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**DIGITAL PLATFORMS AS AN EFFECTIVE MECHANISM OF
AGRICULTURAL CONSULTING**

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Abstract

The article describes the processes of digitalization in the agriculture of Uzbekistan in full details. Improvement of economic indicators, the use of resource-saving and energy-efficient production technologies and the need of compliance with environmental standards demand the use of digital solutions and digital transformation of agricultural production. Digital platform ecosystems are used as main mechanisms of digitalization. The paper gives the definitions of a digital platform. The purpose of the research is to study the foundations and readiness of agriculture to develop and introduce digital platforms in all branches of the agro-industrial complex. The authors analyze the state of concomitant digitalization infrastructure, give an assessment of the modern development of ICT between the city and the village. The paper gives main recommendations for improving infrastructure and bringing it to a condition necessary for the normal functioning of digital technologies. Examples of successful functioning of foreign digital platforms are considered. It is noted that one of the main advantages of the platform as a business model is to ensure that there is direct interaction and exchange between the subjects and the reduction of their transactional and other costs.

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1. Introduction

Digitalization has begun to penetrate deeper into all areas of economic activity, and the agricultural sector is no exception. Today Uzbekistan's agriculture produces up to a third part of the country's GDP and employs up to a third part of the working-age population. In recent years the industry has been undergoing reforms and structural transformations including extracting the maximum opportunities for digital transformation in the development of agricultural production.

Digital platforms are the main tools for implementing the digital transformation of economic processes. Digital platforms have an excellent opportunity to expand their activities constantly focusing on many business tasks, namely: information processing, telecommunications, financial aspects of the organization's core business, as well as the ability to collect new knowledge based on accumulated experience in close cooperation with other participants. Decree of the President of the Republic of Uzbekistan No. PF-6079 dated October 5, 2020 "On approval of the Strategy "Digital Uzbekistan - 2030" and measures for its effective implementation" and Resolution of the President of the Republic of Uzbekistan dated April 28, 2020 No. PP-4699 "On measures to wide introduction of the digital economy and e-government", Resolution of the Cabinet of Ministers of the Republic of Uzbekistan, dated December 17, 2020 No. 794 "On measures to develop a digitalization system in the agro-industrial complex and agriculture of the Republic of Uzbekistan", determined the guidelines for the introduction and development of digital technologies in the agriculture of the republic. Digital transformation is recognized as a necessary process for the development of economic and production processes in agriculture. The latest resolution defines a digital platform as a set of electronic programs designed for various computing systems. The definition of digital platforms has not yet been fully formed in local and global practice, and it can be interpreted in different ways. Here are the definitions of some researchers:

A digital platform according to Pikuleva (2017) is an open platform for interaction between producers and consumers, with management conditions for them as a public infrastructure (platform, market).

A digital platform according to Telecom in Russia (2018) is an algorithmic system of mutually beneficial relationships that is implemented in a single information environment of independent participants in a significant part of the network (or field of activity), which leads to a reduction in transaction costs through the use of a set of digital technologies for working with data and changes in the distribution of the workforce.

Ghasemkhani et al. (2014) define a digital platform is a high-tech business model that creates value by facilitating exchange between two or more interrelated groups of participants.

In order to let platform developers and industry companies to speak the same language, it is necessary to reach a consensus on this definition, which will help assess the existing digital landscape, identify the needs for the development of existing platforms and form new ones in order to provide an information ecosystem in the successful formation of the digital economy. The digital platform is the foundation for delivering a new and unique set of services related to digital processes.

Today developed agriculture is unthinkable without the development of information and communication technologies. Large volumes of information are updated frequently, processed quickly

and accurately through software, providing consumers with the latest and most valuable information and helping them make informed decisions. In the countries with developed agriculture there is a process of reducing the human factor, robotization of production, further improving the functions of transmitting and processing information (Gulyamov, 2021).

2. Problem Statement

For the successful development of agriculture the agricultural producer needs the necessary, correct and timely information for making decisions. In countries with a developed agro-industrial complex digital technologies in agricultural consulting have opened up new opportunities for obtaining such important information by the manufacturer. In Uzbekistan the issues of digitalization of agriculture run into the problems of infrastructure, extremely low awareness of producers, financial opportunities and human resources.

