The development of digital economic in the agricultural sector of region

I Kovaleva, M Kudinova, E Ghidkich and V Levichev
Atai State agricultural University, Barnaul, Russia

E-mail: irakovaleva20051@rambler.ru

Abstract. In the national economy of Russia, elements of the digital economy are being actively implemented in various sectors of the economy. With regard to the agricultural sectors, digitalization of production management is an element of strategic development. Insufficiently high rates of development of this direction are accompanied by the influence of various exogenous and endogenous factors in the agricultural sectors of the regional level. The development of public-private partnerships in the agricultural sector of the economy is of great importance. The management of the regional agro-industrial complex requires the use of innovative technologies, including the digitalization of the sectoral economy. The basis of digitalization is the marketing concept of consumer orientation. The model of providing financial resources for state support in the development of the digital economy of agriculture in the Altai Territory is carried out in accordance with state and targeted programs. It is concluded that sectoral digitalization will increase the level of competitiveness of the region.

1. Introduction
The birth of the digital economy is so closely related to the development of new technologies that it is not possible to discuss these two topics separately from each other. The development of technologies, of course, is important and creates the necessary basis for building the "Digital" economy, but it is only a necessary precondition. The Internet appeared in 1982. We can assume that it was from this moment that the virtual world began to form. Since then, it has been actively developing, complementing all the new components, such as forums, on-line computer games, social networks, etc.

The digital economy is an economic activity in which digital data is a key factor in production, processing large volumes and using the results of analysis, in comparison with traditional forms of management, can significantly increase the efficiency of various types of production, technologies, equipment, storage, sale, delivery of goods and services.

Starting from 2019, Russia will begin to create a large information system, which will collect data on all agricultural enterprises in the country. But the farmers themselves are not ready to share them, and they are wary of digital technologies. In 2017, Russia created the Program “Digital Economy of the Russian Federation”, which was approved by the order of the Government of the Russian Federation dated July 28, 2017 No. 1632-r. Directions for the development of the digital economy: regulatory regulation; personnel and education; formation of research competencies and technological groundwork; information infrastructure; Information Security.
2. Materials and methods
Based on theoretical and methodological research - the work of domestic and foreign scientists on the development of agricultural production in the condition digital economic; Land development; research and recommendations of the Russian Academy of Agricultural Sciences, laws, presidential decrees and executive orders of the Government of the Russian Federation. The study uses a systematic approach to ensure the complexity and focus of scientific recommendations, analytical, abstract-logical, calculating-constructive, economic-statistical, monographic methods of research.

3. Result
The digital transformation of management in the agro-industrial complex of Russia is a task set by the time. Today, the agro-industrial complex demonstrates an increase in production indicators and is on the rise: record harvests are being collected, the tasks of accelerated import substitution are being successfully solved, the country has become a leader in grain export supplies. For many indicators, the target indicators laid down in the Food Security Doctrine have already been achieved. Russia is fully self-sufficient in grain, sugar, poultry and pork. This is largely the result of a significant increase in investment in the agro-industrial complex. However, the creation of a platform that provides a breakthrough in further technical modernization of production is possible only if technologies are improved based on their digitalization, focus on a specific consumer.

Recently, modern concepts of conducting industries, including agriculture, based on digital technologies have appeared. The management of the regional agro-industrial complex requires the use of innovative technologies, including the digitalization of the sector economy. The basis of digitalization is the marketing concept of consumer orientation.

In Russia, the share of the digital economy in GDP is 2.8%, or 75 billion US dollars [1,2]. In agriculture, the development of geolocation technologies, "precision" farming, etc. is relevant. The introduction of digital technologies in agriculture involves: Pilot technologies and other industry modernization technologies; Integration and multi-structured forms of cooperation.

