TRADITIONAL IRRIGATION METHODS IN THE CONDITIONS OF UZBEKISTAN

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Abstract. *This article examines the traditional irrigation methods used in the agricultural sector of Uzbekistan, where water plays a crucial role in crop production under arid climatic conditions. The paper analyzes the characteristics of conventional irrigation systems such as furrow irrigation, border irrigation, and basin irrigation, which have been widely applied for decades. Despite their extensive use, these traditional methods often result in significant water losses due to evaporation and infiltration. The article also highlights the need for improving existing systems and gradually transitioning to modern water-saving technologies to ensure sustainable agricultural development and efficient use of water resources in Uzbekistan..*

Keywords. *Uzbekistan, irrigation, traditional methods, furrow irrigation, surface irrigation, agriculture, water resources, efficiency.*

Introduction

Uzbekistan, located in an arid region, is one of the countries where agriculture consumes the largest share of available water resources. Approximately 90% of all water used in the country is spent on irrigated agriculture. In recent years, due to climate change, population growth, and the expansion of agricultural lands, the demand for water has significantly increased. Therefore, the introduction of water-saving technologies has become one of the key strategic directions in the development of the agricultural sector of Uzbekistan.

To address this issue, the government has adopted several important policy documents. In particular, the Presidential Decree PF–6024 (July 10, 2020) approved the Concept for the Development of Water Management for 2020–2030, which aims to expand the application of water-saving irrigation technologies to 2 million hectares by 2030. Furthermore, the Presidential Resolution PQ–5005 (February 24, 2021) established the goal of introducing drip irrigation systems on 800 thousand hectares by 2023.

These initiatives have led to significant improvements in water management efficiency, crop yield, and quality across the country. One of the most promising areas for sustainable agricultural development is the introduction of pressurized irrigation systems, including drip and sprinkler irrigation technologies, which help reduce water losses, optimize irrigation efficiency, and preserve soil fertility.

In the economic development of Uzbekistan, the agricultural sector — particularly irrigated farming — plays a crucial role. Irrigated lands ensure food security for the population, provide a stable supply of raw materials for industrial sectors, and contribute significantly to the country's export potential.

Among all branches of agriculture, irrigated farming is the largest consumer of water resources. The amount of water used for irrigation largely depends on the soil and climatic conditions of the area, the type of crop grown, and the irrigation method applied.

Given Uzbekistan's unique natural and climatic conditions, surface irrigation methods are most widely practiced in agriculture. In most cases, crops are cultivated using furrow irrigation technology. Additionally, some crops are irrigated by dividing fields into borders or basins, where water is applied by flooding the surface.

Among these methods, furrow irrigation is considered the most traditional and well-adapted technique to Uzbekistan's environmental conditions. This method is convenient for the soil's water retention properties and field topography, and it has been effectively used for many decades.

To ensure uniform soil moisture, the width of furrows is adjusted according to soil type. On heavy-textured soils, wider furrows are used, while lighter soils require narrower ones. Typically, furrow width is 0.6–0.7 m for light loamy soils, 0.7–0.8 m for medium loamy soils, and around 0.9 m for heavy clay soils.

During pre-sowing and moisture-accumulating irrigation, if the field was plowed in autumn, the furrow width is set between 0.7 m and 1.0 m, depending on soil characteristics. For annual crops, the width of furrows used for irrigation is generally between 0.6 and 0.7 m, depending on the crop's biological and agronomic requirements.

The shape of the soil moisture contour depends not only on the soil's physical properties but also on the amount of water applied during irrigation, as well as the duration of irrigation. The configuration of the furrow also affects moisture distribution. In light soils, where furrows are shallow but wide, the wetting front extends downward, allowing deep moisture penetration. On heavy soils, to achieve similar results, furrows are made narrow and deep.

Therefore, depending on cross-sectional shape, furrows are classified as deep and narrow, deep and wide, shallow and narrow, and shallow and wide. At the beginning of the growing season, shallow or medium-depth furrows are used to moisten the upper soil layers, while later, as crops develop, the furrows are deepened. This practice is particularly common in vegetable cultivation.

