

## CHARACTERISTICS AND ANALYSIS OF THE CURRENT STATE OF DIGITALIZATION OF AGRICULTURE IN THE REPUBLIC OF UZBEKISTAN

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### ABSTRACT

*In recent years, very serious and effective measures have been taken in Uzbekistan to develop the agricultural sector, introduce modern innovative technologies into agriculture. Further progress in this direction will increase the competitiveness of the sector and turn the existing challenge into new opportunities. But this requires the development and implementation in Uzbekistan of an already existing range of agricultural technologies and innovations used today in other countries of the world.*

**KEYWORDS:** *Digitalization Of Agriculture, Innovative Technologies, EAP, Agricultural.*

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### INTRODUCTION

Agriculture is a branch of the economy aimed at providing the population with food and obtaining raw materials for a number of industries. The industry is one of the most important, represented in almost all countries of the world. World agriculture employs about 1-billion economically active population (EAP).

The state's food security depends on the state of the industry. The problems of agriculture are directly or indirectly related to such sciences as agronomy, animal husbandry, land reclamation, crop production, forestry, etc. Today, there is an active use of digital technologies in all spheres of the economy. The agrarian industry is no exception, playing one of the key roles in improving the welfare of the state. Large-scale work is being carried out in this direction in Uzbekistan, a number of large projects have been initiated aimed at the digital transformation of agriculture, which is fundamentally changing, intensively introducing advanced and innovative solutions into the sphere. The scientific approach is of great importance in achieving the set goals.

As the locomotive of the economy, the agricultural sector has really made a big breakthrough in recent years. For its comprehensive development, a number of Decrees and decrees of the head of state and government have been adopted. So, on April 28 of this year, the President signed a decree "On measures for the widespread introduction of the digital economy and e-government." Currently, on the basis of the document, digital technologies are widely introduced into all sectors of the economy and spheres of public life, comprehensive measures are being taken to actively develop the digital economy, modern information and communication technologies. And

since agriculture has always been one of the highest priority areas, it is logical that now we are facing great challenges in terms of digitalizing the industry.

How much attention is paid to this area is evidenced by the following fact: according to the above-mentioned resolution, the post of Deputy Minister responsible for accelerated digitalization of the agrarian sector, the introduction of modern information systems and software products in the agricultural and food security sector was introduced. Through an emphasis on sustainable resource management, smart farming contributes to increased productivity and sustainability. Also, in the structure of the department, directorates for the development of digital technologies in the agricultural sector and the development of geoinformation technologies, as well as departments for digitalization of agriculture and water management, have been created.

Among the important projects outlined in the document is the creation of the Digital Agriculture information system. The initiative is undoubtedly of high relevance, and its implementation will significantly increase the efficiency of agriculture.

It should be noted that today the first steps have been taken in this direction. So, in the Andijan Technopark, an innovative pilot project is being implemented to manage agricultural land using artificial intelligence. Within the framework of the project, six areas were selected, which were digitized in vector format and introduced into the online platform. Agricultural land owners received recommendations based on the results of research using satellite technology.

The implementation and implementation of the Digital Agriculture project will significantly increase the efficiency of land monitoring due to the large coverage of territories, significantly reduce time and financial costs in the field.

In pursuance of the resolution and the tasks outlined by the President in the Address to Parliament (dated January 24 of this year), a digitalization school has been opened at the Agrologistics Department of the Tashkent State Agrarian University, where leading specialists of the industry share their knowledge and experience with young people. Such prominent scientists and specialists in the field as the Deputy Minister of Agriculture, the rector of the Tashkent State Agrarian University, academician *Botirzhon Sulaimonov*, academician *Kalandar Abdurakhmonov* and others were involved. The implementation of over 220 priority projects providing for the improvement of the electronic government system, the further development of the domestic market of software products and information technologies, the digitalization of agriculture, is certainly taking into account the experience of developed countries of the world, including the United States, China and a number of European countries. Based on the experience of the Chinese economy. In the Celestial Empire, digitalization in a matter of years brought the country to the fore in a number of indicators. The PRC has achieved an accelerated development of digital technologies in both business and government. The digital economy currently covers more than 30 percent of the country's GDP. Reforms in this direction have created nearly three million jobs. This is one of the prime examples of how effective digitalization can be. It was thanks to her that the world saw the enormous potential and attractiveness of science and technology. The digital economy is designed not only to increase economic productivity in developing countries, but also to provide people with an opportunity for positive change. Digitalization actually unites the world, providing people with the necessary information and useful technologies.

