DIGITAL PLATFORMS IN THE NEW WORLD OF DIGITAL AGRICULTURAL BUSINESS

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Abstract. The global process of digital transformation of the economic space currently involves all industries. The introduction of digital technologies and platform solutions into the activities of enterprises in the agricultural sector is a strategically important task to ensure the country's food security, the solution of which is being carried out within the framework of the national project "Digital Agriculture." The relevance and the need for digital transformation of agriculture and the food industry are due to the new capabilities of managing agro-industrial complexes, as well as the modern conditions for the formation and realization of their development potential. The research focuses on instruments of digitalization of agriculture as a way of innovative optimization of its development. The efficiency of introducing digital innovations and information technologies into agriculture is based on improving the efficiency of production processes, organizing and managing an agricultural enterprise, taking into account the elimination of targeted conflicts, while achieving a balance of productivity and environmental friendliness of technological processes. This approach to the digital transformation of the agricultural sector will contribute to the qualitative restructuring of all production and organizational processes, which will ultimately create the prerequisites for increasing efficiency and reducing the risk of agriculture as a whole.

1. Introduction

Traditionally, agriculture was a fairly conservative sector of the economy. At the same time, the significant restrictions on the active use of investments in the development of the agricultural sector are determined by many uncertainties that affect the level of efficiency of such investments. First of all, this is due to the high risk of agriculture against the background of its low margin, the volatility of prices for finished products depending on the dynamics of the cost of fertilizers and fuel, seasonality and the predominance of zones of risky agriculture. Overcoming these obstacles is possible within the framework of the agrarian revolution, while the transition to Agriculture 4.0 will significantly increase the productivity of agricultural enterprises.

The need for a digital transformation of agriculture is caused by the impossibility of its further development in an extensive way. The limitations of irreplaceable resources and the increase of environmental loads create conditions and prerequisites for the use of intensive development tools and the active introduction of digital innovations and information technologies in the agricultural sector. It should also be noted that the issue of food security is more urgent than ever - the current level of population growth in the world requires an adequate increase in agricultural and food products.
The technological diversity and labour intensity of production processes in the agricultural sector, its dependence on many risk factors, reflect the specifics of the digital transformation of agricultural enterprises. The multidimensional application of digital transformation tools in the activities of agricultural enterprises makes it possible to ensure the sustainability of the development of the agricultural sector both through the point use of innovations and through the development and implementation of specialized digital platforms. In general the platformerization as the instrument of adaptation of the agrarian sector to processes of digitalization of economy allows to aggregate the most demanded technologies in uniform digital space: Internet of things, GIS-technologies (geographic information systems), robotics (drones, drones, smart sensors), big data and cloud computing, smart contracts.

The innovative vector of agricultural development is set at the state level by developing and implementing the national program "Digital Agriculture." In this regard, it is necessary to note the relevance of theoretical research and methodological developments in the field of digital transformation of agriculture. Without the consistent introduction of information technologies and innovations in the activities of enterprises in the agricultural sector, it is impossible to achieve the necessary level of their effectiveness [1-3]. The most promising direction of digitalization of agriculture in modern conditions is the creation and promotion of digital platforms as the basis of digital ecosystems of agro-industrial complexes.

2. Materials and methods
One of the industries most susceptible to the introduction of advanced technological solutions is agriculture, as well as the agro-industrial complex as a whole. These industries are developing dynamically around the world, showing a significant increase in technicality and an increase in the size of the information and communication technologies segment.

Modern economic development is based on the need to use information technologies and introduce innovations in the activities of agricultural enterprises [4-6]. Further development of the agricultural sector is impossible without a qualitative restructuring of all technological and organizational processes towards digitalization. The world and domestic practice of transforming agriculture shows that the main drivers of its digitalization are:

- pilotless equipment (unmanned aerial vehicles, drones, clever tractors and combines): allow to collect and analyze information, to enable the pointed realization of necessary technological processes, to form "the smart card" of an agrarian complex;
- Internet of Things allows you to significantly increase the level of food security, helps to record and identify the resources and assets of an agricultural enterprise: the most popular areas of this tool include precision agriculture, smart farms and greenhouses, smart processing and agrofis, smart contracts;
- geoinformation systems (GIS) combine information and space technologies that enable remote monitoring and sensing of necessary data to increase yields, satellite navigation based on digital maps of agricultural land.

In general, the process of digital transformation of agriculture contributes to improving its development efficiency by increasing yields and reducing the risks of innovation and investment. The active use of digital innovation and information technology addresses a number of important challenges:

- providing information support for the adoption and justification of management decisions in agriculture;
- interconnection in time and space of the land, material, technical and labor resources of the agricultural enterprise necessary for planning the technological process of agricultural production;
• real-time monitoring of agrotechnical operations in order to quickly adjust the process taking into account the peculiarities of a particular work area;
• forecasting and levelling of agricultural risks, assessment of losses and search for opportunities to eliminate or minimize them;
• monitoring and analysis of the use of agricultural machinery, rational planning of its use in technological and organizational processes.

