

разработку валидной карты уязвимости к оползням для поддержки принятия решений по управлению рисками стихийных бедствий в регионе.

Список литературы

1. Ramos-Bernal R., Vázquez-Jiménez R., Rojas W.R. Landslide potential mapping applying maximum entropy to continuous change maps // Appl. Geomatics. 2024. Vol. 16, № 4. P. 951–971.
2. Shi J. Engineering Application of Landslide Susceptibility Mapping in Linear Engineering Optimization // Front. Earth Sci. 2022. Vol. 10.
3. Kalmar T.M. et al. Geospatial technologies for landslide monitoring: a case study of Sighetu Marmăției, Romania // Environ. Earth Sci. 2024. Vol. 83, № 10. P. 341.
4. Sugandhi, N., Supriatna, S., & Rakuasa H. Identification of Landslide Prone Areas Using Slope Morphology Method in South Leitimur District, Ambon City. // Jambura Geosci. Rev. 2023. Vol. 5, № 1. P. 12–21.
5. Bai Z., Liu Q., Liu Y. Landslide susceptibility mapping using GIS-based machine learning algorithms for the Northeast Chongqing Area, China // Arab. J. Geosci. 2021. Vol. 14, № 24. P. 2831.

APPLICATION OF DIGITAL TECHNOLOGIES TO OPTIMIZING AGRICULTURAL PRODUCTION PROCESSES IN UZBEKISTAN

Muhayo Haydarova, 2nd year doctoral student, Bukhara State Technical University, khaydarovamuhayyo30@gmail.com

Azim Oltiev, Doctor of Technical Sciences, Associate Professor, Professor of the Department of Technology of Storage and Processing of Agricultural Products at Bukhara State Technical University

Abstract. This article examines the implementation of digital technologies in Uzbekistan's agro-industrial complex. It presents current digitalization trends and their impact on increasing crop yields, rational use of water and land resources, and the efficiency of production processes. Particular attention is paid to the use of geographic information systems (GIS), Earth remote sensing (ERS), the Internet of Things (IoT), and big data analytics to manage agricultural operations.

Keywords: digital agriculture, GIS, Big Data, IoT, drones, land reclamation, fertility, sustainable development.

The development of digital technologies has become an integral part of modern agriculture. In the context of global climate change and the need for food security, optimizing agricultural processes using digital solutions is becoming increasingly important.

Uzbekistan is implementing a number of government programs aimed at digitalizing agriculture, including the creation of smart farms, soil monitoring, and the automation of irrigation systems.

The Role of Digital Technologies in the Agricultural Sector. Digitalization of agriculture includes the integration of technologies in the following areas:

- Precision Agriculture – using GPS, drones, and sensors to manage crops and fertilizers.
- Internet of Things (IoT) – collecting data from humidity, temperature, and light sensors.
- Big Data – analyzing long-term climate and crop yield data.
- Geographic Information Systems (GIS) – creating digital fertility and relief maps.
- Artificial Intelligence (AI) – predicting plant diseases and optimizing irrigation.

Digital water and land management. Rational use of water resources is one of the key challenges for Uzbekistan's agricultural sector. Remote monitoring systems enable real-time monitoring of soil moisture and water consumption.

Using automated drip irrigation systems based on sensor data allows for water savings of up to 30–40% while maintaining or increasing crop yields.

