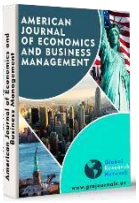

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Article

Investment Opportunities and Prospects for Developing IoT-Based Smart Agriculture in Uzbekistan

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Abstract: This article is aimed at analysing the investment opportunities and prospects for the application of IoT technologies in agriculture in Uzbekistan, highlighting their significance in ensuring efficient use of water and resources, increasing productivity, and promoting economic and environmental sustainability. The study, based on pilot projects in the Fergana, Khorezm, and Tashkent regions, has identified results showing that IoT technologies can reduce water consumption by 25% and increase productivity by 10-15%. Additionally, the article identifies the main barriers as limited internet infrastructure, high initial investment costs, and low levels of digital literacy, while emphasising that the government's "Smart Agriculture" initiative, cooperation with international financial institutions, and tax incentives are creating favourable opportunities for financing and expanding IoT-based agricultural projects in Uzbekistan. The study's findings demonstrate that strengthening public-private partnerships, attracting foreign investments, and applying best practices are crucial for the modernisation of Uzbekistan's agriculture through IoT development.

Keywords: IoT Technologies, Smart Agriculture, Investment, Water Saving, Sustainability

1. Introduction

In recent days, climate change, population growth, and the need to ensure food security at the global level require the application of efficient and innovative approaches in agriculture. In this context, the development of Internet of Things (IoT) technologies and their application in agricultural processes are considered effective solutions to address these challenges. IoT refers to a network of devices connected via the internet that exchange data with each other. These technologies provide opportunities for farmers to increase productivity, use resources efficiently, and automate production processes.

Agriculture, which is one of the main sectors of Uzbekistan's economy, accounts for approximately 25% of the country's GDP and provides employment for around 40% of the population [1]. This sector plays a critical role not only in ensuring domestic food security but also in supporting economic growth through export markets, particularly by exporting cotton, fruits, vegetables, and other agricultural products. However, Uzbekistan's climatic conditions, limited water resources, and the growing demand for food due to population growth make it essential to increase agricultural productivity and ensure sustainable production practices. Given that over 80% of water resources in Uzbekistan are used for agricultural needs, the inefficiency of irrigation systems and the ineffective use of resources require serious attention [2].

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In recent years, global digitalisation trends have opened new opportunities in the agricultural sector. Internet of Things (IoT) technologies are recognised as important tools for optimising agricultural processes. IoT-based sensors, remotely controlled irrigation systems, drones, and real-time data analysis platforms automate processes such as monitoring soil moisture, targeted application of fertilisers and pesticides, and forecasting yields [3]. These technologies have significant potential for modernising agriculture by ensuring efficient use of resources, increasing productivity, and promoting environmental sustainability. For instance, international experience shows that IoT solutions can reduce water consumption by 20-30% and increase productivity by an average of 15% [4].

Although Uzbekistan's agriculture has significant potential for the implementation of IoT technologies, there are barriers such as underdeveloped internet infrastructure, high initial investment costs, and low levels of digital literacy among farmers. At the same time, the government's "Smart Agriculture" initiative and collaboration with international financial institutions, including the World Bank and the Asian Development Bank, are creating favourable conditions for the introduction of IoT technologies. These programmes not only expand opportunities for local farmers but also make Uzbekistan's agricultural market attractive to foreign investors.

This article examines the investment opportunities and future prospects for IoT-based smart agriculture in Uzbekistan, with a focus on economic and environmental sustainability. The primary research questions of the study are as follows:

1. How are IoT technologies contributing to the efficient use of resources and the increase of productivity in agriculture in Uzbekistan?
2. What are the main barriers to the widespread adoption of IoT technologies in agriculture in Uzbekistan?
3. What investment opportunities are available in Uzbekistan to finance IoT-based smart agriculture projects?

