ECONOMIC INDICATORS OF IRRIGATION SYSTEMS IN THE RATIONAL USE OF WATER RESOURCES IN UZBEKISTAN

Shaymanov Sharafiddin Kuvandik son
is a freelance researcher at the Termiz Institute of Engineering and Technology.
Abduqadir Tukhtayevich Butayarov
Associate Professor of Termiz Institute of Engineering and Technology
Address: 288, I. Karimov Street, Termiz city, 100028.
https://doi.org/10.5281/zenodo.11616795

Abstract: Today, the use of modern irrigation systems in the rational use of water resources is considered the demand of the times. Due to the use of limited water, the use of minimal mineral fertilizers, fuel lubrication materials, saving time, only the root part of the plant is moistened due to the prevention of salinity, the transfer during evaporation, the reduction of evapotranspiration, the amount of labor force - save a lot. Due to the fact that the result of the water flowing over the edge of the field did not occur, it is not allowed to destroy it.

Key words: Irrigation technique, humidity, climate, transfer, evapotranspiration, meloration, fuel material, mineral fertilizer, labor cost.

Annotatsiya: Bugungi kunda suv resurslaridan oqilona foydalanishda zamonaviy sug'orish tizimlaridan foydalanish davr talabi xisoblanmoqda. Cheklangan suvdan foydalanishda minimal mineral o'g'it, yonilg'i moylash matiriallarni ko'p miqdorda tejalishi, vaqtning tejalishi, shurlanishning oldi olinishi oqibatida o'simlikning faqat ildiz qismi namlanishi, bug'lanishda transferatsiya, evopatransferatsiya kamayishi, ishchi kuchi miqdorining ancha - muncha tejalishi. Suvning dala chetidan oqib o'tishi oqibati ro'y bermaganligi oqibatida nobudgarchilikka yo'l qo'yilmaydi.

Kalit so'zlar: Sug'orish texnikasi, namlik, iqlim, transferatsiya, evopatransferatsiya, meloratsiya, yonilg'i material, meneral o'g'it, mehnat sarfi.

Аннотация: Сегодня использование современных ирригационных систем в целях рационального использования водных ресурсов считается требованием времени. За счет использования ограниченного количества воды, применения минимальных минеральных удобрений, горюче-смазочных материалов, экономии времени увлажняется только корневая часть растения за счет предотвращения засоления, переноса при испарении, уменьшения эвапотранспирации, количества рабочей силы - сэкономите много. В связи с тем, что результата перетекания воды через край поля не произошло, разрушать его не разрешается.

Ключевые слова: техника орошения, влажность, климат, перенос, эвапотранспирация, мелорация, топливный материал, минеральное удобрение, стоимость рабочей силы.

Enter In Uzbekistan, the lack of rational use of water resources is considered one of the main reasons that hinders the sustainable development of irrigated agriculture today. One of the ways to solve the problem can be the use of a drip irrigation system (TST). Drip irrigation was first developed in Israel in the early 1960s and introduced as an independent type of irrigation on an industrial scale. The positive results obtained in a short period of time helped

the rapid spread of drip irrigation in many countries of the world. Drip irrigation is based on the fact that a small amount of water reaches the vascular zone of plants. At the same time, the amount of water and the frequency of its transfer are regulated according to the needs of plants. Water comes to all plants evenly and in the same amount, exactly as much as the plant needs, without flooding the soil and without wasting it. In addition, huge losses due to evaporation of water before it is delivered to the plant are avoided. So far, this method has not been able to gain the attention of land users in our country. There are many reasons for this. According to farmers, the main reason is the cost and complexity of TST and its quality as irrigation water (turbidity and siltiness).

