

DIGITALIZATION OF THE AGRICULTURAL SECTOR IN KYRGYZSTAN

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Abstract: *This composition discusses the challenges and prospects of digitalization in farming in Kyrgyzstan. The main challenges of introducing Information Communication Technology (ICT) in farming and the benefits of digitalization in a combined providence are shown. The capabilities of applying information platforms in the changeover of the domestic agrarian sector are proposed, as well as recommendations are given for perfecting and operating all the power of farming.*

Keywords: *agriculture, international trade, export, integration, Eurasian Economic Union (EAEU), digitalization, digital platforms*

КЫРГЫЗСТАНДЫН АЙЫЛ ЧАРБА ТАРМАГЫН САНАРИПТЕШТИРҮҮ

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Аннотация: *Бул макалада Кыргызстандын айыл чарбасын санариптештирүү көйгөйлөрү жана келечеги талкууланат. Айыл чарба жерлерине маалыматтык жана коммуникациялык Технологияларын (МКТ) киргизүүнүн негизги көйгөйлөрү, ошондой эле интеграцияланган айыл чарбасында санариптештирүүнүн артыкчылыктары көрсөтүлгөн. Ата мекендик агрардык секторду реструктуризациялоодо маалыматтык аянтчаларды колдонуу мүмкүнчүлүктөрү сунушталды, ошондой эле айыл чарбанын баардык күчүн жакшыртуу жана пайдалануу боюнча сунуштар берилди.*

Өзөктүү сөздөр: *Айыл чарба, эл аралык соода, экспорт, интеграция, Евразиялык экономикалык бирикмеси (ЕАЭБ), санариптештирүү, санариптик платформалар.*

ЦИФРОВИЗАЦИЯ АГРАРНОГО СЕКТОРА КЫРГЫЗСТАНА

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Аннотация: в данной статье обсуждаются проблемы и перспективы цифровизации сельского хозяйства Кыргызстана. Показаны основные проблемы внедрения Информационно-коммуникационных технологий (ИКТ) в фермерские хозяйства, а также преимущества цифровизации в комплексном промысле. Предложены возможности применения информационных платформ при перестройке отечественного аграрного сектора, а также даны рекомендации по совершенствованию и эксплуатации всей мощи фермерского хозяйства.

Ключевые слова: Сельское хозяйство, международная торговля, экспорт, интеграция, Евразийский экономический союз (ЕАЭС), цифровизация, цифровые платформы

1. Introduction

Agriculture and the agrarian sector in general are one of the priority areas for the economic development of Kyrgyzstan in the near and long term. This circumstance is also confirmed by the functioning of the national economy within the framework of the Eurasian integration formation, which more clearly revealed the potential and great opportunities of the country's agriculture, which is expressed in an increase in the growth rate of agricultural production and the export potential of the industry. Moreover, the needs of the Eurasian food market stimulate the development in the republic of intensive sectors of animal husbandry, crop production, industrial horticulture, horticulture, greenhouse production of vegetables, which are capital-intensive industries that require the involvement of a significantly large amount of financial and credit funds. And in this regard, in order to fully and effectively realize the potential of the industry in the context of further deepening of integration, we are first of all going to radically solve the issues of modernizing and improving the financial and economic condition and supporting agriculture in the Kyrgyz Republic. It is necessary to ensure in the near future the transition from extensive to intensive forms of development of the

industry and a significant increase in the level of its industrial development, which will favorably affect the transformation of the domestic agricultural sector into the Eurasian economic space. One of the key aspects that determine the future of the agricultural sector of Kyrgyzstan and one of the elements of mutually beneficial cooperation in an integrating economy is digitalization. Given the favorable climatic conditions of individual regions of the Kyrgyz Republic, economic integration between the EAEU countries creates favorable conditions for increasing trade and investment. Objectively use all the resources of the state (natural, economic, labor), then Kyrgyzstan will take a certain status in the world space and will have its own contingent of buyers of agricultural products in the world market. One of the key aspects that determine the future of the agricultural sector of Kyrgyzstan and one of the elements of mutually beneficial cooperation in an integrating economy is digitalization. Through digitalization, agricultural producers will receive a new respectable market for domestic products.

