The Transformation of Agriculture in the Context of the Economy Digitalization in Order Ensure the Competitiveness of Modern Russia

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Abstract. The aim of the article is to consider the main directions and problems of agriculture digitalization and suggest possible solutions.

Results. Digitalization is the trend of the modern economic development. Aware of the potential and necessity of this vector, special attention is paid to the implementation of the departmental project "Digital Agriculture", its main components are presented. The newly established Analytical Center for the Ministry of Agriculture of Russia has been highlighted as a key conductor for consolidating the available statistics on the agro-industrial complex. The article describes some information systems that are implemented and used in the industry. The main problems of the transformation of agriculture in the context of digitalization of the economy based on SWOT analysis are disclosed; Strengths and weaknesses, opportunities and emerging threats are identified. The results of the SWOT analysis made it possible to determine the directions for solving the problems of agricultural transformation in the context of digitalization. The result of the study was the conclusion about the strengthening of the role of the state in digital processes.

Conclusion. Digital technologies will affect the agricultural production process itself, will contribute to the growth of agricultural production aimed at import substitution and export demand, which in turn will guarantee the food security and independence of modern Russia and increase its competitiveness

Keywords: Digital technologies · Digital agriculture · Digital platforms · Digital solutions · Government

JEL Classification: J 43 · Q 18 · Q 19

1 Materials

Информационно-эмпирическую базу исследования составили официальные материалы Министерства сельского хозяйства Российской Федерации, Аналитического Центра Министерства сельского хозяйства Российской Федерации; обзорные разработки исследователей, опубликованные в периодической печати и сети Интернет. Особенности и возможности перехода к цифровой экономике представлены в трудах Волковой А.А., Мехренцева А.В., Мезенцевой Е.С,

Плотникова В.А., Старикова Е.Н., Стрелковой И.А., Рукинова М.В. (Volkova et al. 2019; Mehrentsev et al. 2018). Вклад ученых является базисом для проведения дальнейших исследований в контексте трансформация сельского хозяйства в условиях цифровизации экономики. The information and empirical base of the study were official materials of the Ministry of Agriculture of the Russian Federation, the Analytical Center for the Ministry of Agriculture of the Russian Federation; survey developments of researchers published in periodicals and on the Internet. Features and possibilities of the transition to a digital economy are presented in the works of (Volkova et al. 2019; Mehrentsev et al. 2018). The contribution of scientists is the basis for further research in the context of the transformation of agriculture in a digitalized economy.

2 Methods

This study is based on the research and synthesis of theoretical and factual materials on digital agriculture using various methods: systemic, comparative, as well as tabular and graphical methods.

3 Introduction

national goals and strategic objectives of the development of the Russian Federation through 2024 included "speeding up the introduction of digital technologies in the economy and the social sphere" (Decree of the 2018). The Executive Order of May 7, 2018 No. 204 defines the national program "Digital Economy of the Russian Federation" (Mehrentsev et al. 2018).

Initially, when the Federal Program for the Digital Economy was developed, agriculture was not included in the list of priority sectors. The increased attention of the federal executive bodies to the development of digitalization in all sectors of the economy predetermined the urgency of developing the departmental project "Digital Agriculture", the purpose of which is the digital transformation of agriculture through the "introduction of digital technologies and platform solutions to ensure a technological breakthrough in the agricultural sector and achieve growth productivity at "digital" agricultural enterprises in 2 times by 2024" (Departmental project 2019).

