Introduction and Development of Digital Technologies in Agriculture of the Kyrgyz Republic at the Present Stage

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Abstract: This article discusses the problems and prospects of digitalization in agriculture of the Kyrgyz Republic. The main problems of the introduction of ICT (information and communication technology) in agriculture, and distinctive indicators of digitalization in an integrated economy were shown. The possibilities of using information systems for the transformation of the domestic agricultural sector in the Eurasian Economic Space were shown. Agriculture in the Kyrgyz Republic has its own characteristics. First of all, this is a small-scale commodity type - agro-industrial complexes. In Kyrgyzstan, more than 440 thousand commodity producers with an area of agricultural land from 2 acres to several hectares are engaged in agricultural production. This requires the development and adaptation of individual digital solutions aimed at developing the capabilities of agricultural cooperation and standardization of product quality. Digitalization of the agricultural sector, covering agriculture, crop production, animal husbandry, fisheries and related areas, has led to a sharp increase in the flow of digital data. Thanks to data obtained from a variety of devices in fields, on farms, sensors, agricultural machinery, weather stations, satellites, drones and third-party systems, including cloud industry platforms, it is possible to obtain fundamentally new information.

1 INTRODUCTION

The age of information and computerization is based on the digital representation of information, which leads to an increase in the economic efficiency of an enterprise and an improvement in the quality of work on the scale of the economic and social life of an individual country and the whole world.

The Kyrgyz Republic is located in Central Asia, where more than three quarters of the country's territory is mountainous and landlocked, which is heavily dependent on agriculture, especially in rural areas, where 62% of its population lives. Agriculture in Kyrgyzstan, mainly family-owned, is focused on small-scale cultivation of crops such as potatoes, sugar beet, corn, wheat, along with animal husbandry. In recent years, Kyrgyzstan has begun to pay more attention to the development of digitalization through the introduction of modern information technologies in order to increase the efficiency of agricultural development. Despite these successes, the agricultural sector is lagging behind in the development of digitalization, leaving untapped opportunities for socio-economic growth and development.

Currently, it is impossible to imagine the work of all sectors of the economy, including agriculture, without information and communication technologies. A necessary condition for the digitalization of the economy and agriculture is the achievement of a high level of informatization and automation.

Digitalization creates prerequisites for choosing new directions for the development of the economy of states and entire regions through ensuring the coordinated work of all economic structures, as well as the public administration system.

The transition to the digital economy is manifested in the automation of business processes,

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the introduction of computer technologies into the production activities of agricultural enterprises, service organizations, government agencies, financial institutions and others.

