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Analyzing the Allocation and Distribution of Irrigation Water Management Expenditures Among Different Regions in Uzbekistan

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Abstract
This research paper aims to analyze the allocation and distribution of irrigation water management expenditures among different regions in Uzbekistan. The effective management of irrigation water resources is crucial for sustainable agricultural development and ensuring food security in the country. By examining the allocation patterns and distribution mechanisms of irrigation water management expenditures, this study seeks to shed light on the equity, efficiency, and effectiveness of resource allocation strategies across various regions. The research will employ a combination of quantitative analysis and qualitative assessment to identify disparities, challenges, and potential opportunities for optimizing the allocation of financial resources in Uzbekistan's irrigation sector. The findings of this study will provide valuable insights for policymakers, water managers, and stakeholders involved in irrigation water management decision-making processes.

INTRODUCTION

Water plays a crucial role in sustaining agricultural productivity and ensuring food security, particularly in arid and semi-arid regions. In Uzbekistan, a landlocked country in Central Asia, irrigation water management plays a vital role in supporting the agricultural sector, which serves as a significant contributor to the national economy. However, the efficient allocation and equitable distribution of irrigation water management expenditures among different regions within Uzbekistan is essential for optimizing agricultural production and promoting sustainable water resource management.

The allocation and distribution of irrigation water management expenditures have a direct impact on the efficiency and effectiveness of water utilization, agricultural productivity, and socio-economic development at the regional level. This research aims to analyze the patterns of expenditure allocation and distribution across various regions in Uzbekistan, shedding light on the disparities and identifying potential areas for improvement.

Uzbekistan's agricultural sector heavily relies on irrigation systems to meet the water demands of crops. The country's diverse geographical and climatic conditions, coupled with the varying needs of different agricultural regions, necessitate an effective allocation of irrigation water management resources. However, there is a need to examine whether the current allocation practices align with the specific water requirements and agricultural potential of each region, and whether the distribution of expenditures reflects the principles of fairness and equity.

By analyzing the allocation and distribution of irrigation water management expenditures, this research aims to provide insights into the extent of regional disparities in resource allocation and identify factors influencing the decision-making process. Additionally, the study will explore the implications of these disparities on agricultural productivity, water use efficiency, and socio-economic development within different regions of Uzbekistan.

Understanding the allocation and distribution patterns will contribute to evidence-based decision-making processes, enabling policymakers and stakeholders to identify areas requiring intervention and formulate targeted strategies to address any imbalances. Moreover, this research will support the identification of best practices and policy recommendations to enhance the efficiency, equity, and sustainability of irrigation water management expenditures across Uzbekistan's regions.

To achieve these objectives, the research will employ a comprehensive analysis of irrigation water management expenditures, including budgetary data, investment patterns, and funding sources. It will also take into account regional variations in water availability, agricultural practices, and socio-economic factors that influence resource allocation decisions.

Literature review

Turning our attention to the Central Asian republics, DFID (2003) highlights that despite more than a decade since gaining independence, the transition to a market economy is still underway, albeit at varying speeds and in different ways depending on each country's political, economic, and social systems. The author emphasizes the significance of the historical and social context when considering an IMT program in Central Asia, noting issues such as the transitional political-economic environment and the bureaucratic nature of the top-down command structures that still persist in state administration. International donors have been supporting IMT processes in the Central Asian republics since the mid-1990s, while the region as a whole has been undergoing the dismantling of state and collective farms. Scholars have identified two key factors that underscore the relevance of IMT implementation in the region. First, the emergence of independent peasant farmers has necessitated efficient and equitable water management and allocation. Second, the financial constraints of governments have made it challenging to sustain the operation and maintenance of large-scale irrigation systems (Abdullaev and Rakhmatullaev, 2013; Wegerich, 2006; DFID, 2003; Sehring, 2007; Abdullaev and Mollinga, 2010; Bichsel, 2009). The actions of development banks in promoting the establishment of Water Users Associations (WUAs) have been closely linked to the sociopolitical factors outlined by DFID (2003). IMT processes have progressed more rapidly in countries where the institutional and political environment is more conducive to such changes. In Kyrgyzstan, for example, the government's collaborative approach towards aid agencies, such as the World Bank and Asian Development Bank, resulted in the issuance of a legal framework supporting the establishment of WUAs as early as 1997 (Sehring, 2007; Rost et al., 2013). In Tajikistan, however, IMT processes faced obstacles due to the civil war, subsequent governmental fragmentation, and the deteriorated condition of water facilities

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(Gunchinmaa and Yakubov, 2009). In Turkmenistan and Uzbekistan, different sociopolitical contexts hindered the development plans of international agencies. Agricultural reforms in these countries were not entirely based on market principles, as state quotas for major crops remained in place (Aminova and Abdullaev, 2009). Although WUAs were eventually established between 2003 and 2007, their effectiveness was partly influenced by inadequate legal frameworks and the continued influential role of the state in water resources management, which limited farmers' empowerment and the creation of governance structures (Abdullaev and Rakhmatullaev, 2013).

