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IMPORTANCE AND BENEFITS OF USING WASTEWATER IN IRRIGATION FARMING

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Abstract

This article presents the importance and advantages of the use of wastewater in agriculture, the classification of wastewater, the criteria for the use of wastewater in irrigation, the socio-ecological and economic benefits of wastewater irrigation in agriculture. Proposals on problems in the use of wastewater in agriculture and ways to solve them have also been made.

Keywords: *agriculture, irrigation farming, effluent, effluent classification, criteria for use of effluent in irrigation..*

Introduction. Issues related to water scarcity around the world are recognized as one of the main problems for the sustainable development of sectors of the economy. In particular, according to the United Nations Food and Agriculture Organization (FAO), "By 2050, the demand for water consumed for the purpose of agricultural, industrial and domestic needs is expected to increase by 50 percent to supply the world's 10 billion inhabitants" [10]. Also, according to a UNESCO report prepared until 2030 (WWAP), "global water supply can shrink by 10 percent in 2030 and by 25 percent in 2050" [11]. At the same time, the global practice of water resources of the World Bank states that "at a time when 36% of the world's population lives in water-scarce areas, sewage treatment and reuse are one of the effective solutions to water scarcity and pollution problems" [12].

In order to rationally use water resources, several measures are being implemented in our country. In particular, in the concept of the development of water industry of the Republic of Uzbekistan for 2020-2030, it was established, including "research on the scientific basis of the use of wastewater (effluent) in agriculture and solving the issues of improving the economic mechanisms of water use in a market economy." Therefore, the implementation of wastewater treatment and their use for irrigation purposes based on the requirements of Integrated Management of Water Resources (IMWR), research on improving economic mechanisms for the use of wastewater in agriculture is one of the current urgent tasks.

Literature review. In particular, Golchenko M.G., Jelyazko V.I., Gostitshev D.P., Kastrikina N.N. and a number of other foreign scientists conducted research on the use of wastewater in agriculture. Lev V.T., Artukmetov Z., Ramazanov A., Makhmudova I.M., Akhmedova G.A., Djumanazarova A.T., Yakubov M.A., Akhmedov I.A., Abdujabbarova M.T. and others conducted research on agricultural use of wastewater in Uzbekistan.

According to their research, water scarcity is one of the main obstacles in the socio-economic development of arid and semi-arid regions. In addition to low rainfall levels and frequent droughts, it has been noted that factors related to increased demand for water reserves in irrigated agriculture, urbanization processes, population growth, changes in industrialization and water pollution further exacerbate the problem of lack of water reserves.

Materials and methods. It is known that waste water is created as a result of the domestic and industrial activities of people and is removed from enterprises and residences through special sewage pipes. They also include precipitation runoff from residential points and industrial enterprise areas as a result of atmospheric precipitation. Effluents containing mineral, organic and biological pollutants that are solid, dissolved and insoluble in composition are separated into industrial, precipitation water, household-sewage water and agricultural effluents (Figure 1).

Industrial effluent consists of wastewater from production facilities and is low in organic matter and has a weak alkaline composition. Complete re-treatment is required at industrial effluent treatment facilities coming out of industrialized cities. This water is mainly used in fishing. Precipitation water can be formed on average up to 5 km3-10 km3, making use of these waters possible. Precipitation waters are used in utility services (4.5%).

Domestic sewage effluents come from the sewers of residential complexes and other domestic organizations and have a constant chemical composition. The volume of this water is 10 km3-15 km3. Complete re-cleaning of household-sewage effluent is required. This water is mainly used in the industrial and energy sectors.

Agricultural wastewater consists of livestock industry and collector water and is mainly used in the sphere itself. The volume of agricultural effluent is 15 km3-20 km3 or more. This water is partially usable and does not require deep cleaning. Since purified effluents may contain substances that have a negative effect on agricultural crops and livestock, it is necessary that such substances contained in effluents used in irrigation do not exceed the permissible norms.

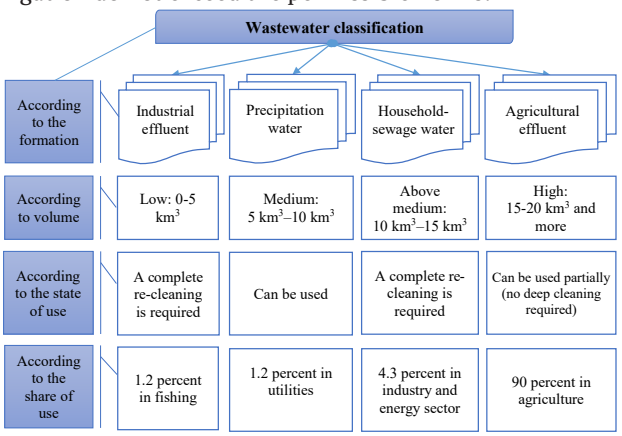

Figure 1. Classification of wastewater.