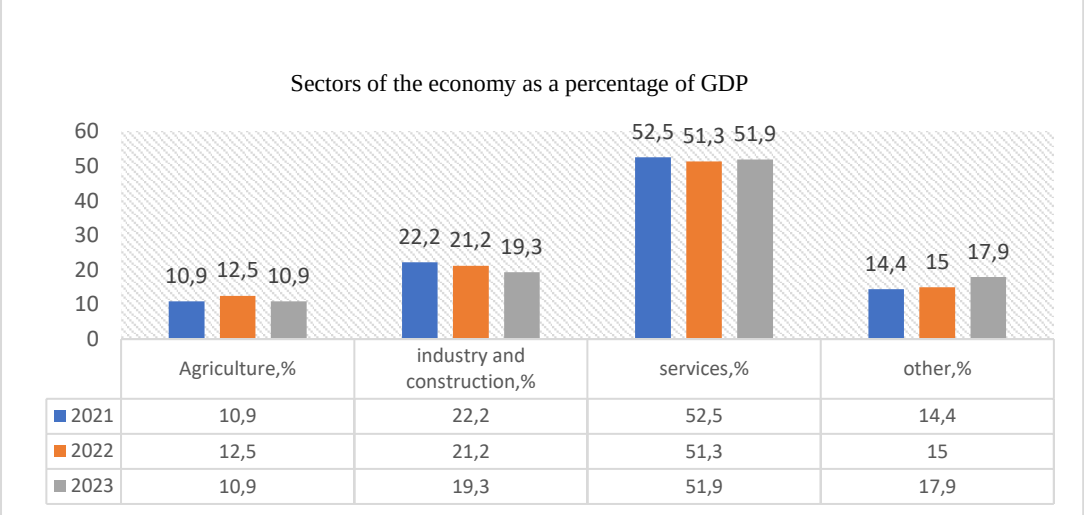
2 MATERIALS AND METHODS

In the Kyrgyz Republic, the starting point for the development of the digital economy can be considered the decision of the Supreme Eurasian Economic Council "On the main directions for the implementation of the digital agenda of the Eurasian Economic Union until 2025" No. 12 dated 11.10.2017. In 2018, the National Strategy for Sustainable Development of the Kyrgyz Republic for 2018-2040 was adopted, as well as the concept of digital transformation “Sanarip Kyrgyzstan” 2019-2023 (Digital Kyrgyzstan 2019-2023), which outlined the contours of the country's digital transformation (Vasilenko, 2017).

In the modern market economy of the Kyrgyz Republic, leading agricultural enterprises consider digital tools as a reserve for increasing productivity and saving production resources. Stimulating the introduction of digital technologies in agriculture will increase the quantity and quality of products produced in the agricultural sector of the Kyrgyz Republic.

Produced high-quality products help provide for the population, increase the profitability of agricultural production and strengthen the stability and sustainable development of agriculture as a whole (Fig. 1.).

Figure 1 shows that the gross domestic product (GDP), according to preliminary estimates, in 2023 amounted to more than 808 billion soms and increased by 4.2% compared to 2022.



	Agriculture,%	industry and construction,%	services,%	other,%
2021	10,9	22,2	52,5	14,4
2022	12,5	21,2	51,3	15
2023	10,9	19,3	51,9	17,9

Figure 1: Food security and poverty information bulletin - B.: National Statistical Committee of the Kyrgyz Republic, 2023. Compiled by the author.

According to Figure 2, it can be seen that the gross output of agriculture, forestry and fisheries in 2023 amounted to 293.6 billion soms, while the physical volume index was 100.1%.

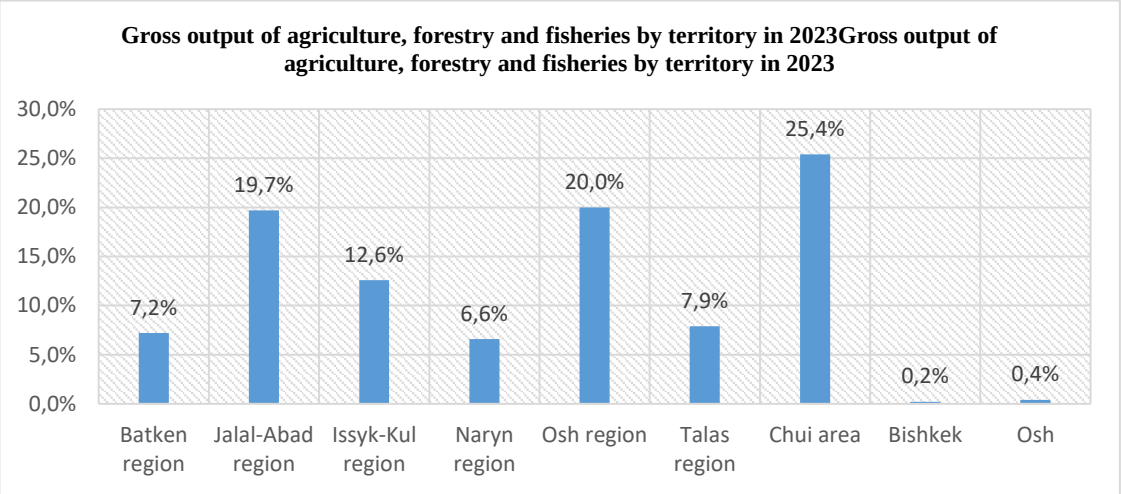


Figure 2: Food security and poverty information bulletin - B.: National Statistical Committee of the Kyrgyz Republic, 2023. Compiled by the author.

