Improving the efficiency of agro-industrial complex management based on digitalization and system approach

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Improving the efficiency of agro-industrial complex management based on digitalization and system approach

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Abstract. The article examines theoretical approaches to the interpretation of the term “digitalization”, substantiates the relevance of digitization of agriculture and digitalization of industry management at the federal and regional levels, describes the possibilities and prospects of the Systems of State Information Support in the Field of Agriculture (SSIS A) created by the Ministry of Agriculture of Russia, outlines its goals creation, describes the architecture of the individual components of the System, its main functions, as well as the place of the SSIS A in the provision on their base of states of agricultural services in the Russian Federation.

World experience suggests that the competitiveness of the national economy is directly related to the development of information technologies: according to the World Economic Forum, the index of competitiveness of national economies has a close relationship with the ICT development index. The branch of information technologies is the most dynamically developing both in the world and in Russia.

Today, the Russian Federation is faced with the task of early formation and development of the information society in order to improve the quality of life of the population and ensure the country's competitiveness. This can be largely achieved on the basis of the digitization of the economy. In this regard, the necessary documents were adopted: The State Program of the Russian Federation “Information Society (2011–2020)”, approved by the Government of the Russian Federation on April 15, 2014 No. 313; the Strategy for the Development of the Information Technology Industry in the Russian Federation for 2014–2020 and for the Perspective up to 2025, approved by Decree of the Government of the Russian Federation of November 1, 2013 No. 2036-p, the Strategy for the Development of the Information Society in the Russian Federation for 2017–2030, approved by Decree of the President of the Russian Federation dated May 9, 2017 No. 203.

Their goal was to give citizens and organizations maximum benefits from the use of innovative technologies. This goal is achieved by: ensuring the provision of services to citizens and organizations using modern ICT; ensuring the rights of citizens to access information; preservation of traditional and customary for citizens non-digital forms of receiving goods and services; development of a technical and technological basis for the development of the information society; ensuring state protection of the interests of Russian citizens in the information environment. Technological, organizational, and managerial changes taking place at the present stage of the development of society are closely connected with the rapid development and spread of ICT.
Digitization of the economy reduces the cost of services compared to the traditional economy and makes public and commercial more affordable, facilitates the entry of goods, and services to the global market, etc.

Today in the world, there is no single understanding of such a phenomenon as the “digital” economy. In particular, this issue can be guided by the decree of the President of the Russian Federation of May 9, 2017 No. 203 “On the Strategy for the Development of the Information Society in the Russian Federation for 2017-2030,” which also contains the official state definition of this phenomenon [5]. Specifically, the documents states that “Digital economy is an economic activity, the key factor in which production is in digital form, and contributes to the formation of the information space taking into account the needs of citizens and society in obtaining high-quality and reliable information, the development of the information infrastructure of the Russian Federation, the creation and use of Russian information and communication technologies, as well as the formation of a new technological basis for the social and economic sphere. Digitalization is closely related to automation and minimizes human participation in the regulation of production processes”.

Today the country has preconditions for the further development of digitalization of the economy. Thus, the coverage of terrestrial digital television has increased from 2013 to 2016 from 44% to 88.5%, with a certain lag of rural areas from urban [4]. The digitalization level of the local rural telephone network in 2016 was 81.3%. However, the negative should be attributed to the fact that, if at home, 52.9% of rural residents use personal computers, then it is only 15.8% at work. Among personal computer skills occupy 45, 5%, work with spreadsheets constitutes 32.5%, and connection to and installation of new devices form 8.9%.

To enhance the management of the agro-industrial complex using digital technologies by the Ministry of Agriculture of the Russian Federation for the period 2013-2020, the system of state information support in the field of agriculture is being implemented (SSIS A). This document presents the main provisions for the development of the state information support system in the field of agriculture. The purpose of the creation of the SSIS A is the formation of state information resources in the field of agriculture and their management. The work on the creation of the Systems of State Information Support in the field of agriculture was started as part of the target program of the Ministry of Agriculture of Russia “Creating a unified information system for the agro-industrial complex of Russia (2008–2010)” approved by order No. 183 of March 31, 2008.

The objectives of the creation of SSIS A are:

− Ensuring the required level of strategic and operational management of the agro-industrial complex of the Russian Federation;
− Ensuring the necessary level of food security of the Russian Federation;
− Increasing the efficiency of state support for Russian agricultural producers.

SSIS A should be created on the basis of further development IR, existing and creation of new AS and PC, providing information resources for decision-making in the agro-industrial sector [6], adequately reflecting the needs of the OU AIC and agricultural producers in the pro-vision and processing of data, the integrated development of its IT infrastructure, the improvement of operating, maintenance and development processes AS and PC. Its functions are shown in Figure 1. The SSIS A will ensure the fulfillment of the functions of the Ministry of Agriculture of Russia on the formulation of state policy and legal regulation in various areas of the agro-industrial complex.
The system of state information support in the field of agriculture

Integration of state information resources in the field of agriculture in EIUP.