It is known that in the 60-80s of the 20th century, many aspects of sewage irrigation were studied. Taking into account the peculiarities of the use of this type of water, the criteria for its use are divided into several groups, which play an important role in the organization of irrigation fields with wastewater and their exploitation. These criteria include reclamation, agrochemical, agroeconomic, environmental protection and sanitary-hygienic criteria, the main requirements for which are as follows:

reclamation criteria – not allowing reclamation of arable land to deteriorate;

agrochemical criteria – preventing the decrease of soil fertility and quality of irrigation areas;

agro-economic criteria – to prevent the reduction of productivity and to achieve high profit by effectively using each hectare of land;

environmental protection criteria – prevention of environmental pollution, in particular the protection of underground and other water sources from pollution;

sanitary-hygienic criteria – the creation of safe working conditions for workers in irrigation areas and compliance with sanitary-hygienic rules (Table 1).

Table 1.

Criteria for the use of wastewater in irrigation

Criteria	Requirements
Reclamation criteria	Preventing reclamation of arable land from deteriorating
Agrochemical criteria	Prevent decrease the quality of soil fertility of irrigation areas
Agroeconomic criteria	Avoid yield loss and maximize profit per hectare, achieving high profits
Environmental protection criteria	Prevention of environmental pollution, in particular the preservation of underground and other water sources from pollution
Sanitary-hygienic criteria	Creation of safe working conditions for workers in irrigation areas and compliance with sanitary and hygienic rules

Discussion. Effluents from the food industry or livestock are commonly used for irrigation. In particular, the effluents from the livestock complex are very useful as fertilizers, with which water streams mixed with manure during irrigation enrich the soil with mineral elements and organic matter as a result of complex biological and biochemical processes carried out under the influence of various microorganisms.

In the rational use of water resources, environmental requirements are considered one of the main principles, for which it is advisable to effectively use purified wastewater in irrigation agriculture. Because, it not only serves to increase the economic efficiency of farms, but also prevents contamination of groundwater and surface water, and also leads to the saving of mineral fertilizers due to the natural saturation of the land with minerals.

There are socio-environmental and economic benefits of effluent irrigation in agriculture. In particular, the issues of lack of water resources are solved from a socio-ecological point of view, protection of surface and underground fresh water is achieved, sources of drinking water are preserved, negative effects on the environment are reduced and the consequences of climate change are mitigated. And in economic terms, an additional water reserve is created, the cost of production decreases due to a decrease in the costs of fertilizing, an increase in productivity due to the efficient use of water is ensured, agriculture is achieved with constant water supply even in drought conditions, and the possibility of growing crops throughout the year is created.

Also, the practice of irrigating agricultural crops with effluent can be economically beneficial only if there is a practice of effective management in agriculture and aquaculture. The creation of appropriate organizational, legal and economic mechanisms in water and agricultural management is required to organize the practice of irrigation of agricultural crops with treated wastewater.

Conclusion. During the studies, it was found that there are the following issues in the use of wastewater in agriculture:

- the bulk of the wastewater corresponds to the proportion of irrigation water;
- the quality of wastewater does not meet the standards of irrigation;
- the system and control of the use of wastewater is not well developed;
- the effluent is treated and drained into the canal;
- precipitation, industrial and household effluents are thrown into a sewage system;
- irrigation with effluent is not systematized (Figure 2).

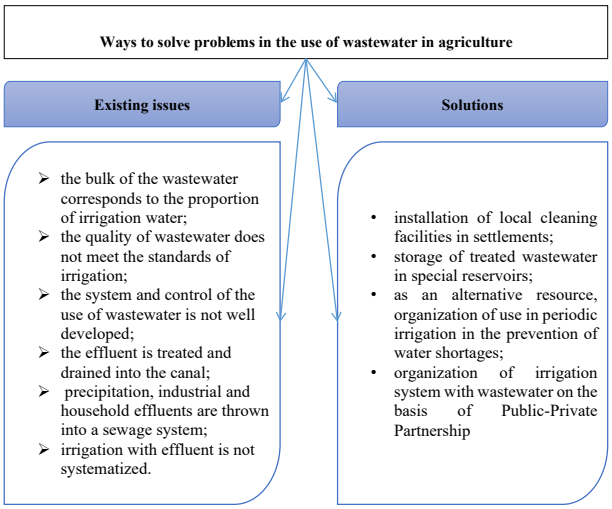

Figure 2. Ways to solve problems in the use of wastewater in agriculture.

To eliminate these problems, it is advisable to carry out the following measures:

- installation of local cleaning facilities in settlements;
- storage of treated wastewater in special reservoirs;
- as an alternative resource, the organization of its use in periodic irrigation in the prevention of water shortages;
- organization of irrigation system with wastewater on the basis of Public-Private Partnership.

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