In the total volume of gross output of agriculture, forestry and fisheries of the republic, the Chuy region occupies the largest share (more than 25%) (Fig.2).

The development of agricultural production in Kyrgyzstan and increasing the efficiency of agricultural production to a world-class level are impossible without the introduction of advanced (digital) technologies.

Digitalization of agriculture is a necessary condition for increasing its competitiveness.

The transformation of the agricultural sector includes the digitalization of all branches of agricultural production: crop production, animal husbandry, fishing, poultry farming, industry and other areas.

The digital economy has been actively developing in Kyrgyzstan since 2020 during and after the COVID-19 pandemic, when many agricultural enterprises, realizing the opportunities that open up to them, were forced to actively use digital technologies and Internet resources, which allowed to increase the number of enterprises in agriculture.

There are more than 150 developed information systems in the Kyrgyz Republic, which are actively used in more than 70 government agencies, including ministries, departments, agencies and agricultural units. However, the lack of a single state register of information systems makes it difficult to accurately assess the number of systems used (Fig. 3).

In general, the development of information systems in the Kyrgyz Republic is rapid, and the improvement of technologies and automation of processes are becoming an integral part of the activities of government agencies.

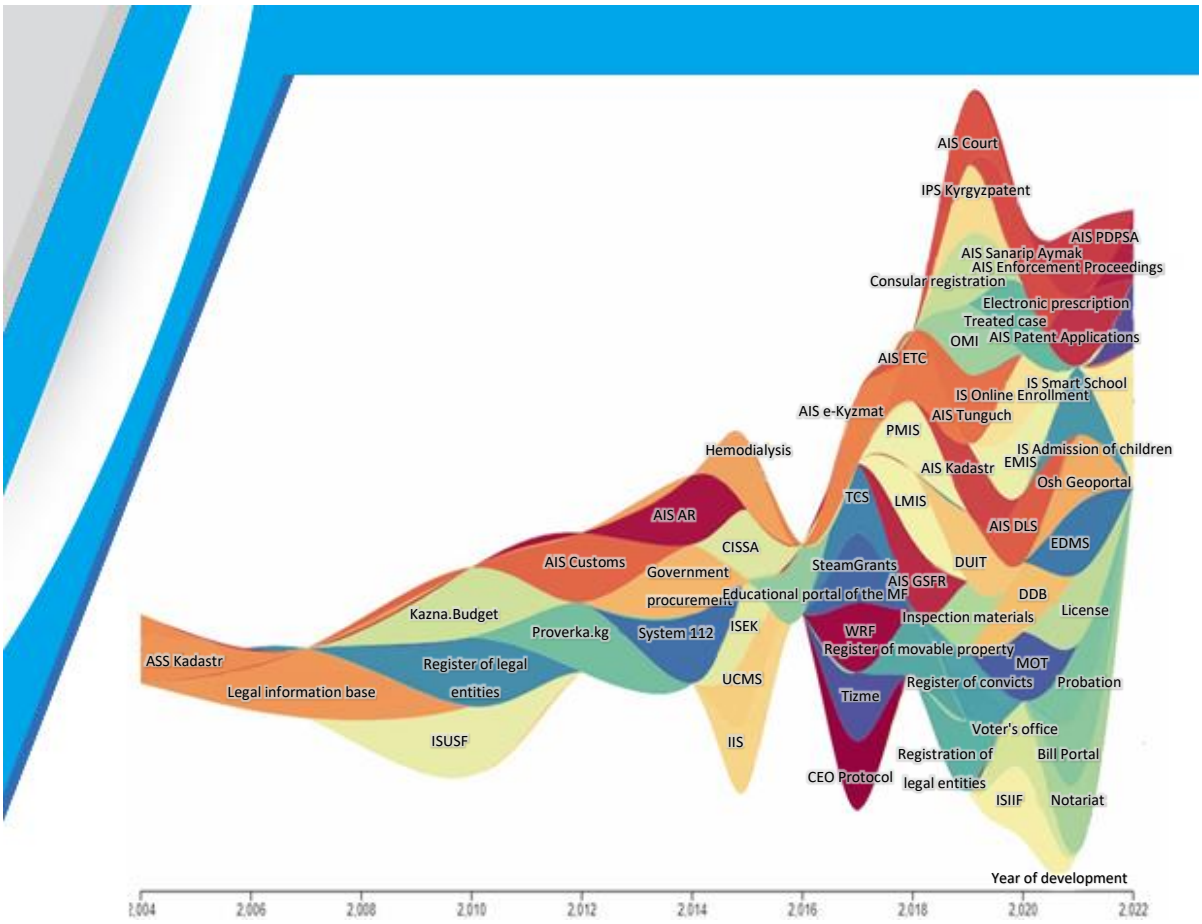


Figure 3: Chronology of development of information systems in the Kyrgyz Republic by year up to 2022.

Digitalization is the development of new business lines, online trade in professional computer equipment and new working specialties, services and functions for training in the use of an intelligent system in agriculture.

There are many factors that contribute to the development and use of digital technologies. Let us note the main factors influencing the agricultural sector:

- globalization of trade;
- population growth
- changes in consumer preferences.

Agriculture and the agro-industrial complex of the country are the key sectors of the economy in which the majority of the working-age population of the country is employed. Digital technologies in this area are developing so rapidly that Kyrgyzstan needs to consider the development and implementation of digital technologies in agriculture in order to ensure faster growth, which will significantly affect the increase in productivity and growth of the entire agricultural sector.