4 Results

4.1 Review and Opportunities of Key Areas of Agricultural Digitalization

The digitalization of agriculture is represented by two components: the digitalization of public administration (state support) processes in agriculture and the digitalization of

agricultural production itself (Departmental project "Digital Agriculture" 2019; Explanatory note 2019). The Ministry of Agriculture of the Russian Federation proposes a departmental project "Digital Agriculture", in which digital transformation of agriculture will be carried out through the introduction of digital technologies and platform solutions and will be built on the following paths (Fig. 1):

national level	functioning of digital platforms of the Ministry of Agriculture of Russia, predictive analytics based on big data, with tools of a distributed registry, artificial intelligence
regional level	smart industry planning, smart contracts
agribusiness level	mass implementation of integrated digital agro-solutions, mass production of digital competencies by specialists of agricultural enterprises

Fig. 1. Ways of digital transformation of the industry

So, the structure of the Ministry of Agriculture of Russia is supplemented by the Analytical Center, the main purpose of which is to consolidate the available statistics on the agricultural sector. One of the key tasks of the center is to ensure the availability of industry information and coordination between the Ministry of Agriculture of Russia, regional governing bodies of the agro-industrial complex, industrial unions, agricultural organizations, cooperatives and farms.

The departmental project "Digital Agriculture" is represented by the components:

1. "Effective hectare". The Ministry of Agriculture of Russia launched the Unified Federal Information System on Agricultural Lands, which includes reliable information on agricultural lands, soil condition, and the state of agricultural vegetation in real time. This will facilitate the implementation of sectoral intellectual planning in 85 constituent entities of the Russian Federation based on the principle of growing the most profitable crops (Digital Transformation of Agriculture 2019).

2. "Smart contracts", that is the creation of personal subsidy offices. It will be possible to automate the provision of subsidies and other types of state support (subsidy/credit/insurance) based on that. Interaction with the Federal Service for Hydrometeorology and Environmental Monitoring and the Ministry of Emergencies will make it possible to adjust the issue of subsidies regarding the introduction of emergency situations in the regions. By 2021, 100% of contracts with recipients of subsidies will be concluded in this mode.

3. Agroexport "From the field to the port", that is the modeling of export flows of agricultural raw materials. Interaction with the Federal Service for Hydrometeorology and Environmental Monitoring will contribute to an accurate forecast of the crop and harvest time. By 2021, escorting 100% of agricultural products export-oriented will be accompanied by a paperless "field to port" system.

4. "Agro-solutions for agribusiness" includes the creation and scaling of domestic integrated digital agro-solutions: "Smart Farm", "Smart Field", "Smart Herd", "Smart Greenhouse", "Smart Processing", "Smart Warehouse", "Smart Agrooffice" (https://www.mcxac.ru/).
5. "Land of Knowledge" involves the creation of Russia's first industrial quasicorporate electronic educational system. It is planned to train 55,000 specialists of agricultural enterprises for 3 years in the digital economy.

The departmental project involves the implementation of the "Information System of Digital Services of the AIC" of the Ministry of Agriculture of the Russian Federation. This will eliminate the need for agricultural producers to conduct personal visits to regional and municipal agro-industrial complex authorities for government support measures (Departmental project "Digital Agriculture" 2019). Such an innovation is aimed at the formation of a single digital space that ensures the implementation of the tasks of digital transformation of agriculture. This will ensure the speed and interactivity of the provision of state support measures to economic entities in the agricultural sector.

An important point in digitalization will be the lack of the need to submit large sets of documents for applications, the provision of reporting forms in various information systems. The implementation of the electronic reporting process by agricultural producers through a personal account in a super service will facilitate the automatic verification of data between reporting forms, filling out reporting forms provided by the Ministry of Agriculture of Russia in one interface, reducing the length of the preparation and delivery of reports and operating costs and the duration of the acceptance process reporting, as well as improve the quality of information in reporting (the introduction of automated monitoring during reporting by agricultural producers).

To obtain state support measures, agricultural producers will have to provide accounting and financial statements (for example, as part of the provision of tax reporting to the Federal Tax Service). Automating the process of presenting these reports will significantly reduce the time and costs of entities involved in this process and receive up-to-date information by state authorities responsible for providing state support measures about financial and accounting reporting more quickly (Departmental project "Digital Agriculture" 2019).

