

ISSN 2181-9408

Scientific and
technical journal

Sustainable Agriculture

№1(21).2024



Chief Editor

Salohiddinov Abdulkhakim

Vice-rector for international cooperation

Professor at "Tashkent Institute of Irrigation and Agricultural Mechanization Engineers"
National Research University, Doctor of technical sciences

Scientific Editor

Yunusov Iskandar

PhD, "Tashkent Institute of Irrigation and Agricultural Mechanization Engineers"

National Research University

Editor

Hodjaev Saidakram

Associate professor at "Tashkent Institute of Irrigation and Agricultural Mechanization Engineers"

National Research University, Doctor of technical sciences

Candidate of technical sciences

EDITORIAL TEAM:

SH.Khamraev, PhD, minister, Ministry of the Water Resources of the Republic of Uzbekistan; **H.Ishanov**, PhD, chief specialist, Cabinet Ministers of the Republic of Uzbekistan; **Dr.Prof.B.Mirzayev**, Rector of "TIAME" NRU; **Dr.Prof.T.Sultanov**, Vice-rector for research and innovations, "TIAME" NRU; **Dr.Prof.M.Khamidov**, "TIAME" NRU; **Dr.Prof. A.Pulatov**, PhD, associate professor, "TIAME" NRU; **B.Pulatov**, PhD, "TIAME" NRU; **G.Bekmirzaev**, PhD, "TIAME" NRU; **M.Amonov**, PhD, associate professor, "TIAME" NRU; **Sh.Khasanov**, PhD, associate professor, "TIAME" NRU; **M.Tursunov**, PhD, "TIAME" NRU; **B.Sultanov**, PhD, "TIAME" NRU; **Dr.Prof.N.Khushmatov**, Chief Scientific Secretary of the Agricultural and Food Supply Production Center; **Sh.Murodov**, PhD, "TIAME" NRU; **Dr.Prof. O.Tursunov**, "TIAME" NRU; **M.Juliev**, PhD, "TIAME" NRU; **Dr.Prof. A.Karimov**, "TIAME" NRU.

EDITORIAL COUNCIL:

Dr.Prof.N.Vatin, Peter the Great St. Petersburg Polytechnic University, (Russia); **Dr.Prof.Y.Ivanov**, Russian State Agrarian University - Moscow Timiryazev Agricultural Academy, executive director of Engineering and Land Reclamation named after A.N. Kostyakov, (Russia); **Dr.Prof.D.Kozlov**, Moscow State University of Civil Engineering – Head of the Department Hydraulics and Hydraulic Engineering Construction of the Institute of Hydraulic Engineering and Hydropower Engineering, (Russia); **D.Ziganshina**, PhD, Scientific Information Center of Interstate Commission for Water Coordination in Central Asia; **J.Lubos**, associate professor at "Department of Water Recourses and Environmental Engineering" of Slovak University of Agriculture in Nitra, (Slovak); **Acad.Dr.Prof.P.Kovalenko**, National Academy of Agricultural Sciences of Ukraine, Advisor to the Director of the Research Institute of Melioration and Water Resources, (Ukraine); **Prof.N.Xanov**, Head of the Department of Hydraulic Structures RSAU – MAA named after K.A.Timiryazev, (Russia); **Krishna Chandra Prasad Sah**, PhD, M.E., B.E. (Civil Engineering), M.A. (Sociology) Irrigation and Water Resources Specialist. Director: Chandra Engineering Consultants, Mills Area, (Janakpur, Nepal); **Dr.Prof.A.Ainabekov**, Department Mechanics and mechanical engineering, South Kazakhstan State University named after M.Auezov, (Kazakhstan); **Acad.Dr.Prof.T.Espolov**, National academy of sciences of Kazakhstan, Vice-President of NAS RK, (Kazakhstan); **I.Abdullaev**, PhD, the Regional Environmental Center for Central Asia, Executive Director; **Sh.Rakhmatullaev**, PhD, Water Management Specialist at World Bank Group; **A.Hamidov**, PhD, Leibniz Centre for Agricultural Landscape Research|ZALF, (Germany); **A.Hamidov**, PhD, Leibniz Centre for Agricultural Landscape Research|ZALF, (Germany). **A.Gafurov**, PhD, Research scientist at the department of hydrology, GFZ Potsdam (Germany). **Dr.Prof. Martin Petrick**, Justus-Liebig-Universität Gießen JLU Institute of Agricultural Policy and Market Research; **Eldiir Duulatov**, PhD, Research Fellow, Institute of Geology, National Academy of Sciences, Kyrgyzstan; **Gisela Domej**, University of Milan-Bicokka Professor of Earth and Environmental Sciences, Italy; **Moldamuratov Jangazy Nurjanovich**, PhD, Taraz Regional University named after M.Kh. Dulati, Head of the Department of "Materials Production and Construction", Associate Professor, Kazakhstan; **Muminov Abulkosim Omankulovich**, Candidate of Geographical Sciences, Senior Lecturer, Department of Meteorology and Climatology, Faculty of Physics, National University of Tajikistan. Tajikistan; **Mirzoxonova Sitara Oltiboevna**, Candidate of Technical Sciences, Senior Lecturer, Department of Meteorology and Climatology, Faculty of Physics. National University of Tajikistan. Tajikistan; **Ismail Mondial**, Professor of Foreign Doctoral Faculty, University of Calcutta, India; **Isanova Gulnura Tolegenovna**, PhD, Associate Professor of Soil Ecology, Research Institute of Soil Science and Agrochemistry named after U.Uspanov, Leading Researcher, Kazakhstan; **Komissarov Mixail**, PhD, Ufa Institute of Biology, Senior Research Fellow, Soil Science Laboratory, Russia; **Ayad M. Fadxil Al-Quraishi**, PhD, Tishk International University, Faculty of Engineering, Professor of Civil Engineering, Iraq; **Undrakh-Od Baatar**, Head of the Central Asian Soil Science Society, Professor, Mongolia; **N.Djanibekov**, Dr, External Environment for Agriculture and Policy Analysis (Agricultural Policy), Leibniz Institute of Agricultural Development in Transition Economies (IAMO) Theodor-Lieser-Str. 2 06120 Halle (Saale) Germany; **A.Karimov**, Dr, Head of the ICBA Regional representative office for Central Asia and South Caucasus.;