2. Materials and methods of research

When studying the issue of digitalization of the agricultural sector of Kyrgyzstan, one of the goals was to identify the best foreign practice that can be applied

in our country. We live in a world of Internet and technology development. Today, most wholesale buyers want to see the entire supply chain of goods. In this matter, a very important aspect of the development of the agricultural sector is the availability and access to the Internet and

Information Technologies (IT) for ordinary farmers.

The basic and international index will show all indicators for export and keep to improving the agricultural environment.

Table 1. Main indicators of Kyrgyzstan

Name of indicator	Index
Agriculture, forestry and fisheries, value added (% of GDP)	13,5
Rural population (% of total population)	63,1
Number of people using the Internet (million people)	2,5
Employment in agriculture (% of total employment) (ILO modeled estimate)	19,3
Total population	6,812,064

Source: World Bank (WB), 2020

According to WB data, the main percentage of the population of Kyrgyzstan lives in rural areas. Of the entire population, only a very small number has access to the

Internet. In this regard, people employed in the agricultural sector are living with a lack of information, new technologies, news from the world community.

Table 2. Kyrgyzstan in international rankings

Name of rating	Rate
Global Innovation Index (GII), 2021	98/132
E-Government Development Index, 2020	83/193
Global Competitiveness Index (GCI), 2019	95/141
Networked Readiness Index, 2021	92/130

Source: World Bank (WB), 2020

If you look at the ratings for the development of innovative technologies, in particular e-government, Kyrgyzstan has very low rates, which shows the country in the lower positions of the rating.

Digitalization creates the prerequisites for choosing new directions for the development of the economies of state and entire regions through ensuring the coordinated work of all economic structures, as well as public administration [2]. Digitalization in Kyrgyzstan should provide Kyrgyz farmers with the opportunity to use information platforms and innovative technologies for mutually

beneficial cooperation of agricultural products between the EAEU countries [3].

The digitalization of the industry allows building inter-industry platforms, which helps to increase the efficiency of cooperative groups, reduce transaction costs, reduce the number of elements of transaction chains, intermediaries, etc. The economic infrastructure of the Common Economic Space (customs, transport and logistics, road, fiscal and etc.), which will radically increase the efficiency of cargo transportation, the supply of goods, and the exchange of services. In addition, only a "digitized" economy of participants will be able to ensure their inclusion in the most

advanced segments of the global market in the coming decades. The implementation of the joint digitalization project of the Common Economic Space of the countries participating in the Eurasian integration will make it possible to build a modern competitive economy based on the basis of a new technological order (information and digital technologies) and meeting the challenges of the modern world order and its development trends [1]. The current state of domestic agriculture is of serious concern: the lack of scientific and practical knowledge on innovative modern agricultural technologies and methodology, the lack of a global forecast for agricultural prices, as well as the underdevelopment of the logistics, storage and delivery system lead to high production costs. Only a small number of agricultural producers have the financial capacity to purchase new machinery, use IT equipment and platforms. It seems to us that the use of a digital platform will create opportunities for the development and increase in trade turnover, and in the rural economic sphere it combines two components, this is the customer's need to receive goods that meet his requirements at the most favorable price and on the part of the agricultural producer - the availability of goods that meet the requirements in the EAEU space. In this case, a bilateral business interest of mutually beneficial cooperation is necessary. At the same time, it is necessary to take into account the mediating role of the state; at the initial stage, state assistance is indispensable. The information and communication infrastructure is the technological basis for the further development of national digital resources, building the information society and integrating into the global electronic space [4]. While Central Asia still needs to gain access to international markets and increase demand for its products, they face a number of challenges.