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According to available data, approximately four billion people on the planet do not have access to the World Wide Web. And this is more than half of the world's population. And the governments of such countries must certainly work on the development of a digital economy that is capable of raising the standard of living of people, providing them with the basic amenities that have become familiar to residents of developed countries. Artificial intelligence, virtual reality, machine learning and other latest technologies are already actively penetrating all areas of industrial life. With each passing day, the boundaries between digital and real economies are blurring. That is why all states should focus on this.

In accordance with the Decrees and Resolutions of the President from 2020, in order to expand market mechanisms in the agricultural sector, to increase the interest of farmers, the state is canceling the market order for cotton and grain. In this regard, the head of state signed a decree "On measures to implement in 2020 the tasks identified in the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030" dated January 28, 2020. The main goal of the concept is to increase the productivity of agricultural crops, increase the productivity of animal husbandry, protect farmland from diseases, pests, including insects, weeds, as well as introduce modern farming methods and raise the scale of production. [1]

*Smart greenhouses* allow more efficient use of fertilizers, chemicals, water, as well as optimize the number of personnel required to care for crops and reduce losses due to human factors. According to experts, despite the fact that the world market for "smart" greenhouses does not exceed 3% of the total number of greenhouse facilities, their number is growing by 9% annually. Smart greenhouses allow you to control the entire irrigation process and microclimate control. In addition, it is possible to monitor the yield and quality of operation of all systems, which can increase the yield increase by 20-40%, while increasing the quality of the product produced and reducing costs.

There are widespread projects to create, in a short time, a network of mini-farms near large cities to deliver "day in day" fresh and natural plant foods, such as greens. At the same time, the following goals are achieved: a large harvest is collected from a smaller area and manual labor is replaced by robotics. It is assumed that in a year from such a farm with an area of 0.4 hectares, you can harvest the same amount of crops as from 12 hectares of a classic outdoor farm. In this case, the land on the mini-farm can be replaced with hydroponics.

*Smart farms* can improve pets' productivity and product quality, as well as reduce costs. According to scientists, animal husbandry based on traditional methods is not very effective in its current form, since one third of the planet's land is grazed by livestock, while animals in the process of growing eat most of the grown grain. The use of automated systems for feeding, milking and monitoring the health of animals, according to experts, can increase milk yield by 30-40% and more efficiently use the available feed base. In addition, there are technological solutions to improve the efficiency of veterinary services, which make it possible to maintain individual veterinary records, a unified database of animals, and records of animal owners. For example, an "electronic passport" of an animal is created on the basis of the chip, the information in the process of reading keeps the database in the software up-to-date, which ensures constant and reliable veterinary control.

*Monitoring the use of agricultural machinery* using satellite navigation systems (for example, GPS) and sensors allows you to reduce fuel consumption, as well as optimize routes and the

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workload of personnel serving equipment. It should be noted that in the EU countries 80% of agricultural machinery is sold with navigation equipment, but only 30% are actually connected to the network, since agriculture is dominated by small family farms with small cultivated areas, and therefore the economic feasibility of switching to smart , the more expensive equipment they have is low.

The safety of raw materials in the process of collecting and moving them can be ensured by appropriate sensors, which make it possible to fully track both the location and the weight of the moved raw materials.

*"Smart" storages for vegetables and fruits* allow monitoring the state of products during storage using specially set algorithms in real time (storage temperature, humidity level, carbon dioxide content), which helps to make the right decisions. If the conditions are violated, the system corrects the situation and notifies about changes in the warehouse owner. The created technological solutions for the processing and storage of agricultural products, the automation of these processes can reduce personnel costs and improve storage conditions for the harvested crop.