Drip irrigation is necessary for Uzbekistan, but the clusters of Surkhandarya region proved it by growing thin-fiber cotton in a large field. Using the method of drip irrigation, he got 48 centners of cotton from 1 hectare of land, and his neighbors with the same land got 15-21 centners of cotton per hectare. Currently, the cluster used 3 times less water, 50 percent less mineral fertilizers and 58-60 liters less fuel for agricultural machinery per hectare of land. The modern system of drip irrigation is used in the cultivation of many agricultural and horticultural crops and has several advantages, for example: - A large amount of water is saved - because only the root part of the plant gets wet, the amount of water that evaporates and is wasted will be reduced to a great extent, and damage caused by water leakage will not be allowed. During drip irrigation, the rows between the rows, called "troughs," remain dry from start to finish, compared to traditional irrigation where water is usually poured into a ditch. Total water saving will be 11.8 thousand m3 for 1 hectare of cotton, 6.7 thousand m3 for 1 hectare of wheat and 11.5 thousand m3 for 1 hectare of garden. - Large savings of electricity, labor, fuel and other materials - usually water is pumped from canals for irrigation. Drip irrigation requires less water volume, therefore less pump work, and less electricity or other types of energy (eg diesel fuel) are used to run the pump.

Also, a much lower labor cost for irrigation (1.3-3 times) is achieved. During the season, about 60 liters of water are saved per hectare of cotton. - Mineral fertilizers are saved by 30-40 percent - in normal irrigation, 850 kg of nitrogen fertilizer, 150 kg of phosphorus, 100 kg of potassium with chlorine are used for 1 hectare of cotton area. During drip irrigation, 250 kg of nitrogen, 150 kg of phosphorus, and 50 kg of potassium are used for 1 hectare of land. At the moment, absorption of mineral fertilizers is 85-90 percent, and in traditional irrigation it is 30-38 percent. Fertilizers dissolved during watering are introduced directly into the root zone. Nutrients are quickly absorbed. This is the most effective method of fertilizing in dry climates. - High productivity and quality of the product - early ripening of the crop is observed during drip irrigation. A 30-70 percent increase in productivity compared to traditional irrigation is guaranteed due to the precise penetration of moisture into the root system of plants and the high efficiency of fertilizer absorption. - Absence of secondary salinity - drip irrigation does not require the construction of drainage, underground water and salts do not rise up, soil structure is preserved. Such irrigation allows to grow plants in moderately saline soil and to use low salinity water for irrigation. In drip irrigation, salts near the droplets are released rapidly. The accumulation of salts on the edge does not have a significant effect on the development of plants. Nutrients with water are absorbed by the root system from the part of the soil where salt has been released. - The possibility of irrigating the land areas with different water absorption into the soil and very uneven surface - drip irrigation system - pipe or tape system is located at the bottom of the plants, i.e. in the furrows. Drip irrigation makes

it possible to irrigate areas with difficult slopes or topography without having to move special trenches or soil. The use of drip irrigation in sloping areas does not cause any erosion of the soil. In addition, it is very useful for hilly lands, where soil subsidence, void formation, and water can be absorbed deep into the soil, not for irrigation of crops, during irrigation with a simple method. Convenience of work done between the rows - in traditional irrigation, the rows are filled with water, and in this case, the effort of machinery and people is required. Drip irrigation of cucumbers in a greenhouse in Namuna district, Surkhandarya region. TST works great on slopes! 5 makes it difficult for them to move. Drip irrigation does not keep the ditches wet and allows tillage, spraying and harvesting at any time, regardless of when the crop is irrigated, as the soil between the rows remains dry throughout the season. - Less weeding - as water is delivered to the root system of the plant, the surrounding land is not irrigated compared to other irrigation methods. The root system develops better than any other irrigation method. The main part of the roots is collected in the zone of droplets, the root system becomes more dense and many active root hairs are formed. The rate of consumption of nutrients increases with water. Based on the data of the TST implementation initiative in the Surkhandarya region, a preliminary comparative analysis of the costs and benefits of the introduction of the drip irrigation system in cotton, wheat and orchards (apple trees) was conducted.

Table 1
Costs of implementing TST compared to conventional irrigation

Name	Unit of measure	Cotton, 10 ha	Grain for 10 ha	Garden (almazor) 10 ha	Explanation
Investments	soum	88 390 000	91 570 000	50370 000	The cost of purchasing film to cover the water transfer tank for the drip irrigation system is also included in the cost of TST
Total benefit	soum/ year	26 890 809	21 450 830	30 104 913	Compared to conventional irrigation
Saving water resources	m^3 / year	117 700	67 000	114 650	Saving of water resources was calculated based on the difference in irrigation technology (irrigation rate).
Saving electricity	soum/ year	4 999 780	3 175 300	3 206 884	Significantly lower electricity costs during the season due to significantly reduced irrigation time and pumps
Saving diesel fuel	soum/ year	1 087 600	37 600	37 600	Diesel fuel is saved due to the reduction of agricultural activities. Its average price per liter is 3500 soums
Savings from	soum/	860	60	60 000	