The main problems of entering foreign markets are:

- lack of awareness among international consumers;
- improving productivity remains a challenge;
- initial investment for an international partnership;
- traditionally natural production does not have supporting certificates;
- fragmented production and lack of volume consolidation;
- weak certification due to costs and lack of experts;
- limited access to markets due to lack of validation;
- lack of regional cooperation;

All of the above problems require an urgent solution; digitalization is considered to be a mechanism for adjusting these issues. However, the level of Certified Infrared Thermograph (ICT) use by the public sector and business in Kyrgyzstan remains low. The current state of the country's agriculture can hardly be called highly technological, in most regions of the republic primitive methods of irrigation, cultivation, etc. are still used, but digital technologies are not alien to modern agriculture. When studying best practice, the example of the Russian Federation was taken, as the main trading partner within the EAEU. As the practice of advanced agricultural countries shows, for many years' computer science and electronics have been part of his daily routine. In the Russian Federation, there is a digital platform for agronomists, where they perform general field control and monitoring of plants, soil conditions, etc. The example for this platform is "AgroSignal" where all the regulation and design of agricultural sector will make by one platform, moreover the farmers and agronomies can use to predict their fails and to react for external and internal nature situations.

The agronomic unit allows you to monitor the health of fields and plants and take prompt action. It contains four important features: the vegetation index as Normalized Difference Vegetation Index (NDVI) for each field, its individual plots and spot surveys, differentiated application of fertilizers and means of protection with the indication of norms in each individual zone, weather monitoring with the ability to set your own thresholds, and keeping notes in digital format.

- Operational monitoring of the state of crops and the uniformity of seedlings;
- Setting priorities when planning technological operations;
- Timely detection of foci of plant disease and the appearance of pests;
- Cost optimization for fertilizers and chemicals;
- Ability to view and analyze information for each field;
- Improving soil quality and controlling the phases of maturation and development of crops.

Figure 1. Vegetation Index (NDVI)



Source: <https://www.agrosignal.com>

The platform of a Vegetation Index (VI) is a spectral imaging transformation of two or more image bands designed to enhance the contribution of vegetation properties and allow reliable spatial and temporal inter-comparisons of terrestrial photosynthetic activity and canopy structural variations (Figure 1) [6]. It means that the quality of product which produced by this territory will be higher for consume and export to another country. Its platform provides useful suggestions concerning irrigation and spraying. Data is collected and transmitted from the field to a

platform via Station, an independent monitoring system equipped with sensors to be positioned in the ground and weather sensors.

The European practice of developing the agricultural sector shows an emphasis on strengthening digitalization and the introduction of information technologies, which allows for constant control and monitoring. Digital solutions are used for plant protection measures and for meteorological forecasts. Agricultural machines are equipped with intelligent