*Automation of irrigation* allows you to minimize the cost of irrigation water and at the same time to obtain high yields. Modern systems allow you to analyze each area and determine the amount of moisture needed, avoiding excessive water consumption. For example, there are systems that operate on the basis of wireless sensors that transmit a signal to the controller and to the irrigation control unit, which makes it possible to automate the irrigation process and control its implementation at all stages: from monitoring the operation of the irrigation system mechanisms to analyzing the state of soil moisture.

Electronic trading platforms for farmers are used for operational communications between agricultural producers (farmers) with purchasing and trading organizations, which reduces the time of product delivery from the field to the counter and reduces its losses associated with intermediate storage.

If a farmer produces an organic product or wants to emphasize a special type of its certification, then he can use "blockchain" technologies to track the delivery of products. Consumers can scan a product barcode in a supermarket to find out what they are buying and see the entire supply chain from farmer to supermarket.

With the help of special programs working with the use of "blockchain" technologies, it is also possible to automate the process of tracking information along the entire grain supply chain. As grain is harvested from each field, all information about the harvest is collected and displayed in real time in the program, and then sent to suppliers' warehouses, distributed between them depending on the required quality and price, which excludes intermediate storage of grain in bulk. According to experts, currently about 30% of grain and other goods supplied in bulk are lost due to middlemen and poor logistics.

*"Smart" technical devices*

*Drones*, which include both ground-based drones and unmanned aerial vehicles (UAVs) and multicopters (quadro-, hexa-, octocopters), as well as winged drones. The latter are more often used over large areas or for mapping purposes. They also allow you to create electronic 3D maps

of fields, calculate indicators for fertilization, inspect fields and monitor the state of the crop, monitor the operation of transport and agricultural machinery, protect land, apply plant protection products and fertilizers to fields, etc. Monitoring from drones can provide data not only on crops, but also on weeds, for example, their standing density and even species composition. By filming from drones, it is possible to construct thermograms, since the temperature of the plants signals the degree of their stress, especially from drought.

At the same time, according to experts, UAV pay off only if they serve at least 10 thousand hectares of land. In this regard, it is more profitable for small farmers to use the services of outsourcing companies that specialize in providing these types of services. Drones are actively used in agriculture in the USA, Europe, Brazil, Argentina and other countries, but they are most used in China, which also occupies a leading position in the production of UAV. For example, the Chinese company DJI captured more than 2/3 of the global drone market back in 2015. Sensors (sensors), which are installed in the ground at control points, are the basis of the system for determining the characteristics of the soil and are capable of detecting, for example, relief heterogeneity, soil types, illumination, weather, the number of weeds, parasites and promptly inform the user about this for making a decision. Thus, sensors and sensors placed in the field at a considerable distance, which are combined into a network, allow you to receive information about the state of fields and crops, in particular, about humidity, temperature, level of weed infestation, plant growth phases, etc., without leaving the site. [2]

*Robots (robotic machines)*, performing a wide range of tasks - from harvesting to cleaning the area from weeds, are rapidly gaining popularity in agriculture. According to the consulting company Tractica, by 2024 the supply of agricultural robots will grow to 594 thousand units, having increased from 32 thousand at the end of 2016. By the beginning of 2017, there were over 150 suppliers of robots for the agro-industrial complex in the world. At the same time, the following key areas of application of robots in the agro-industrial complex are noted: unmanned tractors and aircraft; automated systems for growing crops; automated control systems for dairy farms, etc. At the same time, "smart" tractors and combines can operate autonomously and do not require a human presence, which makes it possible to use them at any time of the day. In addition, they can be equipped with many additional functions, such as built-in pest control systems. For example, the American company Blue River Technology creates robots that use computer vision to distinguish crops from weeds in the field and selectively spray only it with chemicals, and in Japan they created a robot that collects strawberries from the beds instead of a person. According to scientists, in a few years all routine field work such as sowing, weeding and watering will be able to be performed by agricultural robots.

