

Information systems for food supply management in the region

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Abstract. The article deals with the problem of eliminating the inappropriate level of development of information technologies and their use in solving urgent problems of informatization of the food supply system. The article analyzes the main information systems of the agro-industrial complex in the aspect of managing the food supply system, and offers recommendations for eliminating the existing gap in the use of information technologies in the agro-industrial sector.

1 Introduction

Information systems in the agro-industrial complex of Russia, as in other sectors of the economy, have long been developing on the principle of "piece-by-piece" automation. This situation does not allow you to make high-quality management decisions, and also increases the time lag when making such decisions. Effective food supply management requires a complete and adequate information support system.

Every year, the volume of information received from various sources is growing in the agro-industrial complex. With the increasing volume of data, there is an increasing need for high-quality processing and reliable analytics that can be relied on in making management decisions and forming a food strategy. In this regard, there is an increased demand for analytical systems that provide farmers with in-depth analytics, and systems that ensure the formation of digital agriculture are actively developing.

Taking into account the increasing role of state information systems and the transformation of integration information links between branches between economic entities, the traditional tasks of public administration in the field of food security have also received significant changes. In recent years, there has been an intensive development of information systems in various strategic areas of the country's life. Under the Ministry of Agriculture

Analyzing the existing information solutions in the food supply system, we can distinguish three groups of information systems related to systems of different levels of management (Figure 1). The created specialized and intersectoral information systems that aggregate a large amount of data are top-level subsystems. The processed information is sent by level to the regional and federal ministries, as well as to other state information systems. For example, in the Federal state information System "Management". The main source of

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information in the field of public administration of the food supply system is producers, and the formation of a feedback system begins with them.

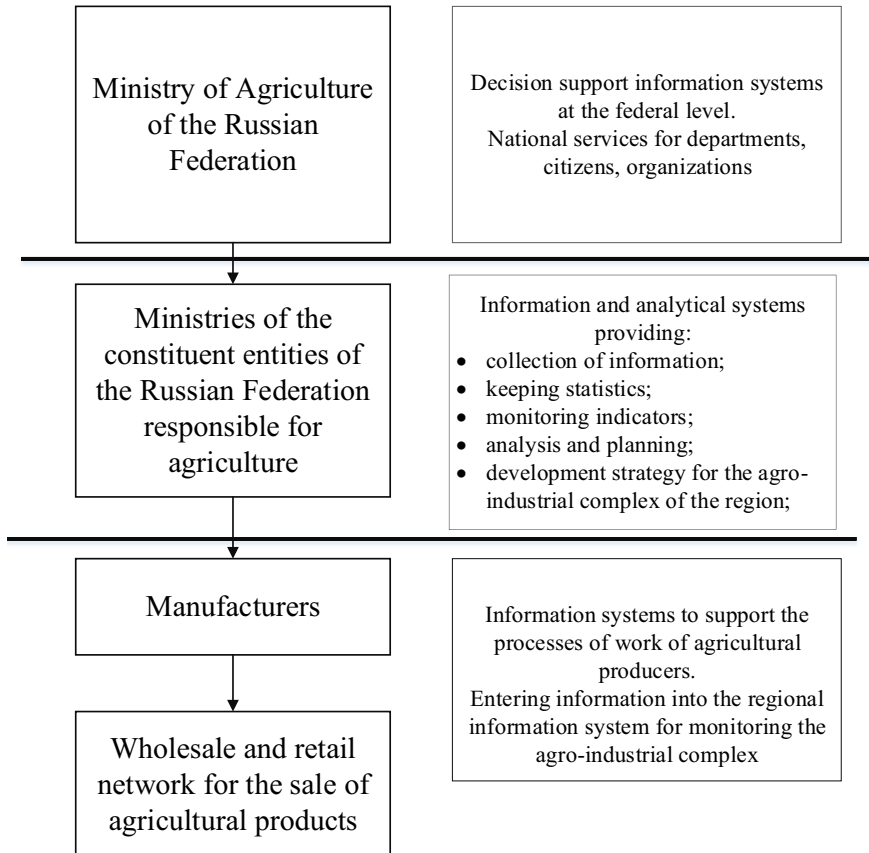


Fig. 1. Information systems in food security management.