3. Research Questions

During the research the following questions were raised:

- i. what are the prerequisites for the digitalization of agriculture?
- ii. what is the current state of agricultural production in Uzbekistan?
- iii. what is the current state of the infrastructure for digitalization of agriculture?
- iv. what solution does the author's research suggest?

4. Purpose of the Study

The authors of the paper consider that the answers given to the above questions will contribute to the development of proposals and recommendations in the planning and implementation of digital solutions in agro-consulting for the development of agricultural production.

5. Research Methods

The authors used universal scientific research methods, as well as methods of comparative and statistical analysis.

5.1. Current State of Agricultural Production

Every year our planet loses more and more in fertility. Droughts and desertification lead to hunger and poverty and accelerate the processes of climate change. The UN called on the world community to stop further soil degradation and move towards rational land use. The UN Secretary-General and the President of the General Assembly noted that the health of all mankind and its future well-being depended on the health of the planet. As they stressed today 75 percent of the soils had undergone degradation and are out of circulation. According to the Chairman of the General Assembly, every year millions of hectares of fertile land are lost which leads to the loss of about 10 percent of world GDP. He and the UN Secretary-General noted that more than 3.2 billion people suffer in one way or another from

the problems of desertification and droughts. Of course, in some cases, soil erosion occurs naturally on all continents based on climatic conditions. But about 70% of the land on the planet has been degraded as a result of irresponsible human activity, and by 2050 this bar may exceed 90%. Experts predict that by 2030 the land use for industrial purposes will increase by 35 percent to more than 115 million hectares, which will be more than the territory of Colombia. However, today's rates of soil degradation threaten the ability of future generations to meet their most basic needs. The world population by 2050 may exceed nine billion people. Providing such a large number of the population with food with limited land resources is possible only in the context of the use of new digital technologies to increase the yield and quality of products grown on improved soils.

For example, in Turkey on 1 hectare of land, products worth \$2,000 are grown, in Egypt - \$8,000, and in Israel - \$12,000. In our country, this figure does not exceed 300 US dollars (Figure 1, Figure 2):

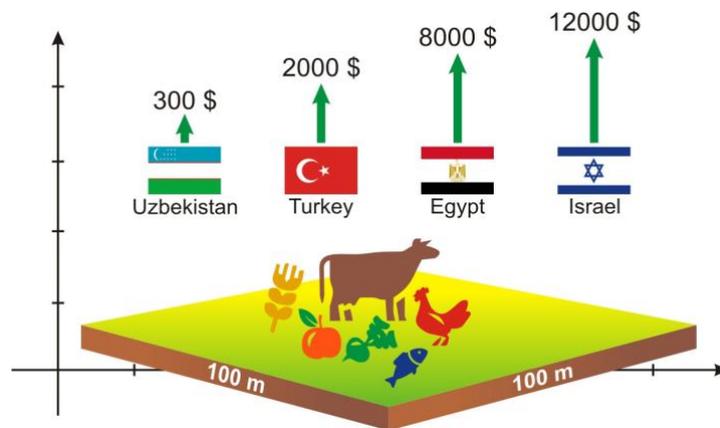


Figure 1. Agricultural production per 1 hectare of land / in USD (Economic Review Journal, 2019)

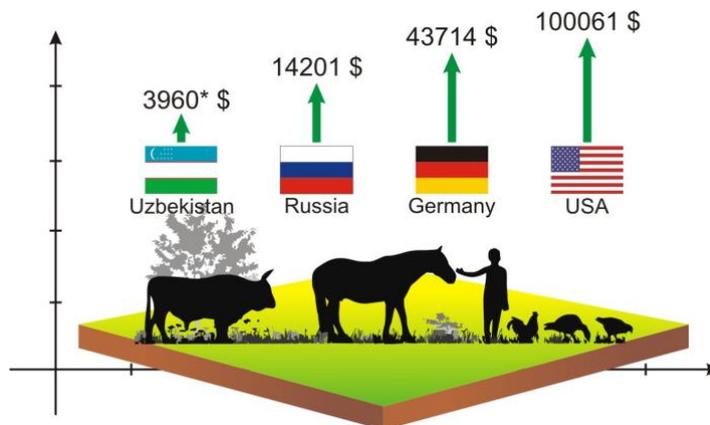


Figure 2. Gross value of agricultural products per worker in 2019 / USD (Dashkovsky & Trofimov 2019; The World Bank, 2019)