![Figure 1](image_url)

**Figure 1.** Implementation of information technology assessment efficiency of agricultural policy.

For the development of sector digitalization of agriculture, it is necessary to develop uniform standards that will allow combining unifying developments in the field of digital agricultural technologies and removing the problem of choice and related risks. One of the problems in the development of digital technologies in agricultural industries is the creation of logistics providers (PL) in the field of creating integrated cloud services. PL will optimize the data of digital arrays in terms of agricultural machinery and provide information and financial flows. In addition, the integrated service will ensure the efficient use of the digital array - remote sensing of the earth, hyper spectral aerial photography, weather forecast data, etc. Thus, the "cloud" service is based on a marketing approach in
the management of the industry [3]. Sometimes Authors said about impotents the use of elements digital economic [4,5]. New generation digital technologies have a number of advantages: will increase the efficiency of investments in the agro-industrial complex; “Will become an important element of non-financial state support for agriculture” [6] (figure 1).

The subject of research in the digital economy is an agricultural organization. The digitalization of the sector economy, including agriculture, involves an active investment policy in terms of IT technologies, consulting and data processing. Capital investments must be optimally distributed between businesses, which imply indicative participation of the state. State planning involves the development of infrastructure requiring investment [7]. Agriculture of the region forms 20% of the gross regional product. Almost 70% of the territory falls on agricultural land.

“If we talk about satellite navigation systems, then practically all large agricultural enterprises have such monitoring systems. Certain elements of precision farming are being mastered and introduced in more than 100 farms. The total application of precision farming systems is carried out in 15 enterprises. Unmanned aerial vehicles operate in the fields of about 10 farms. In addition, a number of enterprises receive such services on a contractual basis. If we evaluate all the vectors of the "numbers", then at the moment in the agriculture of the Altai Territory advanced digital technologies cover more than 660 thousand hectares of arable land, which is about 10% of its total area” [8,9]. For a more intensive implementation of elements of the digital economy, government support for business is required. [8] (figure 2).

Figure 2. Elements of the digital economy in agriculture.

“The Altai Territory is a region of developed animal husbandry. In the field of animal husbandry, the use of IT technologies is aimed at individual support for each animal, automation of technological processes, for example, feeding, milking, manure removal, maintaining a microclimate, etc. reduce labor, energy and other costs. The main element of "smart animal husbandry" is electronic systems for identifying animals using RFID tags or other sensors that can be embedded in ear tags and collars or implanted (implanted) into the body of animals. In addition, the share of implementation of information systems for management and breeding work is high.” [8] Therefore, the use of IT technologies in various sectors of the agro-industrial complex was reflected in the “Program "Digital Economy of the Russian Federation".
At the regional level, there are 3 stages in the development of digital technologies in agriculture (figure 3).

Taking a course towards modernization and intensification of the agricultural sector, Altai firmly holds a leading position in the country in the production of basic types of agricultural products and food. More than 80% of manufactured products are annually exported outside the region; the task of increasing exports is being successfully solved.

Today the industry operates in fundamentally new and qualitative dimensions. And this requires enterprises to develop in modern technological formats, attract investment and highly qualified personnel, work to increase the competitiveness of products and labor productivity, and create decent working conditions for employees.

Space monitoring of fields, remotely controlled tractors and combines, precision farming systems - these are not perspectives of the distant future, but the present day of the agrarian complex of the Altai Territory. For example, in the Rodinsky farm (part of the KDV-Group structure), due to the use of a wide range of IT solutions (satellite navigation equipment, precision farming elements, own meteorological stations) on an area of more than 15 thousand hectares, the yield of a number of agricultural crops has tripled. The consumption of fuels and lubricants due to the installation of special sensors [satellite navigation] is reduced by 25-30%.

At the agricultural enterprise "Agrofirma" Urozhai "(Zonal District) due to the introduction of certain elements of the" figure "on an area of more than 8 thousand hectares over the past five years, the yield of winter crops increased by 25% and last year exceeded 54 centners per hectare.

The peasant farm "Partner" (Mikhailovsky District) relies on "smart" agricultural machinery and uses the latest achievements of the world agricultural machinery in production. On the farm's fields on an area of more than 22 thousand hectares, modern sowing complexes, sprayers with photocells, as well as differentiated application of mineral fertilizers, and the latest models of harvesting equipment operate.

At the agricultural enterprise "Plemreproduktor" Timiryazevsky "(Mamontovsky district), the yield of agricultural crops is increased with the help of a liquidizer - an injector of liquid mineral fertilizers. The application is carried out according to the track of the movement of equipment built by the satellite navigation system, the fertilization is carried out to the required depth [9].