Digital agriculture allows farmers to enhance the uniqueness of their products and improve their quality. Through the use of advanced technologies, farmers can control and optimize growing conditions, including moisture, lighting and nutrients, to create optimal growth conditions for each crop.

This results in products with better taste, texture and nutritional properties. In addition, digital technologies allow farmers to track and control the production process, from sowing and caring for plants to harvesting and storing products. Monitoring and automation systems allow farmers to receive information about the condition of their fields and plants in real time, allowing them to quickly respond to any problems such as diseases or pests.

As a result, farmers can offer unique and high-quality products to their consumers. This can be especially valuable in the context of the growing demand for natural and organic products, as well as

products with certain properties, for example, without certain allergens or rich in certain nutrients.

In general, digital agriculture provides farmers with tools and resources to increase the efficiency and quality of their production, which helps to increase the uniqueness and competitiveness of their products in the market, which in turn affects the solution of the country's food security.

Digital technologies can be used not only for the development of agriculture, but also in animal husbandry. Electronic identification, monitoring, the use of Internet technologies to track animal health, collection and analysis of data on the state of pastures and changes in weather conditions will significantly affect the increase in productivity of farmers in Kyrgyzstan.

Digitalization is an integral part of agriculture: from crop planning, irrigation automation and digital plant modeling to calculating feed for feeding animals.

Agricultural technology has seen a huge increase in investment in the last decade. The main innovations relate to livestock farms, which are becoming more technologically advanced, using automated control systems and modern software.

An important aspect is the marketing of agricultural products. Digitalization should help farmers obtain appropriate electronic quality certificates and other documents that will allow them to trade both inside and outside the country without problems. It is important to note the role of digital platforms in promoting the sale of farm products, coordinating farmers in their interaction with local and regional logistics centers, which will allow farmers to increase sales through electronic trading platforms and reduce risks through the development of insurance instruments.