In 2019, the “Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030” was approved, which covers the following strategic priorities: ensuring food security of the population; creation of a favorable agribusiness climate and value chains; reducing the role of the state in managing the sphere and increasing investment attractiveness; ensuring the rational use of natural

resources and environmental protection; development of modern public administration systems; phased diversification of public spending in support of the sector; development of science, education, systems of information and consulting services in agriculture; rural development; development of a transparent system of sectoral statistics (Il'ina, 2021). Within its framework, it is planned to achieve the following main indicators by 2030:

- development of 1.1 million hectares of agricultural land, increasing the efficiency of the use of 535.6 thousand hectares of rainfed, pasture and other lands;
- growth of average labor productivity in agriculture by 1.7 times (up to 6.5 thousand US dollars per employee per year);
- increase in the rate of processed products up to 30%;
- increase in exports up to 20 billion dollars. (Il'ina, 2021).

To achieve these indicators it is enough for an agricultural producer to provide the necessary, accurate and truthful information. If we proceed from the fact that quintillion bytes of new information per day are generated in the world today, it is not difficult to assume that it is not an easy task for a manufacturer to quickly obtain the necessary, correct information from all this volume of information. To facilitate the solution of this problem ICT, devices for collecting, processing and transmitting information, robotics, achievements of advanced science and technology and consulting services come to the rescue.

Providing the necessary data to all participants of the agro-industrial complex, providing them with fast, accurate and important information is the main task on the way to increasing the efficiency and competitiveness of agriculture and as an important sector of the entire economy as a whole. Creating conditions for timely access of the consumer to the necessary information is an urgent task. Information and communication technology (ICT) skills need to be developed to access information. This task can be fulfilled with the development of centers for information and consulting services as a distributor of information in the form of a product.

The agricultural sector of our country should be consistently included in these processes. To achieve these goals it is necessary:

- to increase the literacy of agricultural producers in the field of information technology;
- to organize necessary infrastructure of information and communication technologies in all regions (wired Internet coverage - 0.9%, mobile Internet - 84% (as of 2019));
- to introduce the best world developments and technological innovations;
- to implement a combination of the above steps, first under the leadership of the state, and then create a healthy competitive environment in the industry, gradually involving private companies in these processes.

According to statistics, the progress of crop production technologies is very slow. Indicators of average yields and the cost factor for the production of major crops have remained unchanged for many years. Hence there is a need to strengthen the intensification of informatization of agriculture. If the

agricultural producer is timely aware of new and accurate information about the achievements of breeding and genetic science, new varieties, new production technologies, irrigation technologies and metered delivery of fertilizers, technologies for agrotechnical earthworks, weather forecast for months ahead, harvesting technologies, storage, processing and delivery to the consumer of the final product, etc. he will be interested and striving to increase productivity and profits and, ultimately, the standard of living and well-being.

The informatization of agriculture implies the formation of the activities of centers of information and consulting services, familiarization and obtaining mutual understanding about the need for their services by participants in agro-industrial production. The implementation of these measures must be carried out based on the ongoing reforms in the agriculture of the republic, initially relying on a developed, comprehensively state-supported program that will make a significant contribution to the development of the industry.

The government has defined guidelines for the development of agriculture for 2020-2030, new opportunities are opening up for the industry, new tasks are being defined (INNO "Buyuk kelajak", 2018). The need for information will only increase. It should be taken into account that the introduction of innovations in the industry is possible only with the development of informatization. Table 1 shows the figures on the provision of the population of the republic with ICT (as of 2020):

Table 1. Provision of the population of the republic with ICT

	Mobile communication devices	Internet users	Social network users
Users	24.84 mln	15.45 mln	3 mln
in %	76 %	47 %	9.2 %
Annual growth	6.7 %	0 %	79 %

In the period from 2019 to 2020 the number of Internet users has not changed, and the number of social network users has increased significantly, which indicates the need to provide the Internet to rural areas and the great work ahead in the future. The activities of state centers of information and consulting services in providing support to industry specialists and the impact of this support on improving efficiency and economic growth indicators will predetermine the growing demand for this activity on the part of agricultural producers. As a result based on foreign experience along with state centers, similar centers based on private property will be opened and this will create conditions for competition and development of the sphere. The main thing here is to put the initial activity on the rails correctly. In the activities of the center it is necessary to involve various specialists with good knowledge and skills in agricultural science, and constantly developing and improving their skills. Under these conditions, the activities of the agricultural scientific community should be embodied in important parts of information support (Gulyamov et al., 2020). These centers will be able to provide comprehensive remote assistance to manufacturers with the help of the latest ICT. To do this they have to develop a system of consulting 24 hours using web pages, mobile applications and social media accounts.