3. Results
The pandemic has COVID-19 radically changed the world, forcing investors to quickly respond to extreme risks and uncertainty. At the same time, 2020 showed an unprecedented increase in venture capital investments in the agro-industrial complex. So, in the 2nd quarter of 2020, $5.9 billion was invested in agri-food startups, which is more than twice as much as investments in the same period 2018-2019. Investments in agri-food technologies continue to grow at the level of 50% (2010-2020), showing no signs of a slowdown in 2021.

Among the agro-industrial start-ups, two segments of Agtech and Foodtech are traditionally distinguished. Agtech accumulates digital technologies to improve the productivity and quality of agricultural production, and Foodtech for the food industry.

During the 416 completed rounds of financing, Agtech's investment in 2020 amounted to $ 5 billion, which is twice the year 2019 (Figure 1). At the same time, over the past decade, the total annual growth rate in terms of transactions amounted to 50%, and in the number of completed rounds of financing - 31%. The given impulse remains in 2021. As of mid-March 2021, 67 Agtech transactions have already been conducted with a total funding of 747.9 million dollars.

[Fig. 1. Agtech VC Global Transaction Activity, 2011-2020 [7].]

Investment in Foodtech is also positive, reaching $17.3 billion in the 631 funding round by 2020 (Figure 2). It should be noted that startups that change the chain of creating the value of the final product are of particular interest to investors. In particular, these are technologies that transform food consumption and logistics. The relevance of their implementation is related not only to changes in consumer behaviour under the influence of the pandemic, but also to the support of the concept of sustainable development and the formation of a sustainable food system on this basis. By 2020, Foodtech has accumulated $50 billion in venture capital funding raised over the past decade. At the same time, more than two thirds of such transactions are related to technological solutions in the areas of delivery and electronic commerce. From 2010 to 2020, logistics and e-commerce together attracted 68% of funding.
Another important trend of agro-industrial complex digitalization is the active integration of FinTech solutions into it. In particular, the agricultural industry actively uses online markets for trading, buying and selling goods, as well as digital platforms and services in the framework of operational and financial activities. In order to facilitate distribution among users, market development services and financial services related to supply chain transformation are actively being developed, thereby using e-commerce technologies [8-10].

In Russia, the level of agribusiness can be judged by a number of publicly available indicators, including indicators characterizing the use of information technologies and special software tools (Figure 3). To date, the digital transformation of agricultural, forestry, hunting, fishing and fish farming organizations is slightly lower than in the whole country. Nevertheless, in the context of key sectors of the national economic complex, their values are at a comparable level, second only to high and medium technology sectors.

In general, the agro-industrial complex has significant potential and susceptibility to innovative digital technological solutions, which, in turn, open up new opportunities for additional industry growth. At the same time, innovation in the conditions of digitalization of agriculture becomes the pillar of the strategic development of the agricultural sector, allowing you to modernize established systems and move towards the implementation of digital business models. As a result, the issue of innovative development should always be open: regularly discussed and taken into account in management decisions [12-13]. Because of its growing importance, innovation has a significant impact on the strategic management of the organization, contributing to the evolution of the business
model of an agricultural enterprise from a traditional (classical) organization to a digital ecosystem (Figure 4).

**Traditional business model**
- low degree of automation, personalization and adaptation,
- traditional ways of organizing technological processes

**Digital business model**
- digital innovations in agriculture, flexibility of the innovation platform, adaptation to the specifics and conditions of the implementation of agricultural activities

**Digital ecosystem**
- a single digital space for the production, processing and sale of agricultural products, flexible integration of all ecosystem participants, a synergistic effect for all participants

**Fig. 4.** Evolution of business models of agricultural enterprises in conditions of digitalization of the economy.

The transformation of agriculture is taking place gradually, with the introduction of individual digital innovations and information technologies and a gradual transition to full-fledged digital platforms and ecosystems. Integration into the digital space will bring agriculture to a qualitatively new level of development and will ensure the formation of full-fledged ecosystems in the agricultural sector. The innovative concept of building a digital ecosystem in agriculture is presented in Figure 5.

**Fig. 5.** Digital Ecosystem Model in Agriculture.
4. Discussion
The development and implementation of digital ecosystems in the agricultural sector will allow us to build the process of digital transformation of agriculture along the main trajectories [14-15]:

- functioning of digital platforms at the national level with public support for predictive analytics information through the use of big data, distributed registries and artificial intelligence;
- smart industry planning and implementation of smart contracts, taking into account the regional specificities of agricultural development;
- mass introduction of integrated digital innovations at the agribusiness level, taking into account the formation of the necessary digital competencies among specialists of agro-industrial complexes.

The result of the development and implementation of the model of digital ecosystems in agriculture will be not only their operational adaptation to the processes of digitalization of the economic space as a whole, but also an increase in the level of efficiency of technological and organizational processes of agricultural production. In the near future, this will allow shifting the agricultural sector of the economy from a conservative development path to a progressive one and will create the prerequisites for ensuring its intensity.

5. Conclusions
The study suggests the inevitability of transformational processes in agriculture, which cannot be developed in isolation from the global digital transformation of the world economy. In this regard, the development and implementation of digital agricultural ecosystems on the basis of national and regional digital platforms will create the necessary innovative and investment environment, the presence of which is a key factor in the intensive development of the agricultural sector. It should also be noted that the use of digital innovations and information technologies in the activities of agricultural enterprises will increase the overall level of efficiency against the background of reducing agricultural risks.

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