agrotechnical activities (cultivation, fertilization, etc.)	year	000	000		
Save on mineral fertilizers	soum/ year	1 144 000	377 600	0	The absorption of mineral fertilizers is 90-95 percent, and in ordinary irrigation - 30-35 percent.
Savings on labor resources	soum/ year	3 000 000	3 000 000	3 000 000	
Benefit from increased productivity	soum/ year	16 000 000	15 000 000	24 000 000	The yield increases by about 40 percent, but it depends on the soil's soil quality.
Exemption from paying land tax	soum/ year	820 529	820 529	820 529	The average score of the land is equal to 60 (6th land level, correction coefficient 6.78). The amount of the basic land tax of the 1st level land in Angor district of Surkhandarya region is 12954.7 soums.
Coverage period	**yil**	**3.4**	**4.4**	**1.8**	

Calculations are given for 10 hectares of each crop type, because it is on this size of land that minimum economies of scale can be achieved and the investment starts to pay off. Depending on the expansion of irrigated lands, the effect on the time of compensation of the incurred expenses is being calculated. Estimates are current for 2021 and are subject to change over time. In this way, the TST is pulled up to the plant and then covered with soil. The part of the tube where the dropper (emitter) is reinforced remains outside. The cost of investments in the installation of TST was calculated on the basis of the relevant prices of the production enterprise of the "angor zamin" cluster farm, which is a partner of the enterprises producing drip irrigation systems in the Surkhandarya region. Installation of TST on 10 hectares of wheat area is the most expensive - 91.6 million soums, and installation on the same area of cotton will cost 88.4 million soums. The cheapest and most profitable is TST for 10 hectares of garden - 50.4 million soums. The benefit calculations are as follows (per 1 hectare of land): - As a result of a significant reduction in irrigation time and the work of the water pump, the consumption of electricity for all crops will be significantly reduced. As a result, drip irrigation reduces electricity costs by 499,000 soums for 1 hectare of cotton, 317,000 soums for 1 hectare of wheat and 320,000 soums for 1 hectare of wheat in one season. - The cost of diesel fuel and agronomic activities will be reduced, especially for cotton, because cotton cultivation involves a large number of agronomic activities compared to wheat and horticulture. Drip irrigation allows saving 100,000 soums of diesel fuel and 85,000 soums of agrotechnical activities for each hectare of cotton area. As a result of efficient introduction

(through the system) and assimilation of mineral fertilizers in drip irrigation, the cost of fertilizers is reduced: 114 thousand soums per hectare of cotton and 1 hectare of wheat annually 37 thousand soums. - Labor costs will be reduced by 300,000 soums for all crops under consideration. The forecast increase in productivity is quite variable and averages 40 percent for all crops. Based on the average yield of crops and the average prices set for them, annual profits were determined. - Water saving for all crops will be 11,769 m3 per year for 1 hectare of cotton, 6,700 m3 for 1 hectare of wheat, 11,650 m3 for 1 hectare of garden. - According to the Decree of the President of the Republic of Uzbekistan PF-4478, adopted on October 22, 2012, the land area under drip irrigation of legal entities that introduced drip irrigation is exempted from the single land tax for a period of 5 years (Amendments to the Tax Code not yet entered into force - due to enter into force in 2013). The approximate calculation of savings due to tax benefits is 81 thousand soums per year for each crop. - The payback period is the ratio of investments to annual total profits. According to calculations, investments made for drip irrigation of cotton will be repaid in a little more than 3 years, for wheat in 4 years. The investment for the garden is the most profitable, and the payback period is less than 2 years. Thus, TST is not only a careful attitude towards natural capital (conserving water resources, improving soil, saving energy and fuel, reducing harmful substances emitted into the air, etc.), moreover, from an economic point of view, it is not only a garden, but also a forest. It is also beneficial for cotton and wheat in the medium term.

Conclusion: Improving the drip irrigation method in the fields of Surkhandarya region is one of the urgent problems of today.