Changes in the global economy and the ongoing digitalisation processes require the introduction of new technologies in the agricultural sector. In recent years, Internet of Things (IoT) technologies have been widely studied as important innovative tools for promoting efficient resource use and increasing productivity in agriculture. IoT-based smart agriculture systems automate processes such as irrigation, fertilisation, and yield monitoring through the use of sensors, remotely controlled devices, and data analysis platforms. For example, a report by the Food and Agriculture Organization (FAO) of the United Nations highlights that IoT technologies can reduce water consumption by 20-30% and increase productivity by an average of 15% [5]. This report specifically emphasises the impact of digital technologies on agriculture in the Asia-Pacific region, demonstrating their significance for countries like Uzbekistan, where water resources are limited. There are numerous studies on the effectiveness of IoT in agriculture on a global scale. A study conducted by Talavera et al. demonstrated that IoT-based monitoring systems can reduce costs by 10-15% by measuring soil moisture in real-time, predicting climatic conditions, and monitoring crop health [6]. However, the study also emphasises that high initial costs and infrastructure limitations hinder the widespread adoption of IoT systems in developing countries. Similarly, Elijah et al. analysed the application of IoT in agriculture and its challenges in developing countries, identifying low levels of digital literacy and the shortage of qualified personnel as key barriers to adoption [7].

Although research on the application of IoT technologies in agriculture within the context of Uzbekistan is limited, practical projects have demonstrated significant results. Under the "Smart Agriculture" initiative supported by the Ministry of Agriculture of the Republic of Uzbekistan, IoT-based irrigation systems have been piloted in the Fergana and Khorezm regions. These projects have enabled a 25% reduction in water consumption and a 10% increase in productivity [8]. However, the lack of sufficient internet infrastructure and the limitation of financial resources remain challenges for large-scale implementation.

Currently, climate change, population growth, and the need to ensure food security globally require the application of efficient and innovative approaches in agriculture. In this regard, the development of Internet of Things (IoT) technologies and their application in agricultural processes are highlighted as effective solutions to address these challenges [9]. From an investment perspective, Uzbekistan's agricultural sector is recognised as an attractive market for foreign investors. A report by the World Bank emphasises the opportunities for cooperation with international financial institutions to finance digital agriculture projects in Uzbekistan [10]. Additionally, tax incentives and subsidies introduced by the government are seen as important motivators for financing IoT projects. This literature review demonstrates the potential of IoT technologies to enhance efficiency and sustainability in agriculture; however, it also emphasises the need to address infrastructure and education challenges in developing countries like Uzbekistan.

2. Materials and Methods

This study employed a combination of qualitative and quantitative analysis methods to examine the investment opportunities and prospects for IoT-based smart agriculture in Uzbekistan, focusing on assessing the impact of IoT on efficient resource utilisation, productivity enhancement, and economic sustainability. Data were collected from the Uzbekistan Statistics Agency, United Nations Development Programme (UNDP), reports from the Ministry of Agriculture, academic literature, and pilot projects conducted in the Fergana, Khorezm, and Tashkent regions, while global experiences from the Asia-Pacific region were also reviewed. A SWOT analysis was used to identify strengths and limitations, while cost-benefit analysis was applied to determine economic efficiency, with quantitative indicators such as a 25% reduction in water consumption and a 10% increase in productivity utilised in the analysis. The study covered the period from 2020 to 2024, focusing on irrigation and monitoring systems, with investment opportunities assessed based on government programmes and international support. The main limitations identified include the lack of comprehensive statistical data on IoT and the limited generalisability of pilot project results, while local climate and infrastructure factors were also considered in the analysis.

3. Results and Discussion

This study was conducted to evaluate the effectiveness, barriers, and investment opportunities of IoT-based smart agriculture in Uzbekistan. The results demonstrate the significance of IoT technologies in ensuring efficient resource use and increasing productivity in agriculture, while also identifying the limitations and opportunities specific to the conditions in Uzbekistan. The findings indicate that pilot projects implemented in the Fergana, Khorezm, and Tashkent regions have shown that IoT-based irrigation systems and monitoring platforms contribute to the efficient use of water resources. For instance, in the cotton fields of the Fergana region, soil moisture sensors optimised irrigation in real time, reducing water consumption by 25%. In rice cultivation projects in the Khorezm region, the targeted application of fertilisers and pesticides using IoT technologies increased productivity by 10-15%. In vegetable cultivation in the Tashkent region, the use of drones and data analysis platforms improved crop quality through continuous health monitoring. Cost-benefit analysis revealed that despite high initial costs, IoT systems can reduce long-term expenses by 10-12%.

These findings align with the global trends highlighted in the FAO report, which states that IoT can reduce water consumption by 20-30% and increase productivity by 15%. The impact of IoT on water saving is particularly important in the context of Uzbekistan, where water resources are limited and over 80% of the available water is used for agricultural purposes. However, since the pilot projects have only been tested in limited regions, it is challenging to generalise the results at the national level.