Results and discussions:

The operations and maintenance (O&M) cost of Basin Administrations of Irrigation Systems (BAISs) in Uzbekistan per cubic meter is lower compared to the average O&M cost in other countries. This can be attributed to both the lack of financing for O&M expenditures in Uzbekistan and lower wages in the country. However, it should be noted that electricity tariffs in Uzbekistan have been increasing in real terms.

In 2019, the estimated total budget cost per 1,000 cubic meters of irrigation water in Uzbekistan was US$14.7, while the O&M cost was estimated at US$9.5[1]. This relatively low O&M cost may indicate the average irrigation water tariff in Uzbekistan if water charges are determined at the district or province level. Although the trend for both total and O&M costs in Uzbekistan has been upward sloping over time, it is still only a third of the average cost in other countries[2]. The range of volumetric prices for irrigation water varies greatly across different countries that have implemented charges for irrigation water. Prices can be as low as below US$1 per 1,000 cubic meters in Canada and Romania, or as high as US$180-290 per 1,000 cubic meters in Israel, US$420 per 1,000 cubic meters in Tanzania, and even US$1,330 per 1,000 cubic meters in the Netherlands (when municipal supply tariffs are applied for irrigation)[3]. However, the average price for irrigation water in most countries, approximately US$20 per 1,000 cubic meters, is likely indicative of the global average volumetric price that covers only the O&M cost[4].

[1] One option is to set water tariffs per actual m3 consumed; tariffs remain unchanged for five years (only adjusted for annual inflation). Farmers are free to save water on-farm as much as they want (via water-saving technologies). Absence of water tariffs between irrigation bodies and WCAs stimulates inefficiency of water bodies.

[2] On O&M costs and water tariffs on irrigation, the comparator countries include Australia, China, Greece, India, Israel, Italy, Jordan, Kazakhstan, Mexico, Morocco, Portugal, Romania, Tanzania, Turkey, and the US.

[3] This US$20/1,000 m3 level was in the late 1990s; if the average annual inflation in the US in 2000–19 were taken into account, then this figure comes to about US$31/1,000 m3 in 2019

[4] The average tariff on irrigation water in most countries is based on O&M cost (without capital depreciation cost) from a river down to farm border. The average tariff for farmers in comparator countries is about US$31/1000 m3 ; in Uzbekistan, water tariffs for farmers do not exist (between main canals and WCAs of farmers). If one were introduced, the actual O&M cost (the basis for a tariff) in Uzbekistan would be about US$9.5/1000 m3—three times less than the global average. So, Uzbekistan farmers could afford it, if they own cotton and wheat output or prices on these crops are unregulated, and if farmers would allocate their farmland between crops. The average tariff in Uzbekistan can be even lower in the long run, after most pump irrigation is transferred to a gravity irrigation scheme.

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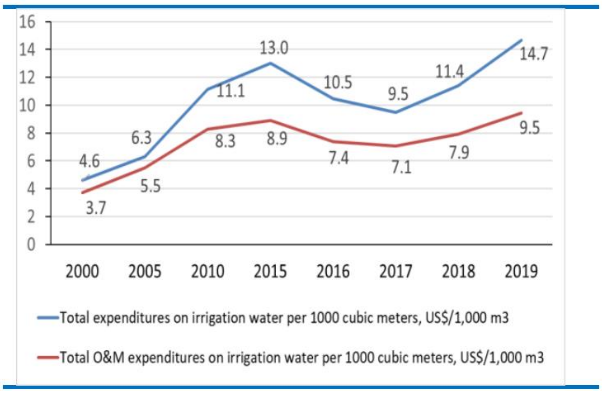

Figure 1. O&M and Total Cost of the Government Budget Expenditures on Irrigation Water Management, US$/1,000 m3 , 2000–19

Source: World Bank staff calculations using data from Uzbekistan authorities. Note: O&M = operations and maintenance.