Table

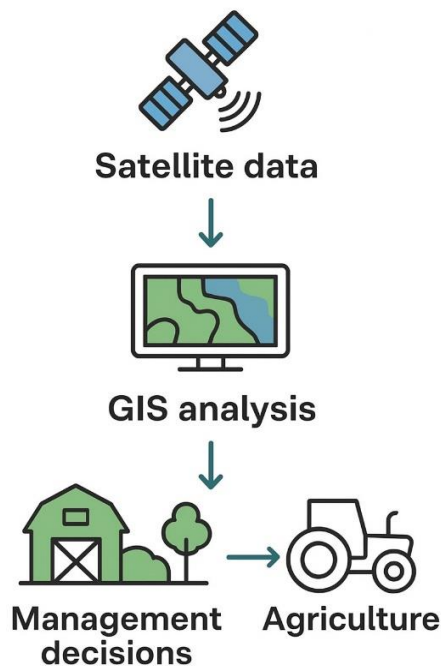
Efficiency of Digital Systems in Resource Management

Indicator	Traditional methods	Digital technologies
Water consumption (m ³ /ha)	8500	5400
Average yield (c/ha)	42	57
Fertilizer consumption (%)	100	75
Harvest losses (%)	12	5

Geographic information systems and remote sensing. Modern satellite technologies allow us to obtain data on crop conditions, salinity levels, and soil erosion.

Using drones with multispectral cameras allows for accurate assessment of plant biomass and chlorophyll levels (NDVI).

This enables early detection of stress zones and allows for targeted agricultural interventions.



Schematic diagram of GIS application in agricultural management

Data analytics and yield forecasting. Big data and machine learning enable yield forecasts based on agroclimatic factors. Historical temperature, humidity, and yield data are used to create models that determine optimal sowing times, fertilizer rates, and irrigation regimes.

The use of such models has increased forecast accuracy to 90–92%, ensuring stable agribusiness planning.

Digital Transformation in Uzbekistan. Uzbekistan is actively developing the Digital Agriculture system. Since 2020, projects to create "smart greenhouses" and "intelligent farms" have been implemented in the Tashkent, Samarkand, and Bukhara regions.

As part of the "AgroTech Uzbekistan" program, mobile applications for land management, weather monitoring, and agricultural operations registration are being implemented.

Table

Key Directions for Digitalization of the Agricultural Sector in Uzbekistan

Direction	Technology	Effect
Field Monitoring	Drones and satellites Crop monitoring	Monitoring the condition of crops
Irrigation Management	IoT Sensors	Water Saving
Crop Management	Big Data and AI	Forecasting and Analysis
Electronic platforms	AgroMap, E-Farm	Farm accounting and reporting

Development Prospects. Digital technologies offer broad prospects for creating sustainable agricultural production.

The following areas are expected to develop in the future:

- Creation of a national agrogeodatabase.
- Implementation of unmanned agricultural machinery.
- Automation of irrigation and plant nutrition management.
- Digital modeling of agroecosystems.

Effective implementation requires training qualified IT agricultural engineers and interdisciplinary training for students at agricultural universities.

The introduction of digital technologies in Uzbekistan's agriculture facilitates a transition from traditional farming methods to intelligent production process management.

This contributes to increased productivity, reduced costs, and the sustainable use of natural resources. Digital agriculture is becoming a key element of food security and sustainable development in the country.

Bibliography:

1. Resolution of the Cabinet of Ministers of the Republic of Uzbekistan dated August 3, 2023, No. 330 "On additional measures to introduce advanced digital technologies in agriculture": text. — Electronic resource. — Access mode: <https://lex.uz/docs/6556009> (accessed: October 20, 2025).

2. FAO. 2022. The State of Food and Agriculture 2022. Leveraging automation in agriculture for transforming agrifood systems. Rome: FAO. Electronic resurs. DOI: 10.4060/cb9479en. — Access mode: <https://digitallibrary.un.org/record/3993910/files/cb9479en.pdf>

3. Makhkamov A.Sh., Akhmedov D.B. Geoinformation technologies in agriculture. – Tashkent: TIIAME, 2021.

4. Saifulina, A.F., Islomova, R.A. "Development of agriculture of the Republic of Uzbekistan in the context of the digital economy" // Universum: economics and jurisprudence, 2021, No. 7 (82).

5. Nurmatov, R., Khamraev, A. "Digital technologies in agriculture: the example of the Surkhandarya region" // International journal of agricultural technology, 2022, v. 18.