Thanks to the introduction of the concept, labor productivity in the field will increase by 30 percent, and cotton picking will be completely carried out by machinery. The creation of stress-resistant, high-yielding, transportable varieties of agricultural crops rich in biologically active substances is 100 percent guaranteed. The use of satellite data and remote sensing technologies will make it possible to quickly and accurately assess the condition of agricultural land and crops grown on them. Another important area is that the number of facilities designed using the "smart greenhouse" technology will be increased to 500. An automated production system will be introduced in animal husbandry, as a result of which the cost of production will decrease by 15 percent. It is worth noting that the transition to digital agriculture in Uzbekistan is carried out in

cooperation with the Food and Agriculture Organization of the United Nations (FAO) and the World Bank. [3]

Improved farming systems install smart technologies based on crop and environmental conditions. These include pest and disease detection, climate, temperature and humidity control, nutrient supply and irrigation equipment. Using all this guarantees an increase in productivity by at least 30 percent. In addition, improved systems will be introduced into all agricultural production and marketing chains. As a result, it will be possible to collect large volumes of electronic data. And as a result of their conservation and analysis, it is possible to ensure the efficient use of water, land and other limited resources, the quality and safety of food products.

The convenience of the electronic system lies in the fact that even after harvesting it is applicable in the process of processing, packaging, cleaning, sorting, and delivering products. Smart farming technologies play an important role in achieving high productivity and quality, reducing water consumption and production costs, planning and forecasting crops.

According to Forbes, in 2017, financing in the field of agricultural technology through investments increased by almost 32 %, which in monetary terms is almost \$ 2.6 billion. According to the UN forecast, by 2025 the population of the planet may exceed 8.1 billion people, and by the middle of the XXI century - to reach almost 9.6 billion.

Global experts believe that thanks to digital transformation, the productivity of the agricultural sector should increase by almost 60 percent by 2030. All this is necessary to prevent a food crisis.

Among the priority tasks of introducing the concept, the following provisions can be noted: the use of water, energy and material-saving technologies, which will make it possible to effectively use existing resources; widespread introduction of a drip irrigation system on open and closed land plots with the use of modern farming technologies and appropriate digital information and communication management systems; the widespread use of methods and techniques for growing local and tropical crops in enclosed spaces, greenhouses.

It is necessary to work on the introduction of methods for growing local and tropical crops using artificial substrates, as well as develop methods of growing crops using modern aeroponics and hydroponics in smart greenhouses with digital program control. Increasing the number and improving the quality of promising digital technologies for agricultural management through internal and external investment in this vital area for the republic will ensure food security for many years.

The introduction of advanced innovative technologies and advanced foreign experience in different areas of agriculture implies a transition to a digital method of information exchange, starting from regional centers with a further transition to a nationwide scale. Thus, the amount of paper reporting will be reduced. It is planned to use artificial intelligence technologies for collecting, processing, transmitting and storing data on agriculture in Uzbekistan, as well as virtual and augmented reality technologies for modeling and managing the state and development of crops in different conditions. The introduction of digital technologies in agriculture requires the preparation and support of a certain infrastructure. And this will be practically impossible without the appropriate organization of mobile communications. Based on the foregoing, in order to ensure reliable marketing of agricultural products, it is necessary to

ensure control over these products in storage areas and in transit using signs, chips, identifiers, digital technologies and systems. It also requires the organization of online platforms and systems for the sale of agricultural products.

The relevance and timeliness of the relevant regulatory documents, technical documentation, standards and legislative acts in this area does not raise any doubts. Moreover, all acts must strictly comply with international standards. Moreover, with the widespread use of digital technologies, it is necessary to develop systems for remote sensing of the flora, navigation of farmland and animal husbandry. At the same time, digital systems and platforms must first be installed and tested within the same territory, region or a dedicated settlement.