Furrow irrigation is typically applied in fields that are naturally level or have been artificially leveled, with a longitudinal slope of no more than 0.02–0.03. It is most widely used for row crops, such as cotton, maize, potatoes, vegetables, and melons.

In some cases, irrigation is organized by dividing the field into border strips (checks). When designing such systems, special attention is paid to the cross slope of the field — ideally, there should be no cross slope at all. For example, the cross slope of borders 3.6–4.2 m wide should not exceed 0.003. If the slope is too steep, water tends to accumulate at the lower end of the strip, leading to uneven moisture distribution and water losses.

During border irrigation, the single irrigation norm typically ranges from 1000 to 1500 m³/ha. To prevent excessive runoff at the end of the field, water application is stopped when approximately three-quarters of the strip length has been covered with water.

Drip Irrigation System – In this method, water is delivered directly to the root zone of the plant in the form of drops. This technology reduces water consumption by 30–50%, allows plants to absorb moisture more efficiently, and decreases soil salinity. This system has been successfully tested in the Samarkand, Bukhara, and Navoi regions of Uzbekistan.

Sprinkler Irrigation System – In this system, water is sprayed through the air in the form of fine droplets. It ensures uniform distribution of water and reduces the effects of wind and evaporation. This method is mainly used for vegetable, melon, and orchard crops.

Subsurface Pipe Irrigation System – In this method, water is supplied directly to plant roots through underground pipelines. As a result, evaporation is almost eliminated, water losses are minimized, and the irrigation process can be fully automated. Although this technology requires higher initial investment, it is economically beneficial in the long term.

In addition, digital technologies and artificial intelligence-based monitoring systems help control water consumption, measure soil moisture, and develop optimal irrigation schedules. Such systems significantly improve water-use efficiency, enhance crop quality, and reduce energy consumption

Conclusio. In conclusion, the introduction of water-saving technologies is a key factor in ensuring the sustainable development of Uzbekistan's agricultural sector. The widespread implementation of drip, sprinkler, and subsurface irrigation systems not only conserves water resources but also increases crop yields, maintains soil fertility, and enhances environmental safety. In the future, further improvement of these technologies and continued support for farmers will strengthen the system of rational water use across the country.

References

1. FAO (Food and Agriculture Organization of the United Nations). Guidelines for Irrigation and Water Management in Arid Regions. Rome: FAO Publications, 2021.
2. Ministry of Water Resources of the Republic of Uzbekistan. Concept for the

Development of Water Management of the Republic of Uzbekistan for 2020–2030. Tashkent, 2020.
3. Presidential Decree of the Republic of Uzbekistan PF–6024, July 10, 2020 — "On Approval of the Concept for the Development of the Water Management System of the Republic of Uzbekistan for 2020–2030."
4. Presidential Resolution of the Republic of Uzbekistan PQ–5005, February 24, 2021 — "On the Strategy for Water Resources Management and Irrigation Sector Development for 2021–2023."
5. Mamatov, S.A., Burkhonjonov, B.Sh. Water-Saving Irrigation Technologies. Tashkent: TIIAME Press, 2022.
6. UNEP (United Nations Environment Programme). Sustainable Water Use and Management in Agriculture. Geneva: UNEP Reports, 2022.
7. Karimov, A., Khudoyberdiyev, B. "Efficiency of Furrow Irrigation in Uzbekistan's Agricultural Systems." Journal of Agricultural Engineering and Irrigation Science, vol. 4, no. 2, 2023.
8. World Bank. Water Efficiency in Central Asia: Challenges and Opportunities. Washington, D.C., 2022.
9. ResearchGate Database. "Comparative Analysis of Drip, Sprinkler and Furrow Irrigation in Arid Regions." Accessed 2024.
10. TIIAME National Research University. Recommendations for Improving Surface and Furrow Irrigation Systems in Uzbekistan. Tashkent, 2023.