It is also necessary to develop the infrastructure for the correct and non-stop operation of technologies in rural areas. The mobile coverage network is expanding throughout the country, but so far, the 3G, 4G network does not sufficiently cover large areas in rural areas. From the available data, you can

find out that the coverage in the republic is 59%. This, in turn, leads to a number of inconveniences when working on the network. According to research by experts, 40% of network users leave it when loading a page for more than 3 seconds. Therefore, it is necessary to improve the infrastructure that guarantees an acceptable connection speed of communication networks.

Table 2. The growth of Internet speed in Uzbekistan (as of December 2018 – December 2019)

	Mobile Internet	Fixed internet
Internet speed	9.97 mbps	10.11 mbps
growth indicators	+ 50 %*	+ 65 %*

Table 3. Infrastructure for Internet access

	2020	Growth per year
Broadband Internet access network (thousand ports)	1234.5	103% ↑
Length of fiber-optic communication lines (thousand km)	36.6	37% ↑
Number of cellular base stations (thousand pieces)	26.4	19% ↑

From these indicators (Table 2, Table 3), 70% of broadband access ports, 20% of fiber optic communication lines and 15% of base stations are in Tashkent city.

5.2. Prospects for Platformization of Informatization

And now let us consider in practice how this is reflected in the manufacturers of the industry. The scientific research considers 2 subjects of agro-industrial production located in the Samarkand region: Farm "Abduvakil Dilnoza Dilrabo" (ADD) is located in the Urgut region in a mountainous and flat area, in the use of about 18 hectares of land, the orientation of production is agricultural, is engaged in vegetable growing and grain growing, has a small the number of cattle and small cattle, 11 people are constantly employed; the second farming enterprise "AgroBravo" (AB) is located in the Akdarya district, in a flat area, has about 500 hectares of land in use, focuses on animal husbandry and agriculture, is engaged in the cultivation of dairy cattle (400 heads), fruit and vegetable growing, grain growing, has large greenhouse fields, about 150 people employed.

It can be seen from the characteristics of the location and economic indicators (Table 4) of two different agricultural entities, ADD is located very far 60 km from the regional center and is much more modest than AB, which is only 7 km closer to the center and is more or less resource-provided. Of course, they cannot be compared with clusters that are not limited in resources and opportunities, but the research focuses on small and medium-sized farms as the main component of agricultural production.

Table 4. Possibilities of access to information for subjects

	Remoteness from the regional center	Provision with computers	Fixed line	Broadband internet access	Mobile communication	Mobile Internet 3G/4G	ICT skills	Access to new information	Using the Internet of Things
ADD	60 km	+	-	-	30%	20% / -	10%	10%	-
AB	7 km	+	+	-	40%	30% / -	25%	20%	-

Requests from mobile operators about the number and format of base station coverage of the studied territories, but the companies, citing trade secrets, did not want to share information, so they had to be content with open access sources and the decision to use the services of the www.gsma.com resource (Figure 3):



Figure 3. 3G mobile network coverage map

The 4G network coverage of mobile operators (Uzmobile, Ucell, MobiUZ, BeelineUZ, PerfectumMobile) is concentrated mainly in regional centers and Tashkent, 3G has expanded to district centers, 2G covers 80% of the settlements of the republic. The information of the resource for the studied area is advisory, which operator's services to use. And now, from the polls, we will consider what sources of information the studied subjects of agricultural production use (Figure 4):