In particular, an extended version of the information system for monitoring the situation in the field of food security is the system " Food Security Monitoring System – SMPB) - a federal information system that was put into operation in 2014 (Order of the Ministry of Agriculture of the Russian Federation No. 122 of 10.04.2014) and was created to monitor food security in Russia, as well as to prevent critical situations of food security. The legal basis for this system was laid down by the Food Security Doctrine. Among the key features of the system are the implementation of the function of information support in the field of food security, inventory of agricultural production facilities, and prompt receipt of information in real time [1-5].

The analysis of this system has shown that it has a number of disadvantages. In particular, the SMPB is used only as a tool for collecting, storing, consolidating and systematizing data.

1. Federal state information system of accounting and registration of tractors, self-propelled vehicles and trailers (FGIS USMT).

2. System for monitoring and forecasting food security of the Russian Federation (SEE PB).

3. The system of providing public services in electronic form from the Ministry of agriculture of the Russian Federation (PC "E-government services).

4. Automated information system of registers, registers and reference data (AIS INE).

5. Information system planning and control of the State program (the IP of PC GP).

6. Integrated information system for the collection and processing of the accounting and reporting of specialized agricultural producers, generate aggregate reports, monitoring, accounting, control and analysis of subsidies to support the agro-industrial complex (AIC "Subsidies in agriculture").

7. Central information and analytical system of the system of state informational support in agriculture (IEC sgio of CX).

8. The unified Federal Information System on Agricultural Land (EPIC CHF).

9. State information System " Information and analytical system for operational monitoring and risk assessment of the state and risks of scientific and technical support for the development of agriculture "(IAS NTOR-SH)"[5].

There are also a number of separate information solutions, including regional ones. In particular, in the Republic of Mordovia, the software solution "Svod APK 3.0" is used to accept reports from organizations [6].

This platform allows you to create a report profile for an organization and accept and control reports based on established forms and indicators. The information in the system is immediately sent to the regional ministry. Also, a software package related to the type of geoinformation systems "Geoanalytic Control Center of the Agro-industrial Complex of the Republic of Mordovia", developed by LLC "TsentRprogramSystem", has been created and operates [7]. The main purpose and objectives of the system are also reduced to the process of collecting and storing information according to established forms, generating reports and visualizing the information received. According to its purpose, the system is a means of monitoring agricultural producers in the region.

These information systems at the regional and federal levels provide information on the state of the food supply system as a whole, but they do not have analytical capabilities and ignore a number of indicators. In particular, these information systems have almost no analytical functions, and work in these information systems is primarily associated with the collection of established reporting forms. As a further development of these information systems, it is necessary to integrate individual IT solutions into a single information environment, which will be expressed by a single digital technology platform.

Modern conditions dictate the requirements for information systems in solving a number of tasks of operational and strategic analysis. In this regard, it is necessary to form a system for collecting, processing and analyzing information on a certain set of indicators with a high degree of updating, as well as to develop a methodology for the most likely risks and threats to the food supply system. A prospective IT system for food supply management should have analytical functions, in particular, to ensure the development of appropriate management measures that require immediate implementation. Equally important is the consideration of indirect information in the aspect of the development of the food supply system, production, infrastructure, accessibility, quality control, etc.

The effectiveness of the food supply information system should be expressed in meeting the needs of all participants in the process – from the producer to the consumer, taking into account the measures of state regulation. The logical continuation of the further development of the digital food supply environment is the creation of an integrated food supply management system and the transformation of information support in the agro-industrial complex.

The current level of digitalization of the food supply system in the aspect of information systems is insufficient: the lack of scientific and practical knowledge, the lack of an adequate amount of information and technical means, and the underdevelopment of the logistics system lead to high production costs. Only a small number of commodity producers have the capacity to create an IT platform. For the further development of information systems in the field of agriculture, it is necessary to create a digital platform that will combine existing IT

solutions and develop them taking into account modern technologies of automated information processing.

It should be noted that the Ministry of Agriculture of the Russian Federation in 2019 introduced the departmental project "Digital Agriculture", the main purpose of which is to solve the problems of planning and forecasting production activities, as well as the formation of a digital ecosystem in the management system of the agro-industrial complex [6]. This project in the future will allow to form qualitative transformations in the food supply management system, and will also be a catalyst for the development of information systems in the agro-industrial complex.

According to the project "Digital Agriculture", work on digitalization should be carried out in two directions [6]:

1. Digitalization of agricultural production;
2. Digitalization of public administration processes in the field of agriculture.