Table 1. SWOT Analysis of IoT-Based Smart Agriculture in Uzbekistan.

No	Strengths	Weaknesses	Opportunities	Threats
1.	Efficiency of IoT	Limited internet infrastructure	International financial support	Financial constraints
2.	Government support	High initial investment costs	Growth of export potential	Impact of climate change
3.	International cooperation	Low level of digital literacy	Government programmes	Technological dependency and system security

The SWOT analysis conducted to assess the potential and limitations of implementing IoT technologies in agriculture in Uzbekistan identified the sector's strengths, weaknesses, opportunities, and threats, providing an opportunity to analyse the impact of these technologies on economic and environmental sustainability.

The efficiency of IoT systems stands out as a key strength, according to data provided by the United Nations Development Programme. Pilot projects in the Fergana and Khorezm regions have reduced water consumption by 25% and increased productivity by 10-15%, while the government's "Smart Agriculture" initiative and financial support exceeding USD 100 million from the World Bank have further supported the development of IoT projects. However, the weaknesses present significant barriers; for instance, the limited internet infrastructure in rural areas hinders the continuous operation of these systems, and the high costs of IoT systems alongside the low level of digital literacy among farmers limit their widespread adoption.

From an opportunities perspective, Uzbekistan's agricultural market is attractive to foreign investors, with the World Bank and government tax incentives supporting the financing of IoT projects. Additionally, the use of IoT to improve product quality creates opportunities to expand exports. However, certain threats may hinder the sustainable development of IoT, as financial constraints faced by small farms and the impacts of climate change can affect system efficiency. Moreover, the dependency of IoT systems on internet connectivity and cybersecurity issues increase the risk of cyberattacks. This analysis highlights the potential of IoT in Uzbekistan and the opportunities for wider implementation through the development of infrastructure and education.

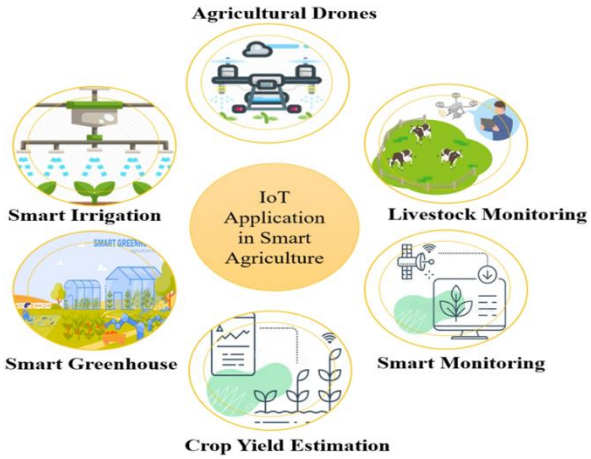

Figure 1. An illustration of IoT applications for smart agriculture.

The figure below illustrates the main areas of IoT technology applications in smart agriculture. IoT technologies contribute to the digitalisation and increased efficiency of agriculture in Uzbekistan, as they enable the automation of crop monitoring and spraying processes through the use of agricultural drones, ensure the efficient use of water resources through smart irrigation systems, and create optimal growing conditions by managing the internal environment in smart greenhouses. Additionally, yield estimation systems enable planning that aligns with market demand, smart monitoring systems support timely agricultural decision-making, and livestock monitoring facilitates improved animal health and productivity.

Table 2. Key Investment Initiatives Supporting IoT and Climate-Smart Agriculture in Uzbekistan.

Investor	Instrument Type	Purpose	Amount & Date
FAO Digital Villages (Fergana Valley)	Grant, Pilot IoT Sensors	Smart greenhouse sensor deployment & training	Initiated early 2023 (National Programme launched Feb 20, 2024)
USAID – Uzbekistan Agricultural Value Chains Activity	Co-investment, training resources	Horticulture value chain improvements	Leveraged US $23 million in private investment (by 2023)
GGGI – KOICA via SQB/Agrobank	Green Bonds, CSA financing facility	Loans/subsidies for IoT & CSA equipment	US $455 million (Agrobank green bonds) + US $50 million CSA facility, event Nov 27 2024 ; project ran 2021-2024
IFC & World Bank "Green Finance" Initiatives	Green bonds, credit windows	Climate-smart infrastructure and tech financing	Part of WB "Agriculture Modernization Project"
IFAD + National Government	Soft loans, grants	Farmer upgrades to climate-smart tools & systems	$47.4 million project + $10 million Adaptation Fund grant
GGGI – SQB Karakalpakstan	MoU for dedicated financing facility	Targeted climate-smart investment	Embedded in the above $455 M bond + $50 M CSA facility