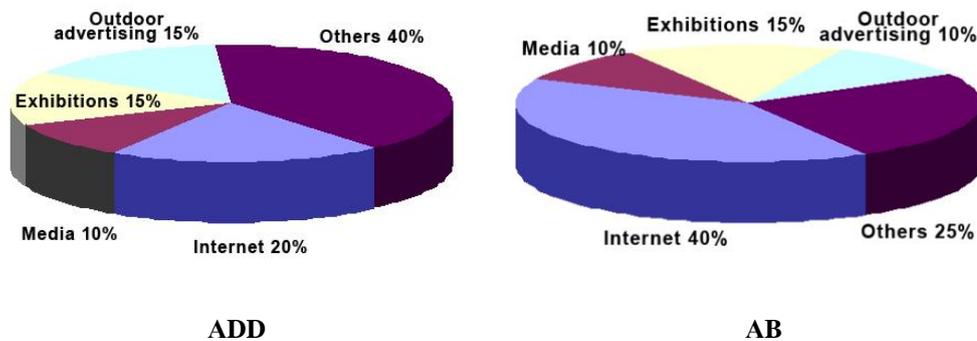


Figure 4. Resources of information for the agricultural production

It is clearly seen that the ratio is almost the same for three points (media, exhibitions and outdoor advertising), but on the Internet we can say that we have to proceed from the available infrastructure resources, the greater the coverage of territories, the more users. In developed countries, about 90% of information is already received from the worldwide web. This suggests the conclusion of the primary requirements for the access of the agro-industrial complex manufacturer to information, how to provide a developed infrastructure for access to a high-speed uninterrupted network (Zhang, 2017); technical equipment for working with ICT; training and advanced training of agricultural producers to work with ICT; national servers and constantly updated databases.

In this scenario the current level of digitalization of domestic agriculture lags significantly behind the level of penetration of digital solutions into the agricultural industry, for example, in the USA, Israel, Canada, and Japan. Only a few large agricultural producers in the country have sufficient financial capacity to digitally modernize their production facilities to use digital products, technologies and platforms. Currently, digital technologies are being introduced into agricultural production rather haphazardly. Moreover, we are mainly talking about the development of individual robotic systems, the automation of individual processes of production and storage of products, the creation of control and monitoring systems for agricultural machinery, agrotechnological activities. The unsystematic introduction of digital technologies leads to a low return on their implementation.

The goal of developing and promoting the digital platform of the agro-industrial complex is to increase radically the efficiency of agricultural and agro-industrial enterprises through the widespread introduction of new digital, including end-to-end technologies and innovative business models of market interaction in the production processes of these enterprises based on the platform-as-a-service model (Platform-as-a-Service). Associate these solutions with the AKIS-based solutions being implemented in each region based on the need to establish support centers for the digital help desk platform.

The activities of these centers in the development of the agro-industrial complex are as follows:

- quick access to necessary, accurate and reliable information;
- provision of awareness of the course of agricultural production on the ground;
- exchange and adoption of best practices of world leaders in the field of agro-industrial production;
- direct contact with international agricultural producers;
- exchange of experience and knowledge at the regional and international level;
- elimination of intermediary chains;
- reduction of production, logistics and implementation costs in the implementation of innovations;
- the actual state of affairs in the industrial zone of the agro-industrial complex participant, the preliminary solution of the problem that has arisen online, advice, recommendations and professional assistance;
- assistance in improving the quality of life of a rural producer and the quality of life of workers.

In the world market of agro-industrial products, the conditions for successful competition require not only the creation of high-performance industries in individual industries, but also a complete understanding of all the possibilities of the agro-industrial complex. To do this, consider the agro-industrial complex as a complex control object. Meanwhile, as the agro-industrial complex includes four areas: means of production for agriculture, agriculture itself, processing and marketing of finished products, infrastructure, the agro-industrial complex has several features:

- The presence of several separate areas, interconnected (plant growing, animal husbandry, etc.).

- Spatial remoteness of objects.
- Dependence on external business conditions.
- Exposure to strong external influences (weather).
- Danger of mass mortality (livestock, land).
- The presence of an intermediary chain to the consumer, which affects the final price and profit of the producer. The figure shows the model of the main composition of the digital platform and its components:

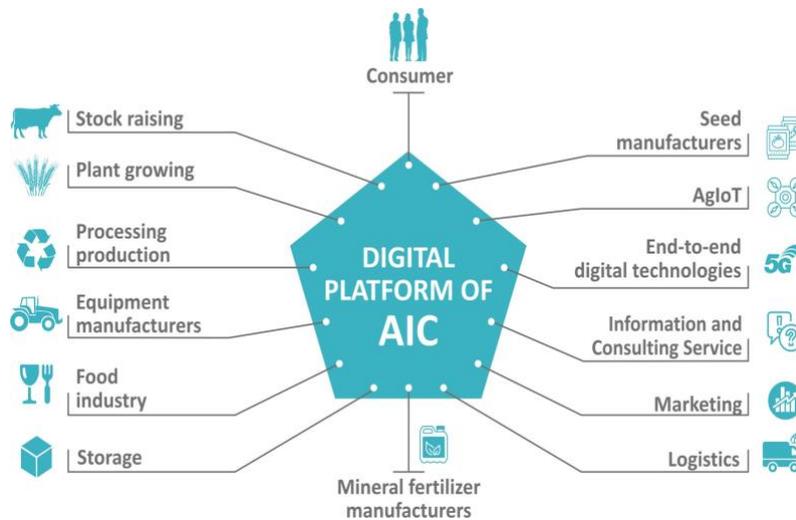


Figure 5. Industry structure of the digital platform

It can be seen from the Figure 5 a digital platform should be consumer satisfaction and the healthy well-being of the population at the highest point of the goals of organizing. The digital platform consists of a number of interconnected sub-platforms and private partner applications that will be included in the platform on mutually beneficial terms (Figure 6):

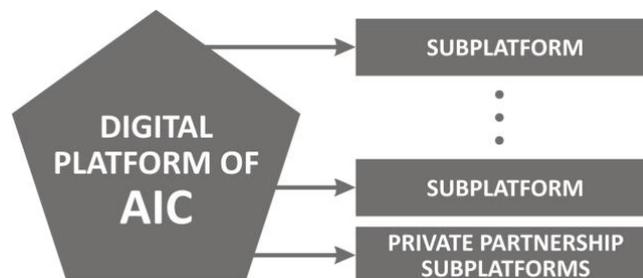


Figure 6. The structure of the digital platform

As the basis for detailed research of the functionality of digital platforms in the field of agriculture, examples of foreign platforms for familiarization can be given, where it is clear that each platform is engaged in a specific type of activity, for example:

- Agri-affaires specializes in the wholesale of agricultural machinery (cars, trucks, tractors, combine harvesters, etc.) working in the US, UK and EU.
- The French platform Agrilocal brings together suppliers and secondary schools, nursing homes, hospitals and other social institutions in need of food supplies.
- Climate FieldView's integrated digital agriculture platform provides farmers with detailed information about their farms.
- In Russia, the Agrosolutions digital platform offers all solutions in the field of irrigation.
- MyAgriGuru is an Indian digital platform that connects farmers and agro-experts and provides a variety of advice on agricultural production, creating a reliable ecosystem.
- The Monterra platform in Uzbekistan is designed to help solve the problems of geoinformation systems, sounding and mapping of the area.

In fact the agro-industrial complex being a complex multiply connected object, needs an integrated approach to its study and management, although this is very difficult. It was clear for a long time, but something makes us raise this issue again. Let's consider what new opportunities for the agro-industrial complex can provide the achievements of scientific and technological progress and information technology. For a comprehensive study and management of the agro-industrial complex, the following things are necessary:

- Development and accumulation of a distributed system of databases and knowledge on the agro-industrial complex (databases of universities and research institutes of agricultural areas, ministries of agriculture and water resources and specialized organizations);
- Development and implementation in the agro-industrial complex of GIS - geographic information systems, including sounding data and cartographic information, Internet technologies;
- Formation of a single information Internet space by developing a specialized digital platform for an information and consulting service (similar projects are successfully operating in many developed countries, in the CIS, developments are being made in Russia, Belarus, Kazakhstan, Ukraine). Together, all three described measures lead to the formation of a single information base necessary for a comprehensive study and management of the agro-industrial complex.

To implement the above measures it is necessary to solve a number of important tasks at the state level:

- to consolidate scientific organizations of agro-industrial profile (universities, research institutes, state organizations and private business entities) to form a single database that includes all aspects of agro-industrial production;
- to provide a developed infrastructure for access to information technologies (wire and wireless, satellite and radio communications; base stations based on population density and remoteness of territories; system and application software; search for opportunities to reduce the cost and increase the speed of the Internet);

- to train qualified personnel for agro-industrial production with deep skills in the field of agricultural knowledge and information technology; improving the skills of rural workers with an emphasis on the development of high technologies;
- to conduct familiarization work and ensure the wide interest of all participants in the agro-industrial complex in establishing an advisory service on the Internet with the creation of a digital platform and a unified information base.

The digital platform of the information and consulting service will help to solve a lot of practical tasks:

- user access from anywhere in the country to the services of a centralized consulting service;
- maintenance of integrated thematic databases;
- consolidation and storage of up-to-date information related to agro-industrial production;
- full-text information search, etc.
- preliminary and full online consulting for agricultural producers.