Thus, the creation of software and hardware solutions in the field of agriculture will eliminate the shortcomings of existing information systems by creating a communication system between all participants in the production process and the process of selling products on the basis of a digital platform. When transforming existing information systems, it is necessary to use current technologies of automated data processing systems, such as "Big Data" and "data lake"»

In our opinion, it is the creation of a single digital ecosystem in the management of food security that will make it possible to make a technological breakthrough in the field of agriculture. At this stage of the development of information systems in the field of agriculture and state management of food supply, there is a significant "digital gap" in the aspect of interaction between departmental ministries, agricultural producers and the wholesale and retail network of agricultural products. This is primarily reflected in the significant difference in the digital development of the participants in the food security system. This is due to many factors, such as the scale of production, the willingness to innovate, the specifics of the manufacturer's specialization, etc.

The effectiveness of the food system management mechanism largely depends on the quality of continuous monitoring of the provision of agri-food products to the regions. It should cover the observation, analysis, assessment and forecast of food supply in the region in order to prepare management decisions and recommendations aimed at improving and developing the food supply system. This process in modern conditions cannot be implemented at the proper level without the formation of appropriate analytical software and hardware IT solutions.

Within the framework of the study, an expert survey of the heads of agricultural enterprises of the Republic of Mordovia was conducted in order to identify the main existing shortcomings of the information development of the industry. Thus, the majority of respondents noted that in terms of the development of information relations, the most important and demanding development are information relations with suppliers and the product sales network (Figure 2).

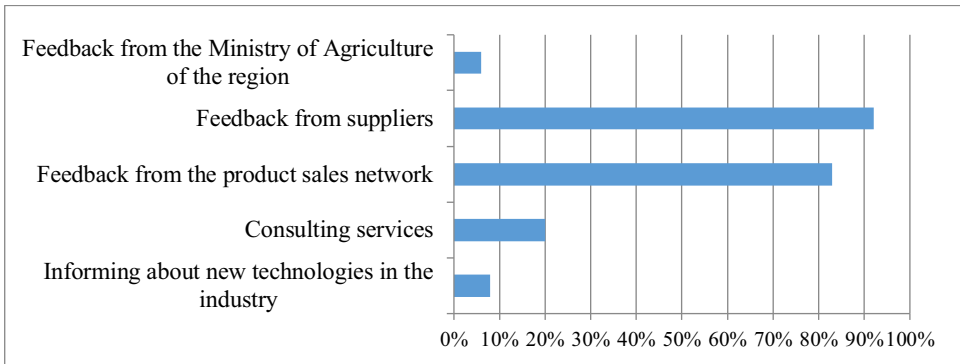


Fig. 2. Results of the survey of business managers.

Among the factors of agricultural development, the majority of respondents consider the most important state support for agricultural innovations and the agricultural policy of the state. Also, the majority of respondents indicated that they do not use specialized information systems to manage the company's activities (87%), but at the same time expressed their readiness for information innovations in the industry (74%)[8-10].

Figure 3 shows an expert assessment of the importance of agricultural development factors in terms of new information and innovative technologies.

