

## Challenges Facing Water User Associations in the Southwestern Region of East Azerbaijan Province within the Lake Urmia Basin

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### Abstract

In the context of increasing water scarcity and drought, the participation of local groups and stakeholders in water resource management has become increasingly important. Water User Associations (WUAs), as one of the most significant outcomes of this participatory approach, play an effective role in the sustainable and efficient agricultural water management. By facilitating users' involvement in the planning, operation, maintenance, and financing of irrigation networks. This study employed a descriptive survey approach combined with a SWOT-based strategic analysis framework to identify the strengths, weaknesses, opportunities, and threats affecting WUAs and to formulate strategic recommendations in the southwestern region of East Azerbaijan Province, located within the Lake Urmia Basin. Employing purposive sampling, 60 key stakeholders were selected, and data were collected through a structured questionnaire. To achieve the study's objective, the strengths, weaknesses, opportunities, and threats of WUAs were analyzed. The results of the SWOT analysis indicated that the mean scores for the Strength–Opportunity (SO), Weakness–Opportunity (WO), Strength–Threat (ST), and Weakness–Threat (WT) strategies were 3.60, 3.52, 3.25, and 3.17, respectively. The findings revealed that four strategic orientations were proposed: competitive/aggressive (SO), reformative (WO), diversification (ST), and defensive (WT). The implementing these strategies can strengthen the institutional capacity, operational efficiency, and social legitimacy of WUAs. Ultimately, the results of this study can assist policymakers and planners in improving and reforming the role of WUAs toward better water governance, sustainable resource management, and greater stakeholder participation in the Lake Urmia Basin.

**Keywords:** Participatory irrigation management, Lake Urmia Basin, SWOT analysis, Water governance.

### INTRODUCTION

Over the past decades, environmental threats such as climate change, water scarcity, desertification, and biodiversity loss have intensified (Azadi et al., 2025; Kuryltsiv et al., 2025). Meanwhile, water resources have been increasingly depleted, and the gap between water

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supply and demand continues to widen; therefore, the sustainable use of water resources is becoming increasingly important (Gao et al., 2017). Nevertheless, the significant decline in renewable water resources has led to a shift from supply-oriented management to demand-driven strategies across the world (Ghasemi et al., 2021). Society's well-being depends on effectively managing water as a vital resource. Growing concerns have emerged about the ability to supply enough water of suitable quality to meet societal needs, driven by climate change and increasing demand (Loboguerrero et al., 2019). The idea of involving farmers in irrigation management transfer (IMT) initiatives began in several countries during the mid-1970s to the 1980s (Elhadad et al., 2020). Evidence from international water development projects indicates that engaging local stakeholders helps reduce inequalities, promote sustainability, and improve project results (Castelli et al., 2021). To implement Integrated Water Resources Management (IWRM) effectively, authorities and development organizations promote the formation of Water User Associations (WUAs) as a highly effective model for local water management (Richards, 2019).

However, despite the rapidly growing body of literature on participatory irrigation management through the development of WUAs, there is limited empirical evidence regarding the identification of their challenges in the southwestern part of the Lake Urmia Basin. This region is in a critical condition due to flow regime alterations (Fazel et al., 2017), unsustainable water management alongside increasing demand, unfavorable climatic conditions (Saemian et al., 2020), and human activities and interventions such as the uncontrolled development of irrigated agriculture in the watershed, dam construction, the construction of the Kalantari Bridge over Lake Urmia, and uncontrolled extraction of groundwater (Haji & Fallah Haghighi, 2026). Existing studies in Iran on WUAs have mostly focused on issues such as identifying problems and success factors among WUAs' members (Omid et al., 2012), assessing farmers' satisfaction with services provided by WUAs (Karami & Choghakhor, 2018), and examining and analyzing factors affecting farmers' participation (Shahrودي & Chizari, 2009). Despite the growing number of studies on WUAs, limited attention has been given to studies related to the identification and analysis of key challenges facing WUAs in the Lake Urmia Basin.