An important digital tool is the *Central Information and Analytical System of the Ministry of Agriculture of Russia*. The system was developed to form a single analytical base for monitoring the state of the agro-industrial complex and support management decisions by the Ministry.

Attaching importance to subsidies, the Ministry of Agriculture introduced the *Automated Information System "Subsidies for Agriculture"*, the main functions of which are to distribute subsidies, inform the Russian Federation on subsidies, monitor the subsidies, monitor the quarterly reporting on subsidies, and select investment projects.

5   Current State of Digital Agriculture and the Needs of the Industry in Digital Technologies

The introduction of digital technologies will contribute to the total increase in agricultural production, which will amount to 361.4 billion rubles. In 2017, the actual volume of crop production amounted to 3033.2 billion rubles. The volume of crop production using digital technologies is 3227.1 billion rubles. The expected increase in crop production due to the introduction of digital technologies is 193.9 billion rubles. Elements of the Internet of Things (IoT) are already used by up to 0.05–5% of agricultural producers in Russia (Agrophysical Research Institute). For comparison, in the USA it is up to 60%, in the EU – up to 80% (Truflak 2018).

Precision farming related solutions are used by about 10% of Russian agricultural enterprises, holdings and farms (Truflak 2018). According to the results of the study in 85 constituent entities of the Russian Federation, 20% of them demonstrate a high level of development of information technology and the introduction of technological solutions in the agricultural sector, and an average indicator is recorded in 29% of the regions (Official website Analytical 2019).

Among the leaders in the pace of implementation of digital approaches in agriculture: Altai Region, Krasnodar Region, Kursk Region, Lipetsk Region, Samara Region, Republic of Bashkiria, Republic of Tatarstan. The level of agro-industrialization digitalization in the regions was assessed by such indicators as testing pilot solutions and their replication, full-featured use of e-Government and new digital technologies, amending regulations that ensure the implementation of the departmental project "Digital Agriculture", unification and application of centralized solutions, and also the ability to connect existing regional systems with a high level of development of information technology.

Studies of industry needs for digital technology have shown the following results. For half of large and medium enterprises in the agricultural sector and about one third of small businesses there are no barriers to the introduction of digital technologies. Costs for one third of such entities are the main factor hindering their implementation. For small and medium enterprises there are no digital applications that meet their needs (demand). (Results of research 2019) (Fig. 2).
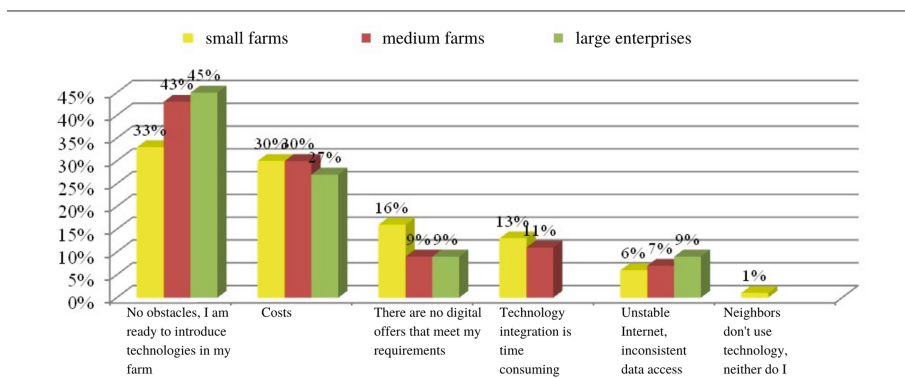