Designer: Dilmurod Akbarov.

Note: Only the authors of the article are responsible for the content and materials of the article. The editorial board does not respond to the content of the article!

Founder: Tashkent Institute of Irrigation and Agricultural Mechanization Engineers

Our address: 39, Kari-Niyaziy str., Tashkent 100000 Uzbekistan , www.sa.tiame.uz

The journal "Sustainable Agriculture" is registered in the Press Agency of Uzbekistan on the 12th of February in 2018 (license № 0957).

In 2019, the journal is included in the list of recommended scientific publications by the Higher Attestation Commission of the Republic of Uzbekistan.



ARCHITECTURE. LANDSCAPE ARCHITECTURE*A.Jumanov, I.Norqobilov***Monitoring the dynamics of changes in land and forest cover using remote sensing and GIS in mountainous and mountainous areas of Kashkadarya region.....5****ECONOMY. ECONOMIC SCIENCE. OTHER BRANCHES OF THE ECONOMY.***S. Umarov, F. Kadirkhodjaeva***Importance and benefits of using wastewater in irrigation farming.....9***F.Ahrorov***Revitalizing agriculture through organic practices: a comprehensive analysis of the Samarkand region's transition and consumer demand dynamics.....12***Sh.Murodov***Innovation as the main factor in the development of agriculture in the region.....17***U.Alimov***Ways to improve the forms of economic management: the network of policing.....21***B.Nosirov***The quality of livestock products is a key development factor of sphere.....24***Sh.Murodov, A.Mamasodikov***Theoretical foundations for the development of the agricultural products market in Uzbekistan.....29***B.Raxmonova***Results of reforms in the field of walnut in Uzbekistan.....32***U.Sangirova, Z.Pardayeva***Foreign experience in flax production and its importance in the national economy.....36***Sh.Murodov, G.Arifjanova***Assessment of use and development of the region's tourism capacity.....40***O.Sattorov***Current trends in the development of farms in intensive horticulture.....44***Sh.Murodov, Sh.Muhammadjonov***Institutional concepts and theoretical-methodological basis of agricultural cooperation related with transactional costs in agriculture.....48***D.Islamova, S.Abdusalomov***The role of potato in agriculture and food production and ways of its development.....52***I.Yunusov***Foreign experience in developing the infrastructure of the fishing industry.....55***O.Shermatov***Issues of improving the organizational and economic mechanism in fruits and vegetables production.....59***M.Qobulova***Organizational and economic principles and evaluation methods of improving personnel competence in the development of agroclusters in Uzbekistan.....63***Z.Shodmonov***The importance of implementation of Islamic finance products to commercial banks.....66***S.R. Umarov, N.J. Mamanazarova, Kh.N Mirjamilova***Efficiency of modern technologies in increasing yield and improving soil fertility.....69**

M.Kholikulov
Enhancing agricultural output in Uzbekistan: a study on fruit and vegetable production dynamics.....73

Sh.Sherkabilov
Assessment of the role of potatoes in ensuring food security and the impact of seed potato imports on sector development.....76

M.Inoyatova
Economic mechanisms of land use in agriculture.....79

HIGHER EDUCATION. PEDAGOGY.