Perspectives on water governance and collective resource management can contribute to a better understanding of WUAs. Research over the past several decades has demonstrated that irrigation management should not rely solely on technical and engineering solutions; rather, it should move toward the development of robust, flexible, and sustainable institutions as well as integrated, decentralized management (Yu et al., 2016). Within this perspective, collective

action (such as WUAs) plays a central role in the management of common-pool resources, through which local communities become capable of establishing, maintaining, and modifying institutional arrangements for resource management (Ostrom, 1990; Yu et al., 2016). Furthermore, social capital has been recognized as a features of social organization, such as norms, networks, and trust, that can facilitate coordination and cooperation for mutual benefit and contribute to the effectiveness of local irrigation institutions (such as WUAs) (Putnam et al., 1994; Yu et al., 2016). In addition, Lako and Çomo (2024) stated that involving the public and creating mechanisms for citizens' participation in decision-making regarding water resources management are key to ensuring the sustainability and efficiency of water supply systems. They also emphasized that collaboration among governmental organizations, the private sector, academic institutions, and the general public is essential for water resources management. Therefore, it can be argued that assessing the strengths, weaknesses, opportunities, and threats of WUAs may provide a useful approach for sustainable water management through the participation of local communities.

Xie (2007) describes WUAs as groups through which farmers collectively manage irrigation systems. Their primary goal is to improve water management through participatory approaches, while governments often manage complex technical infrastructures and sell water mainly to these associations. WUAs operate in many countries around the world based on diverse legal and institutional principles, enabling farmers to play a greater role in the management of irrigation and drainage water (Kuryltsiv et al., 2025). These associations bring together land users and strengthen their capacity to jointly manage their land (Kuryltsiv et al., 2025). In this regard, previous studies have emphasized that WUAs have had a positive impact on water distribution and delivery (Liu et al., 2008), have increased technical efficiency and improved irrigation management (Arun et al., 2012), and ultimately have led to higher crop yields and reduced overall costs (Abd El Maksoud & El Gamal, 2022).

However, in many semi-arid regions of the world, WUAs typically face challenges such as a lack of sustained government support in most African countries (Mutambara et al., 2016), financial, political, institutional, and administrative constraints (Moss & Hamidov, 2016), low member participation and cooperation, conflicts over water allocation, and issues such as water theft or off-scheduled water abstraction (Bopp et al., 2024), all of which can weaken their effectiveness in irrigation management.

In Iran, after nearly fifty years of relatively unsuccessful efforts to manage water resources through hydraulic approaches, policymakers have to some extent realized that better solutions

should be sought by utilizing the potential of local communities (Ghorbanian Kerdabadi et al., 2020). Amini et al. (2019) highlighted the crucial role of local groups and stakeholders in the success of irrigation management and development efforts. Consequently, many nations have invested heavily in capacity building and support for establishing social infrastructure in irrigation systems, with the creation of WUAs standing out as a major achievement. These cooperatives offer farmers a platform to implement strategies that improve agricultural water productivity. The main goal of establishing WUAs is to develop mechanisms enabling farmers to participate in decision-making and manage agricultural water effectively, ensuring the best utilization of available resources. These organizations are based on legal frameworks for water users, giving them responsibility for constructing, operating, developing, repairing, and maintaining irrigation systems and networks, either fully or partially, depending on their capacity (Alibaygi et al., 2020).

Water resources management adopts a comprehensive approach, considering social, economic, environmental, and technical aspects in managing and developing surface water (rivers, lakes, wetlands) and groundwater resources. In essence, its aim is to strengthen the links between water sources and water service management (Basati et al., 2020). The global importance of collective water management has prompted numerous studies aimed at diagnosing issues and proposing improvements and reorganizations of these institutions (Zema et al., 2018). In arid and semi-arid regions like Iran, drought is among the most severe impacts of climate change, threatening the livelihoods of many individuals and farmers (Montazeri et al., 2021).

The recent severe droughts and water management challenges in the Lake Urmia Basin have led to the establishment of WUAs alongside traditional water systems throughout the basin. However, there is limited information about the key challenges they face in semi-arid regions such as the Lake Urmia Basin, where socio-economic and hydrological pressures are deeply intertwined. Therefore, the aim of this study is to identify and analyze the key challenges facing WUAs in the southwest of East Azerbaijan Province using the SWOT analysis framework.

## MATERIALS AND METHOD

This study employed a descriptive survey approach combined with a SWOT-based strategic analysis framework. For data analysis, the SWOT analysis method was employed. SWOT analysis is a strategic planning tool used to assess the strengths, weaknesses, opportunities, and threats that occur in projects, organizations, or business ventures (Afandi et al., 2021). The SWOT matrix is considered one of the most suitable techniques for strategic planning and

analysis, widely used by strategy designers and evaluators as a contemporary management tool. SWOT analysis operates on the premise that an effective strategy maximizes strengths and opportunities while minimizing weaknesses and threats (Morovati & Akbarian, 2019). Researchers systematically apply this technique to formulate strategies. Indeed, SWOT analysis is regarded as one of the most powerful analytical tools, aiding organizations in achieving their objectives and identifying ways to minimize barriers they face (Beni-robin & Lambelanova, 2020).