Fig. 2. Digital dissemination problems

Effective implementation of digital technologies is provided not only by financial support, but also by supporting infrastructure (Fig. 3).
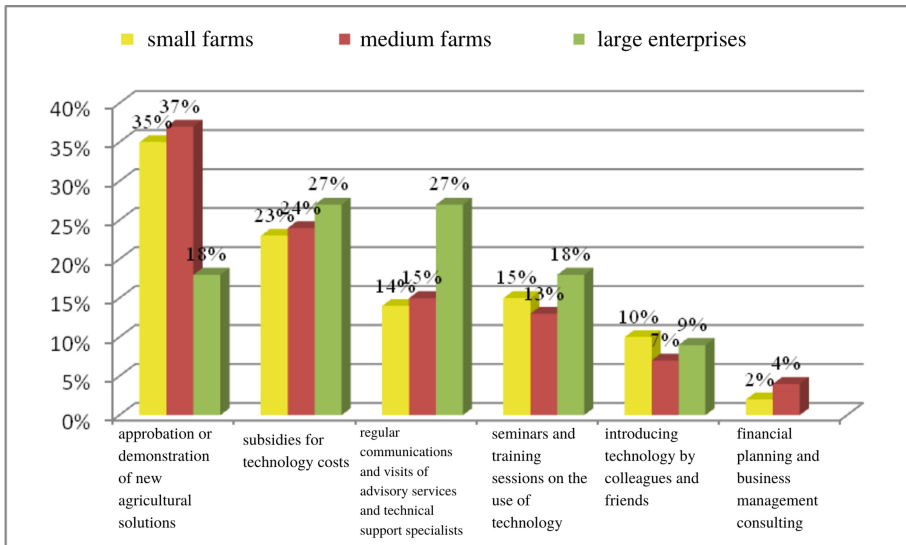

Fig. 3. Digital distribution solutions

According to business entities of the industry, financial investments are needed in training programs, experience exchange programs, etc.

6   The Main Problems of Agricultural Transformation in the Context of Economy Digitalization

Based on the traditional methodology for conducting SWOT analysis, we will identify positive and negative trends in the digital transformation of agriculture, which serve as the basis for the formation of strategic growth points that contribute to the full introduction of digital technologies in the industry (Table 1).

Table 1. General matrix of the SWOT analysis of agricultural transformation in digitalization

Benefits (Strengths) (S)	Disadvantages (weaknesses) (W)
Increasing industry profitability	Lack of trained IT specialists in the industry
Increased food consumption, improved product quality	Imperfection of legal regulation of the development of information technology in the industry
Conditions to reduce the cost of agricultural raw materials	A low level of staffing in the context of information security
Reduction in the cost of agricultural products for the population	Lack of full digital infrastructure in rural areas
Increase in export earnings, modeling of export flows of agricultural raw materials	Insufficient level of knowledge on the creation and use of information and communication technologies
Improving the financial support process for agricultural producers (changing the procedure for providing accounting and financial statements, simplifying loan approval procedures and obtaining subsidies)	Insufficient or complete lack of financial resources for majority of agricultural producers for the introduction of technologies
Formation of an effective sales chain from producer to consumer	Low awareness of digital technology
Integration into related industries of the digital economy	
Worldwide availability and promotion of goods	
Opportunities (O)	Threats (T)
Expansion of geographical and economic markets	Minimization of human participation in agricultural activities (rising unemployment)
The relationship of agricultural producers and consumers	High import dependence (lack of production of the required amount of Internet of things of Russian production)
Creation of conditions for increasing transparency of agricultural markets for households and consumers	Digital fraud, increasing cybercrime, expanding "opportunities" for illegal financial activities
Providing farmers with new IT - opportunities to increase added value	Disappearance of professions (transformation of professions)
Creation of databases on the preferences of consumers of agricultural products and the possibilities of their producers	Ethical issues
Agricultural producer income growth	
Increasing the attractiveness of the industry as a type of labor activity	
Reduction of negative environmental impact	