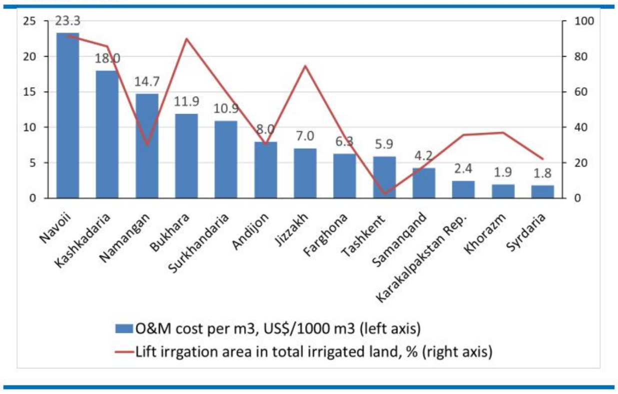

Figure 2. Differences in O&M and Total Costs on Irrigation Water Management across Regions, Electrical Pumping Irrigation vs. Gravity Irrigation, 2018–19.

The O&M cost per cubic meter of irrigation water in Uzbekistan varies significantly across different regions, and this variation can be attributed to several factors such as the dominant irrigation methods (electrical pumping or gravity irrigation), soil salinity levels, and cropping patterns. In regions where electrical pumping irrigation is predominant (such as Bukhara, Jizzakh, Kashkadarya, Navoi, and Surkhandarya), the O&M cost is much higher, ranging from approximately US$11 to US$23 per 1,000 cubic meters. On the other hand, regions that rely predominantly on gravity irrigation (including Andijan, Ferghana, Khorezm, Namangan, Samarkand, Syrdarya, Tashkent, and the Republic of Karakalpakstan) have lower O&M costs, ranging from approximately US$1.8 to US$4.2 per 1,000 cubic meters. These variations in O&M costs reflect the different irrigation systems and conditions in each region.

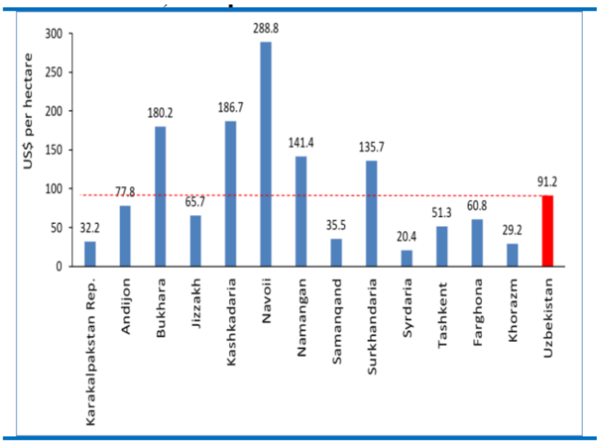

Figure 3. Budget Expenditures on O&M for Irrigation, by Region, Compared with Average Level in 2019, US$ per hectare

Source: World Bank staff calculations using data from Uzbekistan authorities.

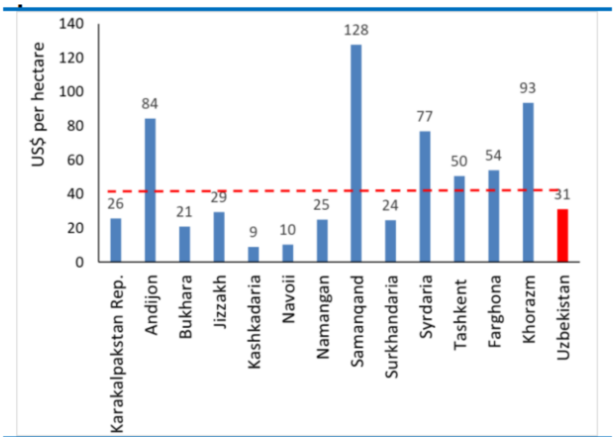

Figure 4. Efficiency of O&M Expenditures, by Region, Compared with Average Level in 2019, US$ per hectare

Provinces in Uzbekistan that rely predominantly on electrical pumping irrigation exhibit lower economic efficiency in terms of O&M expenditures per hectare. The analysis conducted, as depicted in Figure 5.6 and Figure 5.8, reveals that the average return on O&M expenditures is five times higher in four regions with gravity irrigation schemes (Karakalpakstan, Khorezm, Samarkand, and Syrdarya) compared to four provinces with electrical pumping irrigation (Bukhara, Kashkadarya, Navoi, and Surkhandarya). Furthermore, the average O&M expenditures per 1,000 cubic meters of irrigation water for gravity irrigation are 6.2 times lower than for electrical pumping irrigation.

Given these findings, it becomes crucial to enhance water use efficiency in irrigated cropping throughout Uzbekistan, with a particular emphasis on provinces heavily reliant on electrical pumping irrigation. A key strategy to achieve this is through crop diversification, which not only improves water utilization efficiency but also enhances the effectiveness of O&M spending on irrigation and drainage (I&D) systems. When comparing the ratio of crop output from irrigated land per unit of O&M expenditure by province to the national average in 2019, provinces such as Andijan, Khorezm, Samarkand, and Syrdarya demonstrate the highest efficiency levels, while Bukhara, Kashkadarya, and Navoi exhibit the lowest. This discrepancy in crop output efficiency per unit of O&M expenditure is closely related to the type of irrigation method employed, be it electrical pumping or gravity irrigation. Additionally, cropping patterns and land quality factors also contribute to the variation observed.

