Digital technologies for organic agribusiness in Russia

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Digital technologies for organic agribusiness in Russia

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Abstract. Organic production is a priority in the development of the green economy. The aim of the study is to identify opportunities for the prospective development of organic agribusiness in a digital environment and on the way to a green economy. The research methods were the study of the scientific literature and the regulatory framework, followed by a generalization of the received information, as well as analytical and comparative methods. The study made it possible to assess the current state of organic agribusiness. The introduction of digital technologies involving the automation of production, technological, and managerial processes will contribute to the prospective development of organic agribusiness, will allow the production of better products with less harm to the environment, and will also increase the efficiency of organic production due to more economical use of resources. As a result of the study, the directions of greening and digitalization of agribusiness in Russia were identified with a view to transition to a green economy. The practical significance of the study lies in the possibility of using the results in the development and improvement of the regulatory framework for the development of organic agriculture.

1. Introduction

The Russian agricultural sector has a huge resource, scientific, technical, industrial, and labor potential. At the same time, one of the most important problems of Russian agribusiness is the uncontrolled consumption of resources, accompanied by the use of obsolete equipment and technologies, and not taking into account environmental standards, which affects the quality of products and the health of the country's population. The greening of Russian agribusiness will help to avoid adverse effects and ensure further progressive development. In this case, greening refers to the transition to a green economy, the principles of which correspond to organic agriculture. The goals set by the country for the next 10–20 years are in line with the goals of the transition to a green economy, which is reflected in the policy of using resources and protecting the environment, and regulatory documents. However, the possibilities of Russian organic agribusiness in implementing the principles of the green economy are limited due to the small volume of production and the insufficient number of producers of organic products, the lack of support programs for organic agribusiness, as well as educational and research programs [1].

The organic production system is based on biodiversity and natural cycles, and combines traditional methods and innovations to improve the environment. The spread of digital technology, which assumes effective resource conservation, opens up new opportunities. Digital technologies are

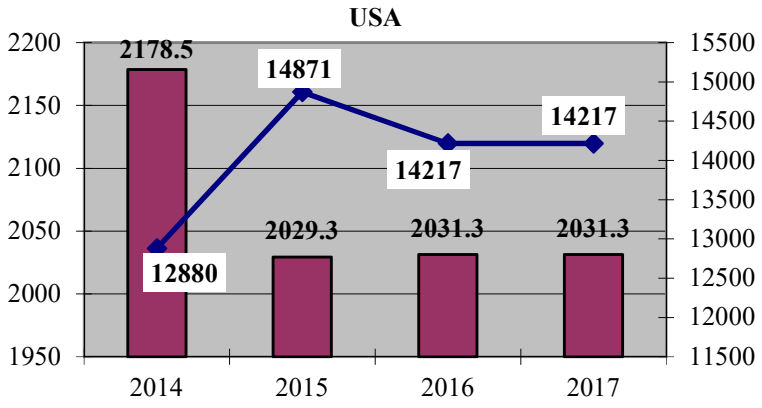
based on the use of automated decision-making systems, integrated automation and robotization of production, as well as design and modeling technologies, and are aimed at minimizing the use of external resources with the maximum use of local production factors. Digital technology can help environmental groups to reduce the environmental footprint of agribusiness. State authorities must ensure that a balance of interests is maintained between agribusiness seeking to maximize profits and people standing out for a clean environment.

The publications of domestic authors (A.G. Paptsov [2], N.D. Avarsky, J.E. Sokolova, V.V. Taran [3], B.A. Voronin [4], etc.) reflect various aspects associated with the production and sale of organic products. The influence of digital technologies on the development of organic agribusiness on the path to a green economy is poorly covered in the scientific literature. The circumstances noted above determined the relevance of the study.

2. Materials and Methods

The work is based on research materials on the development of organic agribusiness, the possibilities of the digital economy to improve the efficiency of agricultural activities, as well as state policy in the field of regulation of organic production and digital transformation of agriculture. As research methods, the study of various sources of information was used, followed by data generalization, analytical and comparative methods. The results of the study are practical and can be used by representatives of government agencies in the development and improvement of the regulatory framework for the development of organic agriculture.