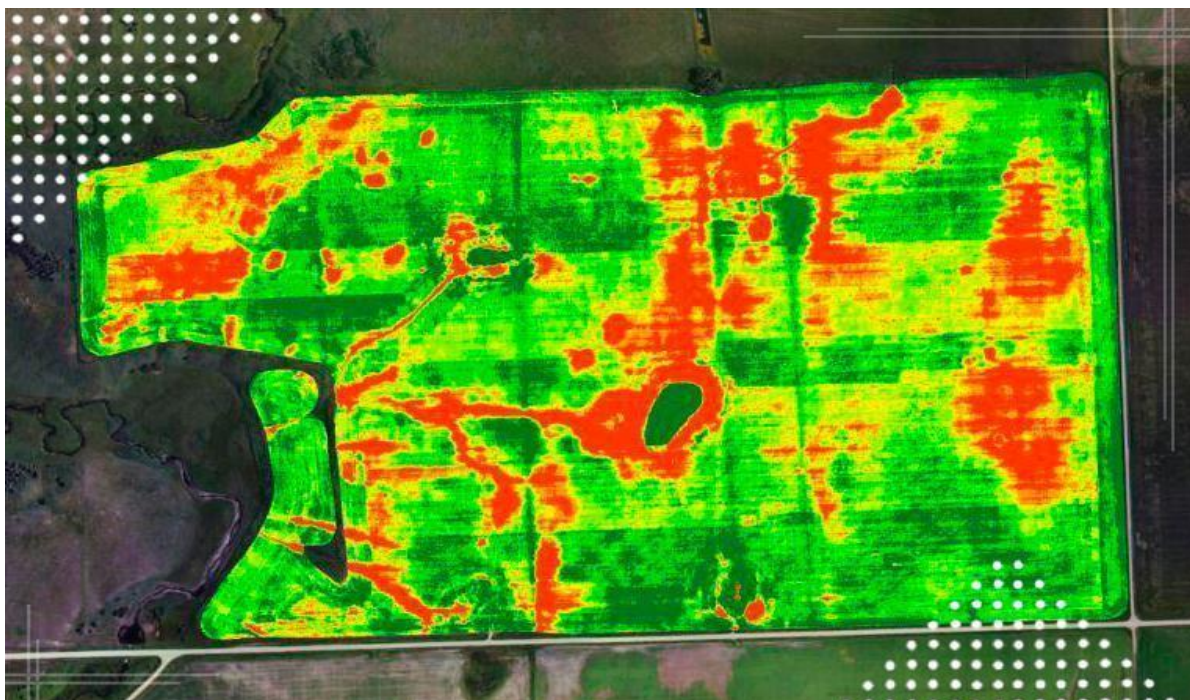


Figure 2. Field monitoring

Source: <https://www.agrosignal.com>

However, digitalization goes even further and, as part of the movement of information flows, establishes links between various processes and their participants, which, along with agricultural producers, include IT service providers, agricultural machinery and specialized consultants. For a wider dissemination of digital technologies in the countryside, the following conditions must be met:

- expansion of digital infrastructure (5G);
- standardization of interfaces and software products of various developers;
- training and consulting, since farmers are not IT specialists, and in order to make a decision on investments in this area, they need to have a good information base;
- improving the reliability of technology;
- further research evaluating the effects of digitalization of agriculture;
- legal regulation of information protection, its secure storage and

information sovereignty, as well as the establishment of other initial conditions (for example, the introduction of rules and regulations for the use of drones). This is one of the best practices from western European countries; exactly one of the keen economy European states is Germany. From this side we have got some parties for our agricultural sector, because the level of development and improving the agricultural environment of European states is the major framework for Kyrgyzstan agricultural sector and economy.

3. Research results

When preparing this article and studying materials on the development of digitalization, the following information resources and portals were studied: a geoformation portal of the Kyrgyz Republic has been created, which contains a cartographic base and a system of geodetic support. Integrated geospatial and statistical data for statistical purposes, including:

- statistical register;

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- population and housing census;
- statistical maps;
- dissemination of statistical information.

Animal Identification and Trace Information System (AITIS). AITIS is a software developed for the identification and tracking of animals in the Kyrgyz Republic. Together with the project "Development of the Dairy Sector of the Kyrgyz Republic" by the International Finance Corporation (IFC) of the World Bank, work has been carried out to modernize the Integrated Library System (ILS). Today, AITIS is distributed throughout the territory of the Kyrgyz

Republic; there are more than 3,000 Internet Protocol (IP) users:

- employees of the State Inspectorate for Veterinary and Phytosanitary Safety and the territorial subdivision of the State Inspectorate;
- private veterinarians;
- laboratory staff;
- official veterinarians of slaughterhouses.

A further update of the functionality includes the development of a "module on traceability and use of veterinary medicinal products in the AITIS" with the support of the German Society for International Cooperation (GIZ).