In addition to the computer version of the digital platform, it is advisable to develop a mobile version of the site and a mobile application with all services based on Android and IOS in order to minimize the loss of time and traffic when accessing the portal in problematic remote areas. It is also necessary to develop and create computer presentations or video instructions that will allow training of agricultural specialists to work with the digital platform on the basis of advanced training and retraining centers for agricultural personnel.

6. Findings

The farm implemented an imitation model of the digital platform of the AIC. The whole algorithm of actions was reduced to the full satisfaction of the farmer's requests for production activities. The requests concerned innovative and resource-saving production technologies, direct contact with producers and consumers, increasing the yield and quality of crops, and new markets.

As a result of the imitation activities of the AIC platform, the gross profit of the farm in 2020 increased by 22%, costs decreased by 12%. In 2021, gross profit increased to 28%, while costs decreased by 17%. Traditional methods and technologies of production, limited resources, remoteness from the centers and lack of training in the field of working with ICT affected the quality of the survey. Additional training procedures were carried out for the respondents.

Researches have shown that the introduction of a digital platform in agriculture will not be able to completely eliminate intermediaries and direct their part of the market to producers and consumers. It is effective in the markets of wholesale (at least 10–15%) and retail (at least 5–10%) food products. In this case, only 30% of the additional profit can go to investment projects. The creation of a digital platform for agribusiness with an application (API) and end-to-end technologies can bring profit through efficient use of resources, cost reduction and production growth. According to the expert community, with

coverage of approximately 10% of all agro-industrial enterprises, applications and end-to-end technologies will bring additional profit in the amount of:

- approximately 20-25% of added value for enterprises supplying mineral fertilizers, equipment and other necessary inputs for agriculture;
- approximately 25-30% of agricultural enterprises due to the increase in crop and livestock productivity, as well as due to cost reduction;
- about 20% for processing industry enterprises;
- not less than 15% to trade enterprises in the field of AIC.

It can be stated that in order to create a national digital platform for the agro-industrial complex, it is necessary to attract investments in the amount of about 5.5 billion soums as of 01.11.2020. Digitalization, according to McKinsey Global Institute forecasts, will give an increase in the republic's GDP up to 12% (Digital Future: Economic Impact McKinsey Global Institute (MGI) IHS EIU Federal State Statistics Service, 2019). In addition to direct financial benefits, the digital platform will be effective in a number of indirect benefits: the elimination of intermediary chains, which affects the final cost of production, will remove barriers to the sale of agricultural products; improve the quality of products; serves as an impetus for the introduction of environmentally friendly production technologies without GMO components. The use of "big data" technologies and "artificial intelligence" based on digital platforms of the AIC will increase the level of knowledge and culture of the platform participants, with the further growth of global economic activity.

The implementation of the principles of the concept of digital transformation is an important and practical task, the solution of which is to activate the process of digital transformation of socio-economic systems and the formation of a digital economy in Uzbekistan. The digital platform services offered on the farm under study, that is, information and advisory services provided in the form of accurate and correct answers to queries, were recognized by the consumer as a necessary digital transformation process. Characterization and development of a digital platform based on a universal digital platform that provides IT outsourcing services in accordance with the developments and recommendations of the authors, offers a wide range of independent digital services used in various sectors and sectors of the economy of Uzbekistan.

7. Conclusion

The result of the research is the proposal of the authors on the organization of a national digital platform for the agro-industrial complex, which includes interconnected subplatforms providing services in certain sectors of the agro-industrial complex and partner application subplatforms (API) on a contractual basis. Web navigation and online response will move agriculture forward. The economic efficiency of the implementation of the digital platform shows that investments for organizing the activities of the digital platform and its support center with technical support and a set of highly qualified specialists, which, according to the authors' calculations, are estimated at about 5.5 billion soums (slightly more than 500 thousand US dollars, at the exchange rate as of December 2021) in the first year

will be justified by a significant increase in the republic's GDP. In addition to direct financial benefits, the organization of a digital platform also provides a number of indirect benefits, such as the elimination of intermediary chains, which affects the final price for the consumer and the cost of production, which is important for the manufacturer; remove barriers to implementation; improve the quality of products; will help in the introduction of environmentally friendly production technologies without GMO components and all this is aimed at improving the welfare and improving the quality of life of the population.

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