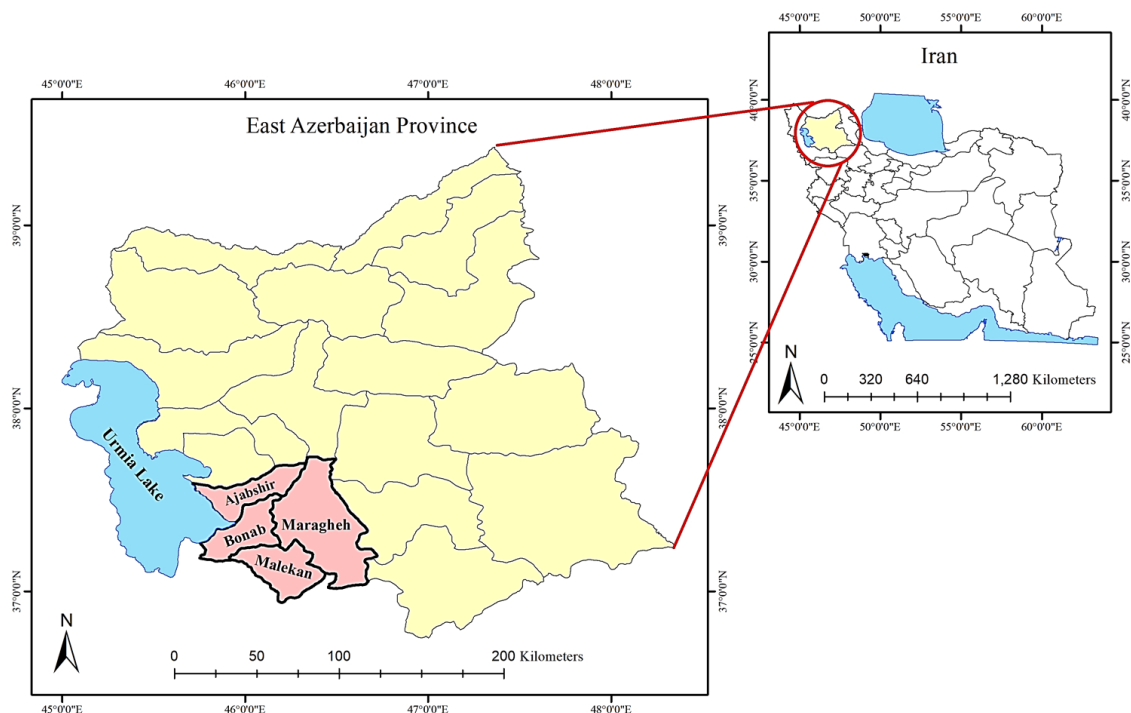
To design the questionnaire, internal factors (strengths and weaknesses) and external factors (opportunities and threats) affecting WUAs were first identified through a review of the relevant literature and previous studies on participatory irrigation management. These factors were subsequently discussed and refined through consultations with a panel of experts, including specialists from the Public Participation Office and Surface Water Management Department of the Regional Water Company, managers of the water affairs offices in Maragheh, Ajabshir, Malekan, and Bonab counties, as well as chief executive officers and board members of WUAs. The preliminary questionnaire was reviewed by the expert panel to assess its content validity, relevance, and clarity, and the necessary revisions were made accordingly. The questionnaire was designed using a five-point Likert scale. Furthermore, to ensure the quality of the research instrument, the questionnaire was evaluated by experts, and its content validity was confirmed.

Purposive sampling was employed to select 60 active stakeholders from the four counties of Maragheh, Ajabshir, Malekan, and Bonab (Figure 1). These counties were chosen because they are located within the Lake Urmia basin, share similar irrigation and water management conditions, and have established WUAs.

The participants consisted of board members and chief executive officers (CEOs) of active WUAs. Eligible respondents were identified through county water affairs offices and the Cooperative Department, which provided lists of active associations and individuals directly involved in water distribution and irrigation management. The inclusion criteria were: (1) at least three years of experience in WUA activities, (2) direct involvement in irrigation management and decision-making processes, and (3) familiarity with the operational challenges and performance of WUAs. Participants' experience ranged from 3 to more than 20 years, and some associations had been operating for over 30 years.