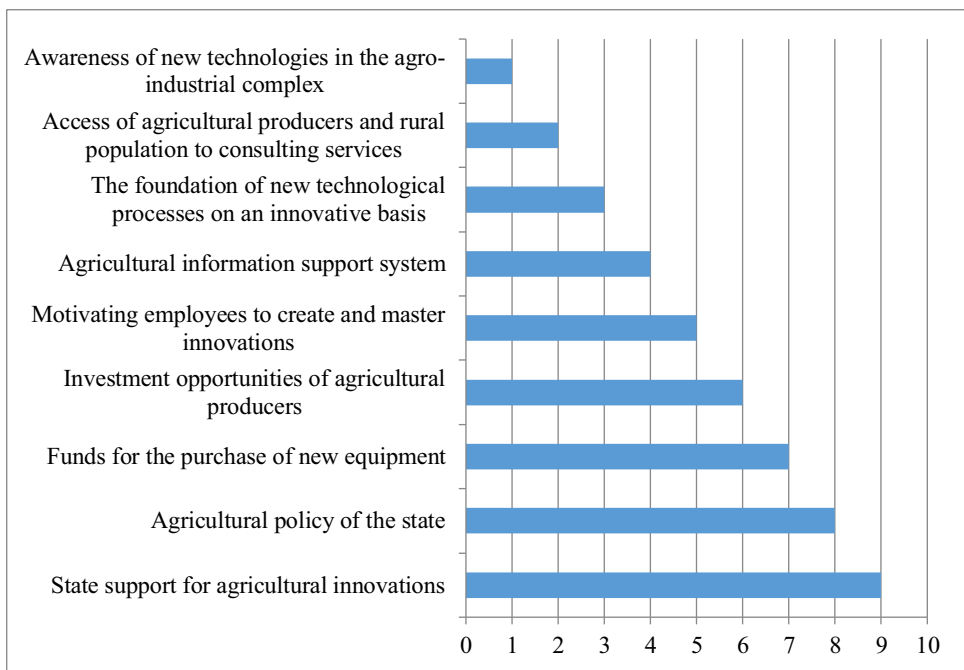


Fig. 3. Expert assessment of the importance of agricultural development factors in terms of new information and innovative technologies.

Based on the results of the survey, we conclude that in the aspect of the formation of an effective food security system in the aspect of the development of information systems, it is necessary to further develop the information mechanism for managing the food security system. In particular, this will improve the existing information interaction between agricultural producers and the state, which will allow to form an effective information system

for managing the development of the agro-industrial sector. The improvement of information systems in the field of food supply management can be implemented by creating an end-to-end digital platform for ensuring the interaction of agricultural market participants. Technologically, this feature can be represented by a digital platform that can be implemented as a web application with a high level of scalability to take into account the regional characteristics of commodity producers. In the end, this platform will have a significant positive impact on the system of state management of food security, as it will allow the use of modern technologies for automated information processing [9].

As part of the development of information systems for food supply management, it is necessary to stimulate the introduction of digital technologies by commodity producers, as well as to systematize the collection and analysis of data from market participants. It is also necessary to create a digital web platform, which was mentioned above. Such a platform will be an aggregator of data and IT solutions in the field of agricultural production on the one hand and public administration on the other. The creation of such a platform will require the integration of public administration processes in the field of agriculture. As measures to eliminate the digital divide, it is necessary to test digital technologies by subjects, including using state incentives, by shifting state support to enterprises that implement digitalization processes and technologies.

A separate aspect of the formation and development of information systems in the field of food supply, as well as the digital transformation of agriculture, is the lack of awareness of market participants of the commodity producer about existing information technologies in the field of agriculture. This drawback is proposed to be eliminated by creating an information and consulting center on the digitalization of production on the basis of the relevant ministry.

As a further development of the information environment of food supply management in the aspect of the formation of information systems, we propose the following:

- formation of a unified information space on the basis of existing projects of the analytical center of the Ministry of Agriculture of the Russian Federation by creating a digital platform for the formation of a sustainable information system for food supply management;
- involvement of Russian regions in the process of digital planning of agricultural production by creating favorable conditions for the formation of the IT environment of enterprises through the provision of subsidies and benefits;
- development of a mechanism for interaction with product manufacturers based on the use of an electronic trading platform (integrated into the digital platform service) in order to create an effective system for monitoring and controlling the export of products to the consumer;
- formation of a digital profile of an agricultural producer based on the use of "personal account" technologies by integrating the service of applications for state support and creating smart contracts based on information services, a trading platform, digital farming services, equipment rental, etc.;
- creation of a consulting center for the implementation of IT solutions based on the relevant ministry;
- improving the efficiency of interaction between agricultural producers and the state in a digital format by integrating information resources based on the use of a digital platform.

Thus, the introduction into the practice of the management of food supply development in the region of the methodology of integrated information support, based on the use of key management processes based on the use of information technologies, will make it possible to fully use the economic potential of the agro-industrial complex of the region, which in turn will increase the economic efficiency and effectiveness of agricultural activities of commodity producers.

A special role in the further development of the food supply system, in our opinion, is the formation of integration relations between producers and suppliers of agricultural products, as well as the strengthening of state participation measures. Work in this aspect requires the participation of specialists in various subject areas: information technology, automation and modeling, agriculture, economics and management, etc. In this regard, we consider it necessary to further develop the information environment of agriculture in order to improve the efficiency of food supply management, as well as the transition from electronic to digital management.

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