Providing state authorities with reliable operational information for decision-making.

Providing agricultural producers and other participants of the agricultural products market with reliable operational information.

Providing information to research institutes and universities for the formation of scientific knowledge and practical recommendations in the field of the agro-industrial complex.

Providing a wide range of government, information and consulting services, including government services with elements of interagency cooperation, as well as improving the availability and quality of services provided.

Providing local governments, regional and municipal authorities of the agro-industrial complex with reliable operational information for making the decision they need to solve current problems of managing and regulating the development of the agro-industrial complex.

Ensuring a widespread introduction of modern communication and electronic information resources and technologies in all levels of government.

**Figure 1.** The main functions of the system of state information support in the field of agriculture (source - data Ministry of Agriculture of the Russian Federation).

When solving the tasks of ensuring the food security of the Russian Federation, the SSIS A created by the government and authorities of the agro-industrial complex will provide comprehensive monitoring and forecasting of the state of the country's food security.

It is assumed that the operation of SSIS A will reduce the cost of production, improve the management of the industry and the competitiveness of domestic agricultural products [1]. Figure 2 shows the location of the SSIS A and the provision of state-based agricultural services on their basis.

The following automated information systems are considered as components of the SSIS A:

1. AIS “Agrostat”;
2. The functional subsystem “Atlas of agricultural land”;
3. Remote land monitoring system (SRLM);
4. Functional subsystem “Accounting for agricultural machinery”;
5. AIS “Passports of regions”;
6. AIS “Electronic Government Services”;
7. AIS “Maintaining registers and harmonization of NSI”;
8. AIS “Food Security”;
9. AIS “State Support”;
10. Information system of planning and control of the State program;
11. Information and analytical system of the Agro-industrial complex;
12. The system of information about the market of AIC;
13. A single integrated resource of the Ministry of Agriculture of Russia;
14. AIS “Code of AIC”, FCRB, UKMS, Accounting for budget subsidies;
15. Unified integration portal of the Ministry of Agriculture of Russia;
16. Information and telecommunication system of the Agro-industrial complex.

Figure 2. Place SSIS A and provision on their basis of government services in the field of agriculture of the Russian Federation.

All listed information systems have their own individual architecture. For example, AIS Agrostat is designed to automate the monitoring processes of the main areas of agricultural activity in the Russian Federation. Indicators of the implementation of the State Program for the Development of Agriculture, regulation of the markets for agricultural products, raw materials and food, the implementation of Federal target programs for agricultural development, support for management decision, and the formation of a transparent information environment have the following architecture as presented in Figure 3.
Figure 3. Architecture of the AIS “Agrostat”.

The system consists of interconnected sites hosted on the Internet, providing automation of data collection of departmental statistical reports, monitoring the completeness and quality of incoming information, its initial analysis, the formation of various types of summary reports to provide management bodies with relevant information about resources and results of the activities of the AIC of the Russian Federation.

If necessary, one could view / edit the stored information, which is made to the database using the software. The result of this request is a template formed and filled with data from a specific region and on a specific date, which, if necessary, can be downloaded to Microsoft Excel.

Also, according to these data, when requesting a database, a summary report can be generated for any form described in the system, for Russia, for Federal districts, for any set of subscribers that report on the desired form, on any date provided for by the frequency of this form [10].

The functioning of this system will allow at the federal, regional and municipal levels:

− Duplication of functions and tasks implemented by various AS and PC;
− Eliminating duplication of the same data used by different AS and PC of the federal and regional levels;
− Integrating different AS and PC of various data formats and various data exchange formats;
− Creating unified technological mechanisms and unification of regulations for collecting information from data sources at the federal level;
− Creating a Departmental secure information and communication network that will simplify and cheapen the collection of reporting from the regions;
− Creating the possibility of centralized management of information resources consolidated at the federal and regional levels;
− Reduce the complexity of operation, complexity and cost of work on the maintenance and development of the AS and PC, due to the diversity of operating AS and PC, implementing the same or similar functionality;
− Reduce the complexity of backup software and databases, due to a large number of heterogeneous AS and PC.

Digitization of agriculture management improves budget efficiency [3].
In addition, at the federal management level of the industry, this will allow creating a support system for AS and PC that are in operation at the Ministry of Agriculture of Russia, a system of technical support used by these AS and PC; create an ordering system for the creation and development of the AS and PC, including, among other things, the agreed order and the creation, development and implementation of the AS and PC; pursue a unified technical policy of the Ministry of Agriculture of Russia in the field of information. All of the above will allow to increase the volume of agricultural production in the country, to increase the degree of export-oriented domestic agriculture [7-9].

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