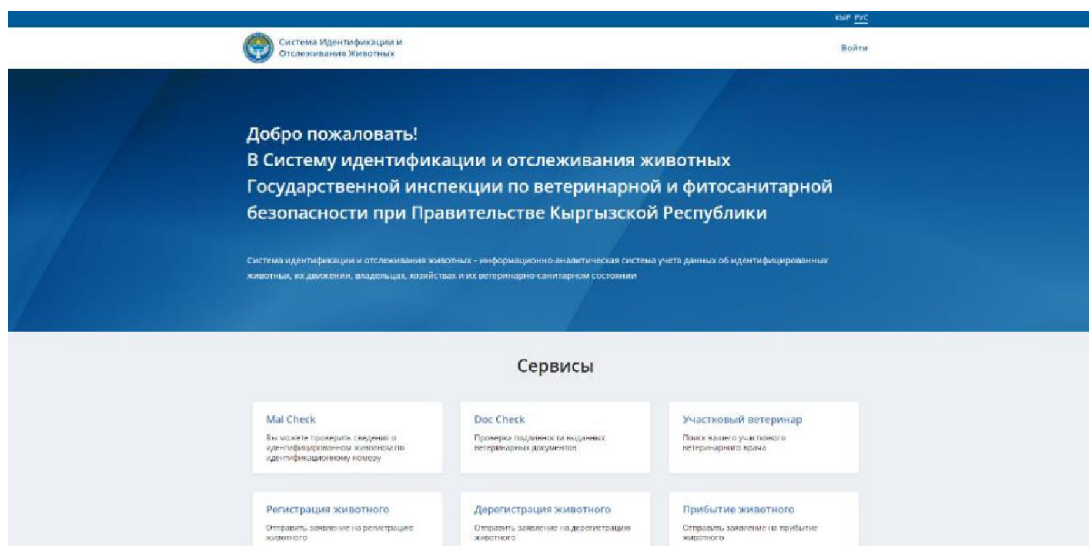


Figure 3. Animal Identification and Trace Information System

Source: <https://www.aitis.gvfi.gov.kg>

Information system on water "Water use". Water Information System (WIS) is a corporate system designed to better organize, plan and record the supply of irrigation water needed for crop production. The WIS "Water Use" was created for use in the subdivisions of the State Agency for Water Resources at various levels of management: district, basin and the Central Office.

WIS "Water Use" was created as a result of the implementation of the World

Bank project "National Water Resources Management", The Central Asian Institute of Applied Geosciences.

Information system "Water use" includes the following sections:

- Reference Information;
 - Planning of irrigation water supply to agricultural enterprises;
 - Management and accounting of water supply to agricultural enterprises.
- The irrigation network includes the following levels of irrigation facilities;

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- Irrigation system - families of connected canals that have one source of power, which can be either a river or another canal, usually a main one;
- Irrigation canal - an artificial channel designed to supply water for irrigation;

- Water outlets/gauging stations - a place in the canal from where water is supplied for irrigation and where water flow measurement devices can be located.