A significant factor in the context of the digital transformation of the industry remains the lack of qualified IT specialists. In the Russian Federation, 112.9 thousand IT specialists in the agricultural sector, or 2.4% of the total population employed in agriculture (see Fig. 4).
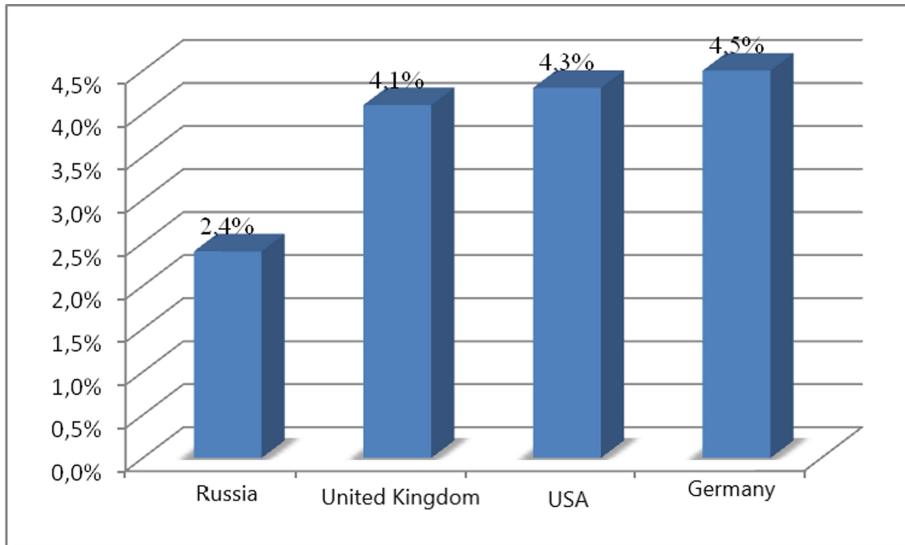
Fig. 4. The share of IT professionals in agriculture of the total number of agricultural workers

So, according to the Analytical Center for the Ministry of Agriculture in Russia, there is 1 IT specialist per 1000 people employed in agriculture. The size of investments in ITC in 2017 amounted to 3.6 billion rubles, or 0.5% of the total investment in fixed assets. This is the lowest indicator in the industry, which indicates the low digitalization of the domestic agricultural sector and the competitive advantage of foreign producers. To achieve the indicator as the leading countries (USA, Germany, Great Britain), Russia and another 90 thousand IT specialists in agriculture are needed.

7   Conclusion

Based on the results of the study, we will offer the following directions for solving the problems of agricultural transformation in the context of digitalization. Thus, the development of the personnel potential of the industry requires appropriate training of specialists who are able to service equipment and cyberphysical devices. The centers of competence for digitalization of agriculture created in the regions (for example, the Kemerovo Region, Oryol Region, Altai Territory, etc.) can become a platform for organizing a system of continuous training of specialists in order to build competence in the field of digital transformation of agriculture.

A significant barrier in the implementation of modern ICT is the insufficiently high level of solvency of agricultural producers. It is advisable to continue to improve the subsidy system in the context of program-targeted methods of agricultural support (subsidizing Russian organizations developing and introducing digital platforms and software products at industry enterprises) and expand the scope of grant financing. The instability of budget financing is predetermined by the need to attract private investment in order to introduce and maintain technological equipment for digital agriculture.

The state should create conditions for motivating private entities in solving this problem (tax benefits, provision of guarantees, loans, grants, etc.). So, in the UK, after the adoption of the law "On the Digital Economy" in 2010, a digital economy strategy was developed aimed at solving the problems of digital transformation of the national economy (Strelkova 2018). R&D financing and tax credits are the main tools in the development of the US digital economy. In Australia, the role of the state in the process of digitalization of the economy is represented by providing the legal framework, increasing the scale of investments in public broadband access to the Internet, science and research.

The identified shortcomings during the SWOT analysis emphasized the feasibility of the legislative regulation of digital agriculture, as the current regulatory legal acts slow down the digitalization of agriculture (imperfection of the norms obliging to provide information on the state and use of agricultural land, etc.)

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