There are many farms that use elements of digital technologies in the region, but the level of equipment is different for everyone. If we talk about satellite navigation systems, then its coverage is large, almost all large agricultural enterprises have such monitoring systems. Certain elements of
precision farming are being mastered and introduced in more than 100 farms. The total application of precision farming systems is carried out in 15 enterprises. Unmanned aerial vehicles operate in the fields of about 10 farms. In addition, a number of enterprises receive such services on a contractual basis.

If we evaluate all the vectors of the "numbers", then at the moment in the agriculture of the Altai Territory, advanced digital technologies cover more than 660 thousand hectares of arable land, which is about 10% of its total area. At the regional level, the Ministry of Agriculture of the Altai Territory in 2015 introduced the regional information system IS.RESPAK, designed for the comprehensive automation of the process of bringing state support funds on the basis of personal accounts of agricultural producers of the region, as well as industry management, based on current and target indicators, and analysis of the state industry as a whole in the region.

The information system provides:

- centralized storage of manufacturers' data;
- integration with the infrastructure of "Electronic government", electronic identification of farmers in the Unified System of Identification and Authentication (ESIA);
- personal accounts of agricultural producers in the region (more than 2.5 thousand large farms, more than 10 thousand with personal subsidiary plots);
- a single space for storing data from periodic reporting, references and calculations;
- automatic calculation of the amount of state support;
- formation of printed documents;
- interagency interaction within the system (FTS, Rosreestr, Rosselkhoztsentr);
- generation of the required reporting, incl. to analyze the current situation;
- organization of legally significant electronic document flow - smart contracts using electronic digital signature.

The solution is built on open technologies, which corresponds to the import substitution program and does not require the acquisition of licenses for the number of jobs. IS. RESPAK is included in the Unified Register of Russian Programs for Electronic Computers and Databases. The entire volume of state support for agricultural producers in the Altai Territory is processed by this system. In 2018, the system processed more than 12.5 thousand applications for state support, for a total amount of more than 3.3 billion rubles. With the help of the IS. RESPAK system, 42 thousand reports of agricultural producers were received and processed [10].

Altai farm "Rodinskoye" began to comprehensively engage in digitalization a few years ago. It was important for the federal holding KDV-group to keep track of all stages of production, from the volume of fuel used on each combine to the depth of soil cultivation. After the introduction of the fuel consumption control system, "Rodinskoye" saved up to 30%, which is a serious indicator for a large farm, where 16 thousand hectares of arable land are cultivated. In "Rodinskoye", agricultural machinery is literally crammed with various sensors. They control the geometry of the equipment during operation. This, for example, allows the agronomist to remotely track the depth of plowing of the soil in each field with an accuracy of centimeters.

At the same time, according to experts' estimates, in the Altai Territory, the number of farms that comprehensively approach digitalization issues does not exceed 10-15 out of several thousand. The rest, at best, use separate elements of precision farming, or are generally far from it.

It is assumed that "Russian Space Systems" can create a network of base reference stations for high-precision farming in the Altai Territory. The company plans to install five such stations in three regions with the most developed agricultural production. If the project is successful, it will be expanded to the scale of the entire region. According to experts, this will require about 60 million rubles. As part of the execution of paragraph 5 of the protocol of the meeting with the Deputy Prime Minister of the Russian Federation Maxim Akimov dated July 20, 2018 No. MA-P8-39pr, the Ministry of Agriculture of the Altai Territory this year is starting to implement a pilot project on the digital transformation of agriculture in the region, including the creation of an appropriate center competencies.
The activities of the pilot project have been agreed with the Ministry of Agriculture of the Russian Federation and include the following areas:

- creation in the region of a center of competence for the digitalization of agriculture on the basis of the Altai State Agrarian University;
- development of a regional spatial data fund for storing basic geospatial information on agricultural lands;
- development of a regional information system for interaction with the applicant in the provision of public services in electronic form, involving the creation of a regional system of digital interaction with agricultural producers (with the introduction of digital services);
- development and implementation in three experimental farms of the region of integrated systems of digital agricultural production based on navigation and information systems and high-precision positioning systems.