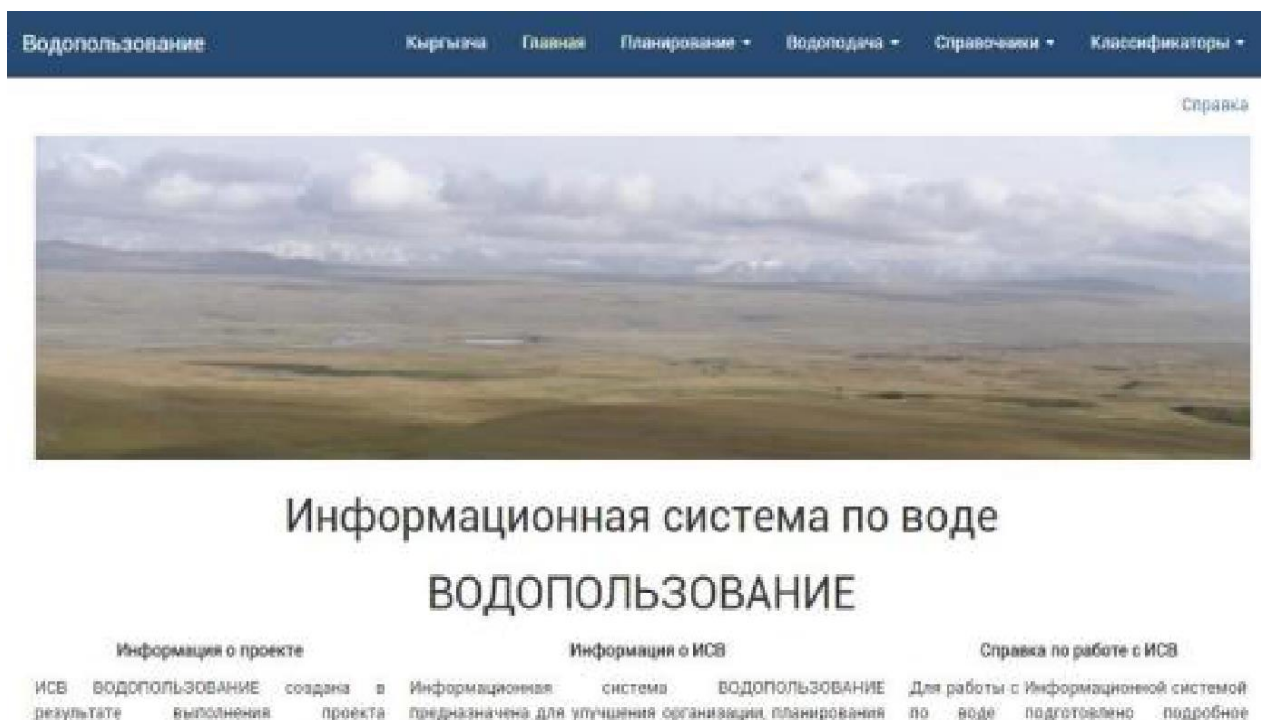


Figure 4. Main page of WIS "Water use"

Source: <https://www.water.gov.kg>

4. Discussion

Researchers of this issue proceed from the fact that the use of new technologies can lead to the disappearance of historically established agricultural professions, which, however, will be compensated by the emergence of new areas of employment. To more actively support the process of digitalization of agriculture in Kyrgyzstan, the following is required:

1. Organization of experimental fields at agricultural enterprises.
2. Creation of a center of competence in the field of digitalization of agriculture.
3. Formation of a "steering committee", including representatives of the Ministry of Agriculture, political circles

(deputies of the Zhogorku Kenesh), scientific and organizational centers subordinate to research organizations.

4. Providing the Ministry of Agriculture of the Kyrgyz Republic with competencies and resources for cooperation at the level of the EAEU and at the international level.

5. Development of infrastructure in rural areas.

6. Collection of geodata, data on means of production and meteorological data.

Knowledge transfer and management are central to these areas of work. Through digital cross-farm solutions, digitalization can be beneficial, especially for small

agricultural enterprises. Active political engagement is designed to ensure that the potential of digitalization is best exploited, with timely identification and adequate prevention of risks. This will also help strengthen the agricultural sector of the Kyrgyz Republic in the long term. Digitalization is one of the key aspects that determine the future of the agricultural sector. In the future, digital transformation for agriculture and the agricultural industry will provide new opportunities that can equally benefit farmers, the environment and consumers.

5. Conclusion

Digitalization will contribute to the development of a new agrarian technological policy of the country and growth in such related industries and areas as: ICT, production of innovative agricultural machinery, as well as equipment for precision farming, biological preparations (stimulants and fertilizers), optimization of the use of mineral fertilizers and chemicals, development of breeding and seed centers, introduction of new educational standards in training programs at agricultural universities and colleges, as well as advanced training courses, a professional service of agricultural consultants, optimization of the life cycle processes of the agricultural industry through the digitalization of processes. Digitalization in agriculture provides an opportunity to create complex automated production and logistics chains covering retail chains, wholesalers, logistics, agricultural producers and their suppliers in a single process with adaptive management. In turn, the digitalization of commodity flows and production makes it possible to systematically accumulate trade parties for the export of agricultural products. Digitalization will create conditions for attracting private funding in information platforms. "Digital Economy" contains

projects, the implementation of which will ensure an increase in the efficiency of the functions performed and labor productivity based on the transformation of business processes through ICT in all areas of the life of modern society, including in the real sector of the economy and social spheres. Digitalization is the main and effective tool in the development of agriculture in the Kyrgyz Republic.

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