References:

1.Butayarov A.T. Status of water use in the Amu-Surkhan irrigation system basin administration. International conference of innovative science and education. November 2020 «Sbornik nauchnyx trudov Pavlodar, Kazakhstan» November, 2020 -St. 132-139.

2.Isaeva A.A. Spravochnik ecology - climatic characteristics. g. Moscow.. MGU, 2005. -412 p.

3.Butayarov A.T. Improvement of water use in farms in the territory of "Amu-Surkhan" ITSB. // "AGROILM" magazine special issue 4.(60). -Tashkent, 2019. -B. 79 - 81.

4.Sabirzhan Isaev, Gulom Bekmirzaev, Mirkadir Usmanov, Elyor Malikov, Sunnat Tadjiev, Abdukadir Butayarov. Provision of remote methods for estimating soil salinity on meliorated lands. E3S Web of Conferences 376, 02014 (2023). https://doi.org/10.1051/e3sconf/202337602014. ERSME-2023

5.Bakir Serikbaev, Abdukodir Butayarov, Sardor Gulamov, Sanobar Dustnazarova. Inflation of water to the soil in the fields of drop irrigation. E3S Web of Conferences 264, 04002 (2021). https://doi.org/10.1051/e3sconf/202126404002. CONMECHYDRO – 2021.

6.Butayarov A.T., Nazarov A.A. Scientific substantiation of technology of efficient use of water resources in irrigation of cotton. E3S Web of Conferences 401, 05048 (2023). https://doi.org/10.1051/e3sconf/202340105048. CONMECHYDRO – 2023.

7.Decree of the President of the Republic of Uzbekistan of December 27, 2018 "On urgent measures to create favorable conditions for widespread use of drip irrigation technologies in cultivation of cotton raw material" - PN-4087.] Journal “Irrigatsiya va Melioratsiya”. Tashkent. 2019, No1 (15).Pp.80-82.

8.Kodirova, M. M., & Anvarova, S. (2024). TIBBIY MALAKALI MUTAXASISLARNI TAYORLASHDA UMUMIY TIBBIY PEDAGOGIKADAN FOYDALANISH MEHANIZMI.(KOMMUNAL VA MEHNAT GIGIYENASI FANINI OQITISH MISOLIDA). Ta'lim innovatsiyasi va integratsiyasi, 20(4), 59-63.
9.Kodirova, M. M., & Muxammadova, G. Q. (2024). PEDAGOGIK TEXNOLOGIYALAR TIZIMINING TIBBIYOT FANLARINI O ‘QITISHDAGI O ‘RNI (Kommunal va Mehnat gigiyenasi dars mashgulotarini organayzerlar asosida). PEDAGOGS, 53(1), 37-41.
10.Muxammadova, G. Q., & Kodirova, M. M. (2023). ISHLAB CHIQARISH SANOAT KORXONALARINI AHOLI YASHASH JOYLARI ATMOSFERA HAVOSIGA TASIRI. Экономика и социум, (11 (114)-2), 274-279.
11.Mukhammadova, G. Q., Kodirova, M. M., & Boqijonov, F. A. (2024). THE EFFECT OF INDUSTRIAL ENTERPRISES ON ATMOSPHERIC AIR. British Journal of Global Ecology and Sustainable Development, 28, 5-9.
12.R.A.Mamutov, Sh.Z.Qo‘chqorov, T.Z.Sultanov Efforts to increase the effectiveness of water-saving technologies in water management. Journal “Irrigatsiya va Melioratsiya”. Tashkent. 2018. No3 (18). Pp.89-91.
13.M.X.Xamidov, B.U.Suvanov Application of drip irrigation technology for cotton Journal “Irrigatsiya va Melioratsiya”. Tashkent 2018. No4 (14). Pp.9-11.
14.M.X.Xamidov, B.U.Suvanov Water resources and their effective use. Journal “Irrigatsiya va Melioratsiya”. Tashkent 2017. No4 (10). Pp.5-7.
15.B.S.Serikbaev, F.A.Baraev, S.B.G'ulomov. Reliability of drip irrigation systems Journal “Irrigatsiya va Melioratsiya”. Tashkent 2017. No4 (10). Pp.10-11..