Nowadays, organic agribusiness in Russia is one of the fastest growing sectors and is showing positive growth. According to the Swiss Research Institute of Organic Agriculture (FiBL) and the International Federation of Organic Agriculture Movements (IFOAM-Organics International), in 2017, the area of organic land increased to 656.9 thousand ha, or 2.7 times compared to 2014 (Fig. 1). Russia holds one of the first places in the growth of certified lands for organic agriculture. In 2017, only 89 households were engaged in the production of organic products. Most organic farms in Russia are small and medium in size, about 70% of producers produce crop products. These indicators are negligible and not comparable with many countries, for example, the USA and Germany [5-8].



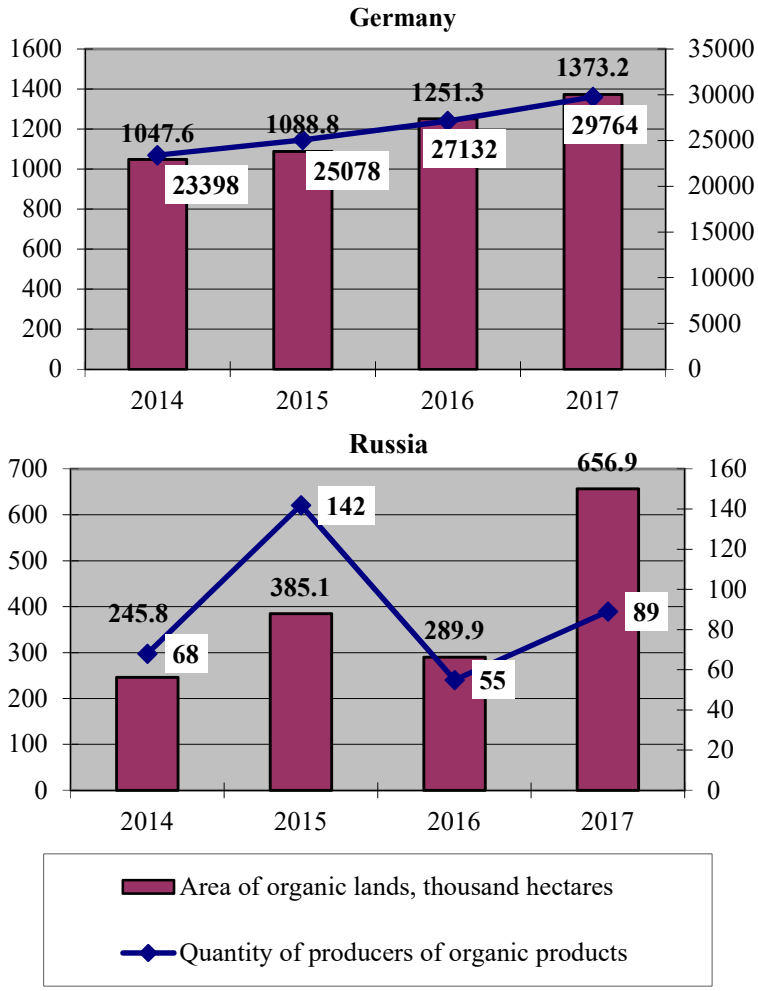


Figure 1. The main indicators of the development of organic agriculture in the USA, Germany and Russia in 2014-2017.

Russian Federal Law N 280-FZ “On Organic Products and on Amending Certain Legislative Acts of the Russian Federation” was adopted on August 3, 2018 [9]. Federal law regulates relations associated with the production, storage, transportation, labeling and sale of organic products. It comes into force on January 1, 2020. The establishment of uniform game rules for all representatives of organic agribusiness will contribute to the popularization of organic products among consumers and will lead to the development of Russian organic agribusiness.

The production and distribution of organic products in Russia is also regulated by three national standards (GOST): GOST R 56104–2014 “Organic food products. Terms and Definitions”; GOST R 56508–2015 “Organic production. Rules of production, storage, transportation”; GOST R 57022–2016 “Organic production. The procedure for conducting voluntary certification of organic production”, as well as the Interstate Standard GOST 33980-2016 “Organic production, production rules, processing, labeling and sales (CAC/GL 32-1999, NEQ)”, which is in force in Russia, Kyrgyzstan and Tajikistan [10].