These findings emphasize the significant potential for increasing water use efficiency at the farm level, which can have a substantial impact on overall agricultural productivity and resource conservation efforts.

In the WCAs where data were available, it was observed that irrigation fees for crops requiring significant amounts of water, such as cotton and wheat (which are the main crops mandated by the state), are consistently set below the levels necessary for cost recovery. In various case study sites (World Bank 2016), small-scale farmers, known as dehkans and tomorka owners, rely on water from WCAs-managed canals for their irrigation needs. However, WCA officials argue that since these farmers are not officially registered as legal entities, they cannot become official members of a WCA. Consequently, the irrigation requirements of dehkans and tomorka owners are not always adequately taken into account by WCAs and public BAISs when preparing water supply schedules, effectively rendering them unauthorized users. Nevertheless, according to water law, all water consumers, irrespective of their registration status, have the right to become members. In WCAs that function well, farmers already pay higher fees and actively participate in maintaining and repairing the irrigation system. However, the low incomes of individual (large) farmers, who predominantly cultivate cotton and wheat, continue to impede cost recovery for O&M. The farmers' inability to afford water supply services can be attributed to several factors, including: (1) a crop placement system that mandates the production of cotton and wheat on approximately 65 percent of arable land; (2) relatively lower profitability of cotton production (and to a lesser extent, wheat) compared to horticulture production; (3) ongoing taxation on wheat and, to a lesser extent, cotton prices; and (4) the limited availability or inadequate quality of public programs, such as advisory services and seed improvements, aimed at reducing production costs for cotton and wheat.

Conclusion:

The analysis of irrigation water management expenditures in Uzbekistan reveals significant variations in the allocation, distribution, and efficiency of these expenditures across different regions. The findings highlight the need for targeted interventions to enhance water use efficiency, improve resource allocation, and promote sustainable agricultural practices throughout the country.

One notable observation is that the operations and maintenance (O&M) cost of Basin Administrations of Irrigation Systems (BAISs) in Uzbekistan per cubic meter is lower compared to the average O&M cost in other countries. This can be attributed to the lack of financing for O&M expenditures in Uzbekistan and lower wages in the country. However, the increasing electricity tariffs in Uzbekistan raise concerns about the long-term sustainability of these low O&M costs.

The relatively low O&M cost per 1,000 cubic meters of irrigation water in Uzbekistan suggests that the average irrigation water tariff in the country, if determined at the district or province level, is comparatively lower. However, it is essential to consider the upward trend in both total and O&M costs over time, even though they remain only a third of the average cost in other countries. This highlights the importance of continuously monitoring and managing irrigation water management expenditures to ensure their effectiveness and sustainability.

The variation in O&M costs per cubic meter of irrigation water across different regions of Uzbekistan can be attributed to factors such as the dominant irrigation methods (electrical pumping or gravity irrigation), soil salinity levels, and cropping patterns. Regions relying predominantly on electrical pumping irrigation exhibit higher O&M costs, while those relying on gravity irrigation have lower costs. These regional disparities highlight the need for tailored approaches and investments to improve irrigation systems and efficiency in provinces heavily reliant on electrical pumping irrigation.

Efficiency analysis indicates that regions with gravity irrigation schemes demonstrate higher economic efficiency in terms of O&M expenditures per hectare compared to regions with electrical pumping irrigation. Enhancing water use efficiency and crop diversification, particularly in provinces heavily reliant on electrical pumping irrigation, is crucial to optimize resource utilization and increase agricultural productivity. Additionally, considering cropping patterns and land quality factors can further contribute to improving crop output efficiency per unit of O&M expenditure.

The research also highlights the challenges associated with irrigation fees for crops requiring significant amounts of water, such as cotton and wheat. The current fee levels are often set below the necessary cost recovery levels, posing financial constraints for farmers. Factors such as the crop placement system, relatively lower profitability of cotton production, ongoing taxation on wheat prices, and limited availability of public programs further impede cost recovery for O&M.

In conclusion, the findings emphasize the need for targeted interventions and policy reforms to enhance water use efficiency, optimize resource allocation, and promote sustainable agricultural practices in Uzbekistan. Addressing regional disparities, improving irrigation systems, diversifying crops, and ensuring cost recovery are crucial steps towards achieving these objectives. By implementing evidence-based strategies and considering local conditions, Uzbekistan can strengthen its irrigation water management practices, enhance agricultural productivity, and ensure the sustainable use of water resources for future generations.

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