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STUDY OF THE POSSIBILITIES OF USING WATER-SAVING DRIP IRRIGATION SYSTEMS IN RICE GROWING

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Annotation. *This article analyzes the practical application and future prospects of drip irrigation systems in Uzbekistan. In the context of limited water resources and drought problems in the country, the important role of this technology in agriculture, in particular in the cultivation of rice and other water-intensive crops, is considered. The possibilities of drip irrigation to save water, reduce soil salinity, increase productivity, and achieve environmental sustainability are emphasized. Recommendations are also given for the expansion, automation, and introduction of this technology to farmers.*

Keywords: *drip irrigation, water saving, rice cultivation, Uzbekistan, agriculture, water resources, agrotechnology, environmental sustainability.*

Introduction

Water resources are becoming increasingly scarce due to global population growth and climate change. Water is not only essential for human survival, but also a key resource in agriculture. Effective water management is particularly important for water-intensive crops such as rice. Traditional irrigation methods often result in significant water losses, which not only wastes resources but also reduces crop yields.

In recent years, advanced technologies, including drip irrigation systems, have been widely used in agriculture to save water and increase productivity. Drip irrigation is an effective method that delivers precise and measured amounts of water to plant roots, minimizing evaporation and runoff losses.

This system is especially important in rice cultivation, as rice is a water-intensive crop, and its effective irrigation improves crop quality and allows for efficient water use.

Many regions of Uzbekistan are recognized as regions with drought and limited water resources. Therefore, the development of drip irrigation systems in our country is of strategic importance for ensuring the sustainability of agriculture and rational management of water resources. This article examines the water-saving potential of drip irrigation systems in rice cultivation, the advantages and practical application of the technology, as well as its prospects in the conditions of Uzbekistan.

The relevance of water resources in rice cultivation

Rice is one of the main food crops in the world and is the main daily consumer product for billions of people. However, the rice cultivation process has its own agrotechnical characteristics and requires a particularly large amount of water consumption. According to statistics, it takes an average of 2,500–5,000 liters of water to grow 1 kg of rice. This figure is several times higher than for other crops such as wheat or corn.

Traditionally, rice seedlings are grown in fields filled with water. On the one hand, this method creates the necessary environment for plant growth, but on the other hand, it causes

significant losses due to evaporation, filtration, and improper water management. This problem is especially acute in regions with limited water resources and a hot and arid climate.

Water scarcity is having a dramatic impact in many regions of Uzbekistan, in particular, the Republic of Karakalpakstan, Khorezm, Bukhara, Syrdarya, and other regions. While the water flow in the Amu Darya and Syrdarya basins is decreasing year by year, the issue of rational and efficient use of available resources has become a priority. Rice cultivation remains one of the largest water consumers in this process.

In addition, the volume of water used for irrigation is decreasing as a result of climate change, reduced rainfall, and groundwater depletion. This has a direct negative impact on the duration, yield, and quality of rice cultivation.

Therefore, today, the introduction of water-saving technologies in rice cultivation has become not only an ecological but also an economic necessity.

Innovative methods such as drip irrigation are considered an important tool in the fight against these problems. They not only save water, but also provide the necessary microclimate for rice growth, contributing to the production of high and quality crops.

Drip irrigation is one of the most economical and modern technologies for increasing the efficiency of water use in agriculture. In this method, water is delivered directly to the roots of plants in a precise amount and in the form of slow drops. In traditional irrigation methods, water is poured over a large area at once, which leads to many losses - evaporation, surface runoff or absorption into deep layers. In drip irrigation, these losses are practically absent, since water is supplied only to the plant roots in the right place. This creates a favorable agroclimate for the plant and increases the efficiency of water use several times.

The principle of operation of this system is simple, but quite well-organized. The water source – which can be a well, canal or reservoir – is first passed through a filter system. The filters remove sand, silt or other particles from the water, which is essential to prevent pipes from clogging. The water is then pumped into main pipes at the required pressure through special pressure regulators. From the main pipes, the water is then pumped through distributors to drip pipes. These pipes are laid in line with the rows of rice plants, and the water slowly drips into the soil around each root zone.

It is worth noting that not only water, but also dissolved fertilizers can be supplied through the drip irrigation system. This process is called fertigation. Through it, plants receive nutrients directly through the roots, which accelerates their growth and increases productivity.

This method is especially effective in rice cultivation, and recent achievements in the field of selection and agrotechnology have proven that rice can also be successfully grown using this method.

There are also automated types of drip irrigation systems that operate independently depending on a certain time of day, soil moisture or air temperature. This significantly reduces human labor, saves resources, and reduces the likelihood of human errors during the irrigation process.

In general, the drip irrigation system is a solution for arid and water-limited regions. It not only saves water, but also has a positive effect on the quality and quantity of the crop.

This technology can also be successfully applied to water-intensive crops such as rice, which serves as one of the practical solutions to the problem of water shortage in Uzbekistan.

The limited water resources and arid climate in Uzbekistan make the issue of water conservation and efficient use in agriculture very urgent. In particular, when growing rice, cotton and other water-intensive crops, a large part of the water is lost as a result of the use of traditional irrigation methods. Therefore, in recent years, great attention has been paid to the widespread introduction and development of drip irrigation systems in our country.

The practice of drip irrigation has been actively developing in Uzbekistan since the early 2000s. In particular, the application of this technology in the cultivation of cotton, vegetables and rice has led to a reduction in water consumption and an increase in productivity. Through projects implemented with the support of the Ministry of Agriculture of Uzbekistan and international financial organizations, drip irrigation systems are being installed on thousands of hectares.

In practice, drip irrigation systems play an important role not only in saving water, but also in preventing soil salinization. In traditional irrigation methods, a large amount of water falls on the surface of the earth and evaporates, increasing the risk of salinization. In drip irrigation, since water is delivered precisely to the root zone, salinity levels are significantly reduced and the natural fertility of the soil is preserved. This, in turn, allows for sustainable agriculture.

The introduction of drip irrigation technologies is expanding in our country, especially in the Republic of Karakalpakstan, Khorezm, Bukhara, Jizzakh and Syrdarya regions. In these regions, the problem of water shortage is most acute, and through innovative irrigation methods, the water needs of crops are being optimized. At the same time, special trainings and seminars are organized for farmers and peasant farms, providing practical skills in the effective use of drip irrigation.

In the future, there are great opportunities for the further development of drip irrigation systems in Uzbekistan. First of all, it is necessary to allocate financial subsidies and loans for the introduction of this technology to small and medium-sized farms. Also, research institutes are working to adapt drip irrigation technology to the climatic conditions of Uzbekistan and develop new, more efficient drip materials.

There are also opportunities to further optimize irrigation processes by automating and digitizing drip irrigation systems. For example, using sensors that measure soil moisture and computer systems that control them, the level of water supply is controlled in real time, which will not only help to further save water, but also increase productivity.

At the same time, the widespread introduction of drip irrigation will be an important factor not only in increasing the economic efficiency of agriculture, but also in protecting the environment and sustainable management of water resources. Our country needs to expand the effective use of this technology in order to save water resources and reduce water demand. In conclusion, drip irrigation is rapidly developing in Uzbekistan as an important tool for agricultural development in conditions of water scarcity. In the future, its further expansion, enrichment with new technologies, and creation of favorable conditions for farmers will serve to strengthen the food security of our country.

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