F.B. Kilicheva
Development of critical thinking in the process of teaching russian to students of technical universities.....82

IMPORTANCE AND BENEFITS OF USING WASTEWATER IN IRRIGATION FARMING

S. Umarov, doctor of Economics, professor

F.Kadirkhodjaeva, doctor of philosophy in economics (PhD), TIAME NRU

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., Kastrikin 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.

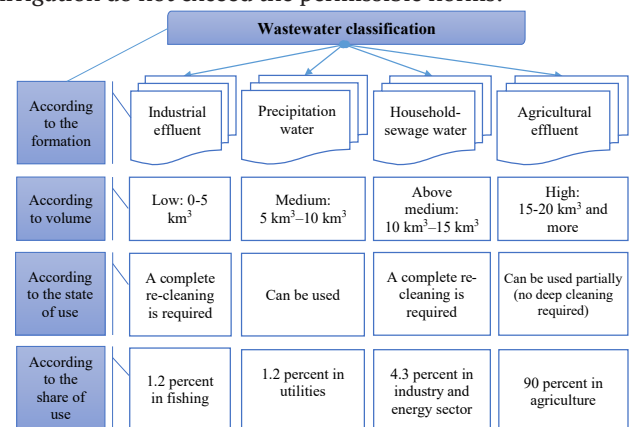


Figure 1. Classification of wastewater.

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, agro-economic, 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).

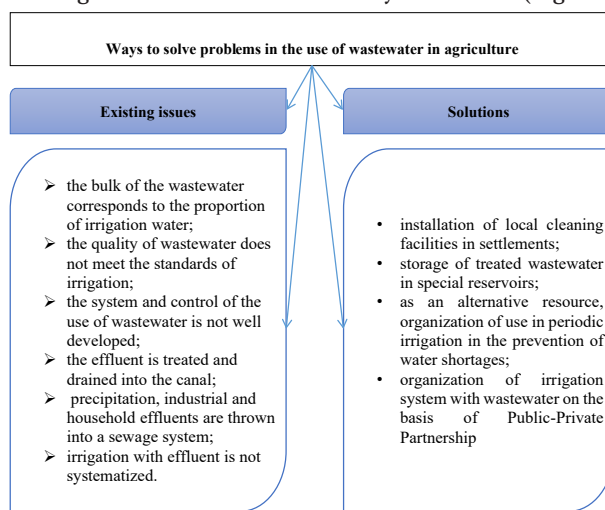


Figure 2. Ways to solve problems in the use of wastewater in agriculture.

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.

References:

1. Decree of the President of the Republic of Uzbekistan dated July 10, 2020 № PD-6024 “On approval of the concept of development of the water sector of the Republic of Uzbekistan for 2020-2030.” - <https://lex.uz/docs/4892953>.
2. Golchenko M.G., Zhelyazko V.I. Wastewater irrigation. - M.: Agropromizdat, 1988.
3. Gostishchev D.P., Kastrikina N.N. Use of wastewater for irrigation of agricultural crops. - M.: Kolos, 1983.
4. Lev V.T., Artukmetov Z. Wastewater for irrigation. - Tashkent, 1990.
5. Ramazanov A. et al. The main ways and tasks to overcome the shortage of water resources in Uzbekistan. – Nukus: “Bilim”, 2009.
6. Makhmudova I.M., Akhmedova G.A. Fundamentals of assessment and purification of the quality of natural and waste waters. - Toolkit. - TIAME. 2008.
7. Jumanazarova A.T. Improving the irrigation of corn with livestock wastewater in the conditions of the Republic of Karakalpakstan. PhD. dissertation abstract.
8. Yakubov M.A., Akhmedov I.A. Problems of sewerage and drainage. - Tashkent, 2004.
9. Abduzhabbarova M.T. Improving accounting and economic analysis at water supply enterprises. - abstract of the dissertation of the Doctor of Philosophy (PhD) in economics. - Tashkent, 2020.
10. <http://www.fao.org/zhc/detail-events/en/c/880881/>
11. <https://www.unwater.org/publications/world-water-development-report-2020/>
12. <https://www.worldbank.org/en/news/press-release/2020/03/19/wastewater-a-resource-that-can-pay-dividends-for-people-the-environment-and-economies-says-world-bank>