Within the framework of the State Program for the development of agriculture and the regulation of agricultural products, raw materials and food markets for the period until 2025 (hereinafter referred to as the State Program), there are no areas for the development of organic agriculture, and there is no

separate state program, accordingly, no measures of state support for producers of organic products are been taken [11].

Thus, organic agriculture in Russia at the very beginning of its development. Due to the lack of a national data collection system in this area, it is difficult to give a more detailed assessment of the current state of organic agriculture in Russia.

3. Results

Compliance with the principles of the green economy implies the economical use and conservation of natural resources. Therefore, priority is given to new technologies that contribute to the preservation of the environment. Organic agriculture is a recognized method for solving environmental problems in the agricultural sector. Compared to traditional agriculture, less energy is required to produce organic products, and a positive environmental impact is expressed in: reduction of greenhouse gas emissions; reduced freshwater intake; increase biodiversity through natural methods of controlling pests, diseases and weeds, which preserve beneficial organisms; increasing soil fertility through the use of crop rotation, organic fertilizers, mulch, cover crops; preventing erosion and soil compaction. Thus, the use of green technologies in organic agriculture activates the processes of self-healing of disturbed ecosystems. Organic foods are safe and improve public health [12].

Organic agriculture involves not just abandoning the chemicalization of production, but the use of green technologies (scientifically defined methods for selecting crops and varieties, crop rotation planning taking into account the effectiveness of organic fertilizers, biological methods for controlling pests, diseases and weeds, various methods of minimizing soil cultivation etc.), which not only improve the state of the environment, but also make it possible to achieve increased production and labor productivity [13, 14, 15].

The introduction of digital technologies involving the automation of production and technological processes, a management system, jobs, logistics, interactions with consumers, competitors, investors, authorities, etc. will contribute to a significant increase in the production of organic products. Digitalization of organic agribusiness allows making targeted, objective decisions, integrally considering complex set of various biological processes. The cost of sensors decreases, they become cheaper and more affordable. Almost any organic farm with their help can collect a huge amount of data, get deep analytics [16]. The range of digital solutions for green technologies in organic agriculture is presented in Table 1.

Table 1. The range of digital solutions for green technologies in organic agriculture.

Green technologies	Digital technologies	Effect of the introduction of digital technology
✓ Crop rotation ✓ Combination of crops ✓ The use of cover crops ✓ Design of farming systems	✓ Electronic field maps, software for convenient work with them. ✓ High-precision agrochemical field inspection. ✓ The use of sensors ✓ IoT platforms	Creation of an electronic field map that clearly shows all the characteristics of the field, combining it with a soil map containing many parameters and soil characteristics collected using sensors, processing information with specialized software on the IoT platform: simplifies the planning of production processes, including on the basis of information about predecessors, past cases of infection with pests or diseases in each field; facilitates the selection of suitable crops grown on the field for each season or year, as well as cover crops; promotes competent spatial organization used to combine crops; allows more accurately calculating the amount of necessary seeds, fertilizers, fuel for equipment
Drip irrigation system	Automatic watering and irrigation	A drip irrigation system using IoT sensors that monitor the level of soil moisture and the state of the plants will make watering plants almost completely autonomous.
The use of organic	Yield mapping system	Yield mapping system and variable rate technology allow