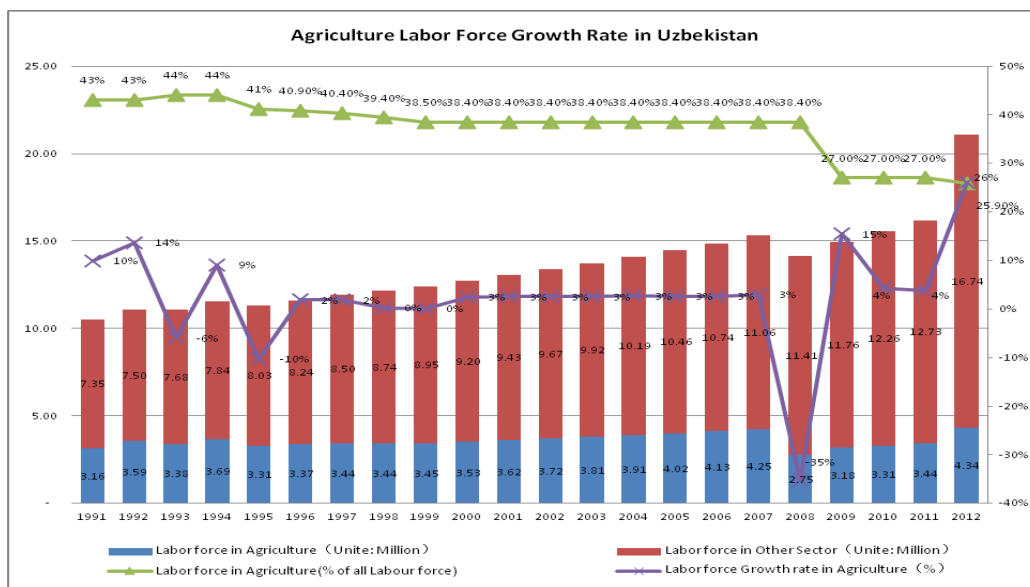


Figure-1. Growth rates of the agricultural labor force in Uzbekistan from 1991 to 2012.

Considering that the republic does not have a very high degree of modern agricultural literacy, it is necessary to pay special attention to digital distance education on problems and new trends in agriculture with the involvement of agricultural consulting firms and organizations. It also makes sense to increase the number of students in agricultural universities, as well as targeted advanced training of teachers of agricultural educational institutions on the problems of the digital economy and digital technologies in agriculture.

It is obligatory to take into account the socio-economic and natural-ecological factors of the development of agriculture, modern trends in the agro-industrial sector, and the demand of the population for products. For example, there are issues related to the provision of farms with mineral fertilizers, seeds and agricultural machinery, as well as financial support. In addition, the insurance relationship between farms and insurance companies does not fully meet the requirements of a market economy. As a result, in case of force majeure, farms do not receive full payments. In addition, it is necessary to rationally and efficiently use water resources, improve the activities of water users' organizations and provide them in full with engineering and technical means for performing hydraulic and hydrographic measures. Of particular importance is the improvement of the legal framework for the fulfillment of contractual obligations by farmers and dekhkan farms, the introduction of information and communication technologies in

the agricultural sector. In the development of agro-industrial infrastructure, it is important to implement a set of measures to identify the main directions and objects of public-private partnership. Today, the first need is the development and implementation of promising projects for the development of the machine and tractor fleet based on the study of foreign experience and in-depth analysis of internal needs. It is also desirable to effectively organize the repair and maintenance of agricultural machinery, using modern and acceptable methods in this area.

In recent years, the agricultural sector in our country has transformed into a diversified complex. Appropriate measures are being taken to increase the export of agricultural products and ensure the financial and economic stability of suppliers. A number of positive results have been achieved in the process of modernizing all sectors of industry, rational use of land and water resources, introduction of modern resource-saving agricultural technologies and further deepening of modern market relations. As a result of agricultural diversification, the share of this sector in GDP reached 17 percent, with an average annual growth rate of six to seven percent. The agricultural sector of the economy employs over 3.6 million people.

The indicators of the agricultural sectors give full confidence that the sphere will only flourish in the future. Taking into account the steps taken by the government, this process will bear fruit in the near future.

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