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Research Article

OPTIMIZING IRRIGATION AND SOIL MOISTURE MANAGEMENT IN UZBEKISTAN'S AGRICULTURAL SECTOR THROUGH MODERN TECHNOLOGIES

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ABSTRACT

This article examines the role of modern technologies in improving irrigation and soil moisture management in Uzbekistan's agricultural sector. With 9.7% of the country's land under irrigation, efficient water use is critical. Traditional soil moisture measurement methods are labor-intensive, while IoT-based sensors and automated systems offer real-time monitoring and optimization. Research findings show that these technologies enhance water conservation, increase crop productivity, and prevent soil degradation, making them essential for sustainable agriculture in water-scarce regions like Uzbekistan.

KEYWORDS

Uzbekistan agriculture, soil moisture management, irrigation technologies, IoT in agriculture, water resource optimization, sustainable farming, automated irrigation systems, crop productivity, soil monitoring, water conservation in agriculture.

INTRODUCTION

The agricultural sector of Uzbekistan is one of the key industries in the country's economy. Currently, irrigated lands account for 9.7% of the total land area of the country, which is approximately 4.3 million hectares. The largest areas of irrigated land are located in Kashkadarya (16.9%), Jizzakh (11.1%), and Samarkand (10.9%) regions. However, in Andijan region, this figure is only 5%. Efficient use of water resources and

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increasing productivity remain critical challenges in managing these lands[1][2]

METHODS

Soil is the primary resource in agriculture and directly influences productivity. Understanding the physical and mechanical properties of the soil is crucial for enhancing its fertility. The air and water content within the soil significantly affect plant growth. For instance, sandy soils dry quickly due to low moisture retention, requiring frequent irrigation, while heavier clay soils can retain water for longer periods.

To enhance soil fertility and ensure efficient use, it is essential to regularly monitor the soil's physico-mechanical properties and its water retention capacity. The more moisture the soil retains, the longer plants can thrive without irrigation. Therefore, a detailed analysis of soil composition is vital for determining its suitability for crops[2]

Irrigation and Moisture Measurement Methods. Irrigation is one of the most critical processes in agriculture, and timely and accurate measurement of soil moisture significantly impacts crop yield. Traditional methods of measuring soil moisture can be time-consuming and labor-intensive. The method developed by V.Y. Kabayev was designed for rapid and efficient field measurements, but it involves delays and high labor costs[1][3].

For this reason, it is necessary to optimize moisture measurement processes using modern methods and technologies. These include IoT-based sensors, remote monitoring systems, and automated irrigation systems. By measuring soil moisture levels in a timely manner, excessive water usage can be prevented, resources conserved, and productivity increased[2](3].

Modern Technologies. Today, modern irrigation technologies play a crucial role in agriculture. IoT technologies enable the measurement and monitoring of moisture levels at different points in the field. For instance, soil moisture at various depths is continuously transmitted to a central database via Wi-Fi, where the data is processed[3].

Through IoT technologies and soil sensors, the optimization of water usage and monitoring of field conditions is increasingly automated. These technologies ensure that water resources are used efficiently, and soil moisture levels are continuously monitored, helping to prevent both over-irrigation and water shortages[4].

DISCUSSION

Advantages of IoT Technologies. IoT technologies allow for precise, real-time monitoring of soil moisture, which plays an important role in agriculture. These technologies not only help increase productivity in the field but also enable the optimal use of water resources. Soil sensors can detect not only moisture levels but also the chemical, physical, and mechanical properties of the soil, making irrigation processes much more efficient[2] [4].

Modern irrigation systems, integrated with IoT technologies, prevent excessive water usage and reduce energy costs. In large-scale irrigation systems, remote control based on IoT technologies is creating new opportunities for agriculture, allowing for more efficient management of water resources and creating optimal conditions for plant growth[1][3][4].

RESULTS

With the use of modern remote soil moisture measurement technologies, data collected at short intervals provides a clearer understanding of overall

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field conditions. In this research, soil moisture was measured at various depths every 20 minutes. The aim of the study was to determine the average soil moisture levels and optimize irrigation processes.

For instance, the measured moisture levels were 23% for sample 1, 26% for sample 2, 31% for sample 3, 26% for sample 4, and 24% for sample 5. The analysis of this data allowed for moisture levels to be adjusted at each point, enabling the revision of irrigation processes.

The data shows that compared to traditional methods, remotely measured results are more accurate and allow for real-time monitoring of soil conditions. Soil moisture levels are continuously analyzed, and based on the results, water usage is optimized. This significantly reduces water wastage and helps protect the soil from salinization.

During the research, the data collected from modern IoT sensors was analyzed, and soil moisture levels were optimized accordingly. The data was continuously transmitted to a central database via Wi-Fi, and the field conditions were analyzed. Based on this information, the irrigation system automatically adjusted water usage to achieve optimal results.

These results provide a clearer understanding of soil conditions at various points in the field, enabling efficient use of water and accurate determination of plant irrigation needs. By optimizing water resources based on the data, it is possible not only to increase productivity but also to prevent soil degradation[2][3].

CONCLUSION

Efficient use of water resources and accurate, rapid measurement of soil moisture are crucial in Uzbekistan's agriculture. The widespread adoption of modern technologies can optimize irrigation processes, increase productivity, and contribute to water conservation.

REFERENCES

1. Liutin A., Castañeda Dower P. Irrigation innovation: Navigating challenges in Uzbekistan's water–energy–food–environment nexus. – 2023. URL: https://www.cgiar.org/news-events/news/irrigation-innovation-navigating-challenges-in-uzbekistan-water-energy-food-environment-nexus
2. Chathuranika I. et al. Implementation of water-saving agro-technologies and irrigation methods in agriculture of Uzbekistan on a large scale as an urgent issue //Sustainable Water Resources Management. – 2022. – Т. 8. – №. 5. – С. 155. URL:https://link.springer.com/article/10.1007/s40899-022-00746-6
3. Jumanov A. Determination of soil moisture depth in a mountainous region of Uzbekistan. – 2022. URL:https://staff.tiiame.uz/storage/users/856/articles/nXjvtfVRVidLOTLOOr6OKaHCniBtGCHCywouXfQF.pdf
4. Ahmed Z. et al. An overview of smart irrigation management for improving water productivity under climate change in drylands //Agronomy. – 2023. – Т. 13. – №. 8. – С. 2113. URL:https://www.mdpi.com/2073-4395/13/8/2113