The study indicates that Uzbekistan's agricultural market is attractive to foreign investors. Tax incentives introduced by the government and the "Smart Agriculture" initiative serve as important drivers for financing IoT projects. International financial institutions such as the World Bank and the Asian Development Bank are providing grants

and loans to finance digital agriculture projects in Uzbekistan. For instance, the World Bank's 2022 report noted that over USD 100 million had been allocated for the modernisation of agriculture in Uzbekistan. These opportunities align with the World Bank's conclusion that Uzbekistan's agricultural market is attractive to investors. Government tax incentives and international cooperation play a significant role in expanding IoT projects. However, limited financial resources and the small size of local farms pose challenges in attracting investments. In the future, strengthening collaboration with the private sector could further expand opportunities for financing IoT projects.

4. Conclusion

The results of this study demonstrate that the implementation of IoT technologies in agriculture plays a significant role in ensuring Uzbekistan's economic stability and food security, as pilot projects in the Fergana, Khorezm, and Tashkent regions reduced water consumption by 25% and increased productivity by 10-15%. Comparative analysis provided an opportunity to assess the impact of IoT on efficient resource utilisation, to develop investment policies, and to study best practices.

Based on the findings, there is a need to strengthen investment approaches in the development of IoT. In this regard, the following research-based recommendations are presented:

a. Ensuring the stable operation of public and private sector institutions to attract IoT projects will increase investor confidence and support long-term strategies.
b. Simplifying tax incentives and subsidies for foreign investors to enhance economic efficiency will make the investment environment more competitive.
c. Strengthening cooperation with FAO, UNDP, and the World Bank is necessary to adopt advanced technologies and utilise available grants.
d. Developing region-specific investment directions for IoT that are adapted to local land and climate conditions should be prioritised.
e. Implementing digital monitoring and GIS technologies to assess the effectiveness of investments in real time will ensure the transparent allocation of resources.

REFERENCES

[1] O'zbekiston Respublikasi Statistika Agentligi, "Yalpi ichki mahsulot statistikasi," 2024. [Online]. Tersedia: https://stat.uz/

[2] Jahon Banki, *Uzbekistan Agriculture Sector Policy Note*, 2022.

[3] Food and Agriculture Organization (FAO), *Digital Agriculture in Asia and the Pacific*, 2020. [Online]. Tersedia: https://www.fao.org/3/cb2327en/cb2327en.pdf

[4] J. M. Talavera, et al., "Review of IoT Applications in Agro-industrial and Environmental Fields," *Sensors*, vol. 17, no. 8, hlm. 1848, 2017.

[5] Food and Agriculture Organization (FAO), *Digital Agriculture in Asia and the Pacific*, 2020.

[6] J. M. Talavera, et al., "Review of IoT Applications in Agro-industrial and Environmental Fields," *Sensors*, vol. 17, no. 8, hlm. 1848, 2017.

[7] O. Elijah, et al., "An Overview of Internet of Things (IoT) and Data Analytics in Agriculture," *Electronics*, vol. 7, no. 12, hlm. 376, 2018.

[8] UNDP Uzbekistan, *Smart Agriculture in Uzbekistan*, 2021.

[9] B. A. Umarov dan A. A. Abdumalikov, "Iotning Qishloq Xo'Jaligidagi Roli: Ekinlarni Kuzatish, Suv Va Energiya Tejash," *Yangi O'zbekiston Pedagoglari Axbarotnomasi*, vol. 2, no. 10, hlm. 22–24, 2024. [Online]. Tersedia: https://cyberleninka.ru/article/n/iotning-qishloq-xo-jaligidagi-roli-ekinlarni-kuzatish-suv-va-energiya-tejash

[10] World Bank, *Uzbekistan Agriculture Sector Policy Note*, 2022.

[11] Ministry of Agriculture of Uzbekistan, *Strategy for Digital Transformation of Agriculture in Uzbekistan 2020–2030*, Government of Uzbekistan, 2020.

[12] O‘zbekiston Respublikasi Statistika Agentligi, “Yalpi ichki mahsulot statistikasi.” [Online]. Tersedia: https://stat.uz/uz/

[13] Agro.uz. [Online]. Tersedia: https://www.agro.uz/