible adjustment.

Monitoring and control of indicators and coefficients of food security according to regional programs should be carried out by departments of agro-industrial development of regional state administrations. The department of development and implementation of the food security strategy of the Ministry, on the basis of monitoring results, adjusts strategic measures, instruments and mechanisms of the state agrarian policy, target programs at the state level and agrees on their change with the management.

The Ministry of Economic Development, Trade and Agriculture of Ukraine should implement the following tasks in ensuring the operation of the information system and decision-making based on the results of food security monitoring:

1. Organization and coordination of the work of users of the information system, control of data collection;
2. Consolidation and analysis of data, which involves the creation of analytical reports on the current situation and trends of food security of Ukraine, compilation of food balances for the country and regions, formation of reports on prices for food and agricultural products;
3. Making management decisions regarding the development of strategic measures to guarantee food security and tools for its provision, as well as adjustments as necessary; formation and support of state strategic stocks and food reserves; monitoring the trends of food security in the regions.

Access to the information base can also be provided to trade, agricultural, food and processing enterprises, and market infrastructure enterprises. The provision of information at this level to interested users should be carried out within the limits of the defined access rights for an individual user.

The result of the project will be the formation of an information and analytical base for assessing the trends of food security, threats and opportunities, strengths and weaknesses, conclusions based on the results of the analysis of

indicators of food provision of the population, development of the agricultural sector, agricultural production and efficiency of agricultural enterprises, food provision of the population and food consumption, food independence and self-sufficiency. Based on the information and analytical base, it is proposed to develop a forecast and strategy of food security.

Therefore, the development of the food security monitoring information system will provide users with comprehensive, relevant, timely, objective information about the trends of food security in Ukraine. This information system will present the trends in the development of the agricultural sector, agricultural production and the efficiency of agricultural enterprises, food supply for the population and food consumption, food independence and self-sufficiency. The developed food security monitoring information system will form a technical, informational and methodological basis for the comprehensive formation and analysis of food security indicators, to develop a food security forecast and strategy.

### **Conclusions**

The organization of effective coordinated work of the participants of the food security system requires the formation of a single information system that would be able to consolidate incoming and outgoing information flows during food security monitoring and create an information and analytical base for making strategic management decisions. To solve the task, it is proposed to develop an information system for monitoring food security, which will allow to systematize and optimize information resources of state and regional authorities, to receive timely information for analysis and assessment of the trends of food security from various sources, to objectively assess the trends of food security in the reporting period, to form analytical reports, strategic plans and forecasts, to promptly respond to possible threats to food security and to implement corrective measures to counter factors of negative impact on food security.

The functions of the information system should be collection and consolidation of input data, analysis, generation of analytical reports, storage of results and provision of prompt access to information. The proposed information system will make it possible to form an information and analytical basis for comprehensive assessment, analysis and monitoring of food security indicators, development and implementation of the state food security strategy and regional

food security programs, justification of strategic directions and mechanisms for ensuring food security at all levels, formation of regulatory mechanisms and tools functioning of the food market, strategies, programs and forecasts of food security.

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