The implementation of a pilot project for the digitalization of agriculture is planned to be carried out jointly with PJSC Rostelecom and JSC Russian Space Systems within the framework of the concluded agreements.

The pilot project is focused on:

- increasing production efficiency, including increasing the volume of agricultural products, improving its quality, optimizing costs, increasing labor productivity, increasing the profitability of agricultural producers;
- monitoring of agricultural land;
- training of specialists in the field of digital economy;
- development and provision of digital services for agricultural producers (digital diary of an agronomist, investment map of fields, etc.);
- in the medium term - for digital monitoring of crops, forecasting the harvest taking into account the weather factor.

The pilot project for the digitalization of agriculture in the Altai Territory is aimed at implementing the main directions of the departmental federal project "Digital Agriculture" developed by the Ministry of Agriculture of the Russian Federation. However, due to the regional specifics, the expediency of introducing a centralized "federal intellectual system of state support measures + personal account of the subsidy recipient" is highly questionable. For example, the procedure for providing types of state support in the regions is different - it is associated with the agricultural specialization of territories. In some regions, livestock farming is actively developing, and in others - crop production or some territories have better climatic conditions for growing sugar beets, others for corn for grain, buckwheat, lentils. Based on this, the regional authorities determine the directions that need to be supported. Everywhere there is and will be regional specificity, so it is impossible to create a unified functionality of smart contracts.

4. Conclusion

The specificity of conducting agricultural sectors is reflected in the conditions for the introduction of elements of digital technologies and, in general, affects the efficiency of digitalization of agriculture. The introduction of pilot technologies is of great importance as a "vector of development" of integration with the subsequent saturation of the market with IT-technologies. Therefore, compliance with the epic implementation of elements of digital technologies is of fundamental importance, since it will not only optimize the time period for the development of technologies, attract investors, but, in general, effectively operate the regional agricultural economy. It is necessary to create a distributed information system with regional segments, integrated with the central federal part. This will allow you to get a complete picture of what is happening in the industry in the country without losing flexibility and speed.
of making changes to the types of support, to ensure a high level of reliability. The results of the implementation of the pilot project in the Altai Territory can become the basis for building a platform for digitalization of agriculture at the federal level. The implementation of a pilot project for the digitalization of agriculture in the Altai Territory will provide an opportunity to test and implement the best digital solutions, expand the range of digital services provided, increase the yield of environmentally friendly agricultural products, increase the consumption of functional food products, and therefore improve the quality of life of the population.

References
[1] Kovalyova I and Semina L 2018 The Sustainable development of rural areas in terms of economic diversification in the region *East European Science Journal Press* 3(7) 45-9
[2] Kovalyova I 2018 The Diversification of rural territories *Modern Economy Success Press* 47-52
[3] Ministry of Economic Development of the Altai Territory https://econom22.ru/prognoz/strateg/index.php
[4] https://spravochnick.ru/ekonomika/cifrovaya_ekonomika_v_selskom_hozyaystve/
[5] Kundius V, Kovaleva I, Semina L and Voronkova O 2017 Functioning of the Agro-Industrial Cluster in Terms of Development of Innovative-Investment Activity doi: 10.3923/ibm.2017.2097.2103
[6] Bergson A A 1938 Reformulation of certain aspects of welfare economics *The Quarterly Journal of Economics Press* 52(2) 310-34
[7] Sannikova I, Semina L and Kovaleva I 2019 Security factors in the cross-border region *Advances in Social Science, Education and Humanities Research* 364 International Conference on Sustainable Development of Cross-Border Regions: Economic, Social and Security Challenges (ICSDCBR) Press http://creativecommons.org/licenses/by-nc/4.0/)
[8] UN Resolution adopted by the General Assembly *Transforming our world: The 2030 Agenda for Sustainable Development* <http://www.un.org/ga/search/view_doc.asp>
[9] http://en.doc22.ru/
[10] Official site of the Ministry of Agriculture of the Altai Territory http://www.altagro22.ru/