The study area contained approximately 74 registered WUAs; however, only about 30 were actively engaged in management and operational activities at the time of the study. Therefore,

respondents were selected from these active associations to ensure that the information collected reflected current managerial and operational realities. Sampling continued until data saturation was reached, meaning that additional responses no longer generated new information and the identified SWOT factors became repetitive. The final sample consisted of 60 respondents, including 20 CEOs and 40 board members. This sample was considered sufficient to capture the institutional and geographical diversity of active WUAs across the four counties. A questionnaire based on a five-point Likert scale was developed and distributed among the participants. Following the analysis, ST, WT, WO, and SO strategies were formulated. The present study was conducted in accordance with the ethical principles for human research outlined by Vanclay et al., (2013) in their article entitled Principles for ethical research involving humans: ethical professional practice in impact assessment Part I. First, informed consent was obtained from all participants in this study, and they were fully informed about the purpose of the research, their right to withdraw at any time, and the measures taken to ensure the anonymity and confidentiality of their data. All procedures were designed to respect participants and to prevent any harm or undue interference.



**Figure 1.** Location map of the study area

### Analysis of Strengths of WUAs

The findings reveal that the most significant internal strengths of WUAs in the province are the promotion of cohesion and coordination among all stakeholders (weighted mean = 3.50;



relative weight = 0.206), mitigation of conflicts stemming from unequal water distribution among farmers (weighted mean = 3.44; relative weight = 0.202), and the accurate and equitable allocation of agricultural water resources (weighted mean = 3.43; relative weight = 0.201). Conversely, factors such as addressing inefficiencies and curbing excessive water consumption by users (weighted mean = 2.98; relative weight = 0.175), reducing the operation and maintenance costs of irrigation networks (weighted mean = 2.94; relative weight = 0.173), and the absence of mechanisms for trading water outside the region (weighted mean = 2.89; relative weight = 0.170) ranked lowest in terms of importance.

**Table 1.** Results of Internal Factors Analysis (Strengths of WUAs).

| Strengths of WUAs                                                                                     | Total Scores | Mean Scores | Relative Weight | Priority |
|-------------------------------------------------------------------------------------------------------|--------------|-------------|-----------------|----------|
| S1 Creating cohesion and coordination among all beneficiaries                                         | 200          | 3.50        | 0.206           | 1        |
| S2 Reducing conflicts caused by unequal water distribution among farmers                              | 193          | 3.44        | 0.202           | 2        |
| S3 Accurate and fair distribution of agricultural water                                               | 199          | 3.43        | 0.201           | 3        |
| S4 Gaining full trust and satisfaction of the community                                               | 198          | 3.35        | 0.197           | 4        |
| S5 Increasing cooperation, collaboration, and cohesion                                                | 184          | 3.34        | 0.196           | 5        |
| S6 Utilizing experienced board members and auditors                                                   | 190          | 3.33        | 0.196           | 6        |
| S7 High level of technical and professional awareness among members                                   | 197          | 3.28        | 0.193           | 7        |
| S8 Transparency and documentation of cooperative activities                                           | 185          | 3.24        | 0.190           | 8        |
| S9 High awareness of cooperatives regarding fair water distribution laws                              | 185          | 3.24        | 0.190           | 9        |
| S10 Strong spirit of cooperation and teamwork among members: Total Score                              | 186          | 3.20        | 0.188           | 10       |
| S11 Improved maintenance of irrigation networks                                                       | 179          | 3.14        | 0.184           | 11       |
| S12 Existence of communication and interaction between members and related organizations/institutions | 183          | 3.10        | 0.182           | 12       |
| S13 Optimization of the existing water use system in the region by cooperatives                       | 172          | 3.07        | 0.180           | 13       |
| S14 Replacing traditional irrigation methods with modern, high-efficiency ones                        | 174          | 3.05        | 0.179           | 14       |
| S15 Addressing low irrigation efficiency and preventing excessive water consumption                   | 167          | 2.98        | 0.175           | 15       |
| S16 Reducing the costs of operation and maintenance of irrigation networks                            | 171          | 2.94        | 0.173           | 16       |
| S17 Preventing the sale of water to outsiders                                                         | 168          | 2.89        | 0.170           | 17       |

Note: Weighted means (WM) and relative weights (RW) are calculated based on survey responses and indicate the perceived importance of each weakness among cooperative members.