fertilizers	and variable rate technology	distributing organic fertilizers (e.g. compost and vermicompost, green manure, manure, microbial fertilizers) more rationally, changing the dose of fertilizers depending on the soil composition, planned yield and needs of each field zone.
Monitoring pests, diseases and weeds	✓ Unmanned vehicles ✓ Unmanned aerial vehicles ✓ The use of sensors	Ground-based unmanned vehicles, unmanned aerial vehicles equipped with cameras and highly sensitive sensors, as well as sensors installed dozens of kilometers away, provide specific information about the state of the monitored fields, in particular, monitor plant health, detect pests and control weeds in time.
✓ Minimum tillage ✓ Mulching	✓ Soil samplers ✓ Laboratories for soil and product analysis.	Minimum tillage and mulching help to improve the natural structure of the soil, prevent soil erosion. Automated mechanisms for sampling the soil allow monitoring its condition, making decisions about covering the soil with mulch or additional organic fertilizers.
✓ Active use and conservation of natural enemies of pests ✓ Mechanical pest control ✓ Biological control of pests, diseases and weeds ✓ Natural insecticides	✓ The use of sensors ✓ Weather stations	The choice of various methods for controlling pests, diseases and weeds is based on information about pests, pathogens, and the condition of crops. Information can be obtained using sensors. Weather stations allow more accurately predicting the weather for field work.
Selection of high quality organic seeds and planting material of suitable varieties	Laboratories for soil and product analysis.	The presence of our own laboratories allows quickly obtaining the results of product analyzes as a result of field trials. This makes it possible to increase productivity, product quality and crop stability.

Implementation of IoT projects in organic agriculture, combining technologies in the field of data analysis, sensor development and self-driving (unmanned) equipment, as well as connected network solutions, control systems, platforms and applications, will bring plant growing methods to a new level. The use of digital technologies in organic agriculture will allow, on the one hand, producing better products with less harm to the environment, and on the other hand, increasing the efficiency of operations through more economical use of resources.

A high-quality exchange of accessible and reliable information is necessary for agribusiness entities not only at the production stage but also during the promotion of products in markets, including export ones. The development of the system of logistics, storage and delivery of organic products will be facilitated by information and communication interactions between organizations in a single information space of the agricultural sector of the economy. Organic producers can share and post information on one platform.

As part of the implementation of measures to form state information resources in the areas of ensuring food security and managing agribusiness of the State Program, the Ministry of Agriculture of the Russian Federation has created such information systems as: The system of providing public services in electronic form of the Ministry of Agriculture of the Russian Federation; Automated information system of registers and reference information; A comprehensive information system for collecting and processing accounting and specialized reports of agricultural producers, generating summary reports, monitoring, accounting, control and analysis of subsidies to support agribusiness, etc. There are also the functional subsystem “Electronic Atlas of Agricultural Lands”, the automated information system “Federal register of agricultural property”, and others [11]. The creation of an organic land information system filled with relevant and reliable information about the location,

condition and actual use of each land plot in the Russian regions, cultivated crops in real time, will provide equal access to information for management bodies and organic agribusiness entities.

In 2019, the departmental project "Digital Agriculture" was included in the State Program in the direction (subprogram) "Ensuring the conditions for the development of the agricultural sector" [11]. The departmental project involves the digital transformation of agriculture in 2019-2021 and is designed for three levels:

national - the 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 - smart industry planning, smart contracts;

agribusiness level - the massive introduction of integrated digital agro-solutions, the massive acquisition of digital competencies by specialists of agricultural enterprises.

The project involves work in several areas: "Effective hectare", "Smart contracts", "Agro-export "From field to port", "Agro-solutions for agribusiness", "Land of knowledge", and also provides for the creation of information systems for operational monitoring of the condition and development of agricultural facilities and agricultural land.

Thus, organic agribusiness in Russia has significant reserves of growth in production volumes, increased efficiency and increased labor productivity through the use of modern digital management solutions at the macro and micro levels.

4. Conclusions

The effect of the use of green technologies in combination with digital ones can provide a big leap in the field of organic agriculture and the transition to a green economy [17]. Government officials and agribusiness entities should join forces along this path. It is advisable to include the following areas of state support for organic agribusiness:

- financial support per unit of cultivated area/unit of finished products for the conversion period, as well as for the purchase of new equipment, the use of IT equipment and platforms;
- improvement of the certification and standardization system, including partial compensation of certification costs;
- reduction of tax payments to preserve the environment;
- advanced training, training and retraining of personnel for organic production and IT specialists;
- support for organic processors;
- promoting the consumption of healthy organic products

Improving the environment as part of the green economy is impossible without revising approaches to agricultural production methods. Russian organic agribusiness should use new growth opportunities, in particular, the use of digital technologies. Investments in green and digital technologies will mitigate environmental and social problems, increase rural incomes, and contribute to the economic development of the country as a whole.

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