Digitalization of deep processing of agricultural products can affect the increase in added value. This industry will require the use of digital technologies for traceability and automation of processes in order to conduct detailed monitoring of the quality of products, inventory and sales processes. Together, the digitalization of agriculture and the promotion of innovation in this industry will make it possible to make strategic and tactical decisions based on data analysis and optimization of production and supply chain of agricultural products.

Technologies such as connected sensor systems, automatic seeders and harvesters, systematic data collection and transmission, as well as aerial photography of agricultural land.

Digital technologies play a key role in agriculture and processing enterprises, enabling the collection and analysis of data for strategic decision-making. They also help farmers increase productivity by monitoring animals, soil, and weather. It is also important to provide farmers with appropriate certificates for convenient trade. The digital platform facilitates sales and coordination with logistics centers, and the demand for digital skills in the Kyrgyz economy is high, especially in the communications and information services sector.

As noted above, electronic identification monitoring, the use of Internet technologies to monitor the condition of livestock, the collection and analysis of data from the ground, weather changes – all these factors have had a major impact on increasing the productivity of farmers. An equally important issue is the sale of agricultural products.

The introduction of digital technologies is accompanied by farmers receiving the corresponding electronic quality certificate, as well as other documents that make it easy to trade inside and outside the country.

The role of the main sectors of the economy in creating demand for digital skills. It has been determined that the main sectors of the economy of the Kyrgyz Republic need specialists with digital skills at different levels, both in quantity and quality. The level of technological complexity of these industries strongly affects the overall competitiveness of the products of these industries in the international market.

Agriculture plays an important role in providing employment and requires workers to have basic digital skills. However, achieving the indicators of the agricultural sector of Sanarip Kyrgyzstan, as noted above, means increasing labor productivity, automating production processes and reducing the share of employment in this sector. Therefore, to achieve the set goals, a smaller number of more qualified personnel with advanced ICT skills is required, which leads to an increase in income.

Digitalization of agricultural products can also affect the increase in the cost of additional products. It is necessary to use digital technologies to calculate and automate the processes of detailed quality control and labeling of products manufactured in this industry.

The use of digitalization in agriculture involves solving the following tasks:

- increase in labor productivity;
- increase in export revenues;
- increase in the cost of products of enterprises;
- increasing the rate of economic growth in industries;

- creation of an effective supply chain from producer to consumer; integration into related sectors of the digital economy;
- increasing the attractiveness of agriculture and increasing the income of farms.

It is extremely important for agricultural businesses to make the most of innovative Internet technologies to increase profitability. Therefore, one of the main factors in the development of agriculture in order to reduce costs, increase productivity and optimize the labor process is the introduction of digitalization. To achieve this, agricultural producers need to implement better applications in the near future, such as:

– Cropstream - an application that facilitates collaboration between agricultural producers and enterprises through coordination, communication and synchronization of crop production activities. It brings together farmers, seed sellers, service providers, consultants, retailers and often manufacturers, helping them grow their business and simultaneously keep track of all discussions, products, photos and places related to them;

– FieldCheck - an application that helps pesticide application specialists find special crops and insect hive locations using their mobile devices;

– Kugler Timing - a farm management application that provides fertilizer planning and provides tips on a wide range of crops with 11 additional options that cover every stage of plant development from seed to harvest;

– RRXtend Spray helps farmers plan spraying more effectively by providing weather forecasts and risk probability;

– Agrellus app is a marketplace that brings together buyers and sellers of agricultural materials and protective equipment. This solution allows users to request numerous offers from dealers, customize requests, select targets such as insect type, weed type, seeding or defoliation, select the rate per hectare, receive advice on regulatory requirements to produce the best product to meet the needs of stakeholders, as well as specify delivery dates.

3 CONCLUSIONS

The importance of introducing digital technologies in the agricultural sector for Kyrgyzstan is that it will reduce risks, increase crop yields, as well as reduce the cost of production, improve its quality and competitiveness in the market.

Thus, the acceleration of digital transformations in agriculture and the formation of a digital agricultural sector of the economy largely depends on the investment climate in the country and the increase in investment in this industry.

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