### Weaknesses of WUAs

Based on the results obtained, the main internal weaknesses of WUAs are as follows: insufficient training regarding cooperative management (weighted mean = 3.65, relative weight = 0.146), lack of knowledge and skills in irrigation network management (weighted mean = 3.55, relative weight = 0.142), and absence of accurate information about water storage, water demand, and distribution timing (weighted mean = 3.54, relative weight = 0.141).

Less critical weaknesses include limited member awareness of the principles and philosophy of cooperative formation (weighted mean = 3.15, relative weight = 0.126), the potential for network damage by farmers during agricultural activities (weighted mean = 3.11, relative weight = 0.124), and intra-group pessimism and mutual distrust among members (weighted mean = 2.90, relative weight = 0.116).

**Table 2.** The result of analyzing the internal factors (The weakness of the WUAs)

| Weaknesses of WUAs |                                                                                                                             | Total Scores | Mean Scores | Relative Weight | Priority |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------|-------------|-----------------|----------|
| W1                 | Lack of Sufficient Training on Cooperative Management and Administration                                                    | 212          | 3.65        | 0.146           | 1        |
| W2                 | Lack of Knowledge and Skills in Irrigation Network Management                                                               | 210          | 3.55        | 0.142           | 2        |
| W3                 | Lack of Accurate Information Regarding Water Storage Volume, Water Demand, and Distribution Timing                          | 202          | 3.54        | 0.141           | 3        |
| W4                 | The lack of sufficient and appropriate incentives for agricultural water users                                              | 198          | 3.53        | 0.141           | 3        |
| W5                 | The lack of accountability on the part of cooperative members                                                               | 206          | 3.49        | 0.139           | 4        |
| W6                 | Low awareness of the irrigation network members about the general aspects of the plan                                       | 206          | 3.49        | 0.139           | 4        |
| W7                 | Financial dependence of the irrigation cooperative on government support                                                    | 205          | 3.47        | 0.138           | 5        |
| W8                 | Illegal use of water by powerful groups                                                                                     | 208          | 3.46        | 0.138           | 5        |
| W9                 | Low awareness of beneficiaries about their rights in the cooperative                                                        | 203          | 3.44        | 0.137           | 6        |
| W10                | Lack of design of the irrigation network according to the boundaries of the covered villages                                | 200          | 3.40        | 0.137           | 6        |
| W11                | Neglect of cooperative members' viewpoints in decision-making                                                               | 201          | 3.42        | 0.136           | 7        |
| W12                | Low awareness about water allocation, distribution, and water rights                                                        | 202          | 3.41        | 0.136           | 7        |
| W13                | Weak local leadership and a lack of influential and commonly accepted individuals                                           | 198          | 3.38        | 0.136           | 7        |
| W14                | The water user association members' problems in the management change process                                               | 193          | 3.37        | 0.135           | 8        |
| W15                | Weak management in the water user associations                                                                              | 199          | 3.35        | 0.134           | 9        |
| W16                | Lack of delegation of the necessary authority to farmers to resolve irrigation network problems                             | 201          | 3.32        | 0.134           | 9        |
| W17                | The shortage of qualified human resources in the water users' association                                                   | 193          | 3.25        | 0.133           | 10       |
| W18                | Lack of equitable water allocation in some cooperatives                                                                     | 196          | 3.26        | 0.132           | 11       |
| W19                | The concurrent engagement of cooperative members in other occupations, and insufficient motivation to actively participate  | 192          | 3.24        | 0.130           | 12       |
| W20                | The lack of beneficiaries' knowledge about the operation, protection, and maintenance of the irrigation network             | 196          | 3.21        | 0.130           | 12       |
| W21                | Lack of cooperation and obstruction by some cooperative members                                                             | 185          | 3.15        | 0.129           | 13       |
| W22                | Excessive financial burdens on the cooperative due to the absence of clearly identified funding sources                     | 193          | 3.11        | 0.128           | 14       |
| W23                | limited understanding of the foundational principles and philosophy underlying the establishment of cooperatives by members | 186          | 2.90        | 0.126           | 15       |
| W24                | Potential damage to the network by farmers as a result of agricultural activities                                           | 187          | 3.11        | 0.124           | 16       |
| W25                | Lack of trust among cooperative members                                                                                     | 174          | 2.90        | 0.116           | 17       |



Although the lack of sufficient training in the management of WUAs has been reported as the most significant internal weakness, the root cause of this issue is not merely a shortage of educational funding. It appears that the underlying cause of this weakness in the region can be traced to the separation of training from implementation across various institutions. For instance, on the one hand, the East Azerbaijan Regional Water is solely responsible for implementing measures and operations within irrigation networks; on the other hand, the provision of training is entrusted to the Agricultural Jihad Organization. This division of duties and duality effectively disrupts the necessary coordination for effective training in the management of WUAs, thereby failing to adequately address the real needs of WUAs. Furthermore, concerning the weakness in knowledge and skills related to irrigation network management, one possible reason for this shortcoming is that the training courses offered by the responsible institutions lack the necessary richness to enhance the skills of water user cooperative members and fail to meet their actual needs. Second, continuous and sustained support for improving skill management in WUAs is typically provided only at the initial stage of forming these associations and is not maintained. Consequently, members' skills deteriorate over time. Additionally, the main cause of the weakness in the availability of accurate information regarding water storage, water demand, and water distribution scheduling appears to be the fragmentation of information and the lack of coordination among government institutions in providing accurate and timely information to the members of WUAs. This issue can disrupt WUAs' access to the data required for effective and optimal management.

### Analysis of Opportunities of WUAs

External opportunities for WUAs in the province are as follows: reducing operation and maintenance costs of irrigation networks (weighted mean = 3.37, relative weight = 0.337), coordination among local institutions in support WUAs (weighted mean = 3.35, relative weight = 0.335), and the existence of successful models in the management, operation, and maintenance of networks in the region (weighted mean = 3.28, relative weight = 0.328).

Conversely, the results indicated that government support for cooperatives according to Article 44 of the Constitution (weighted mean = 3.0, relative weight = 0.3), increased motivation and investment by farmers outside the network (weighted mean = 2.94, relative weight = 0.294), and interaction between organizations with cooperatives regarding network maintenance, repair, and dredging (weighted mean = 2.91, relative weight = 0.291) are of relatively lower importance as external opportunities.

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**Table 3.** Results of External Factors Analysis (Opportunities for WUAs).

| Opportunities for WUAs |                                                                                                     | Total Scores | Mean Scores | Relative Weight | Priority |
|------------------------|-----------------------------------------------------------------------------------------------------|--------------|-------------|-----------------|----------|
| O1                     | Reduction of operation and maintenance costs of irrigation networks                                 | 189          | 3.37        | 0.337           | 1        |
| O2                     | Existence of coordination among local institutions supporting Water User Associations               | 191          | 3.35        | .0335           | 2        |
| O3                     | Presence of successful models in network management, operation, and maintenance in the region       | 184          | 3.28        | 0.328           | 3        |
| O4                     | Availability of local expert consultants in the region                                              | 184          | 3.22        | 0.322           | 4        |
| O5                     | Attention to irrigation and drainage network development in national development plans              | 185          | 3.18        | 0.138           | 5        |
| O6                     | Expansion of complementary and economic activities by cooperatives                                  | 176          | 3.14        | 0.314           | 6        |
| O7                     | Government policy of reducing direct intervention in water and irrigation services                  | 167          | 3.03        | 0.303           | 7        |
| O8                     | Government support for cooperatives based on Article 44 of the Constitution                         | 171          | 3           | 0.3             | 8        |
| O9                     | Increased motivation and investment by farmers outside the irrigation network                       | 171          | 2.94        | 0.294           | 9        |
| O10                    | Interaction of organizations with cooperatives in the maintenance, repair, and dredging of networks | 172          | 2.91        | 0.291           | 10       |

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**242 Analysis of Threats to WUAs**

243 The analysis of stakeholders' and WUAs' managers' perspectives regarding the most  
 244 significant threats facing the cooperatives indicated that the main external threats are as  
 245 follows: water scarcity and drought in the country (weighted mean = 4.40, relative weight =  
 246 0.259), weak existing water management legislation (weighted mean = 4.05, relative weight =  
 247 0.238), and unfulfilled promises by government officials (weighted mean = 4.05, relative  
 248 weight = 0.238).

249 Conversely, relatively less important threats include members' distrust of the plans proposed  
 250 by executive agencies (weighted mean = 3.67, relative weight = 0.216), members' distrust of  
 251 government-recommended management methods (weighted mean = 3.61, relative weight =  
 252 0.212), and weak participation and cooperation of relevant organizations with implementing  
 253 agencies (weighted mean = 3.50, relative weight = 0.205).

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**Table 4.** Results of External Factors Analysis (Threats to WUAs)

| Threats to WUAs                                                                            | Total Scores | Mean Scores | Relative Weight | Priority |
|--------------------------------------------------------------------------------------------|--------------|-------------|-----------------|----------|
| T1 Water scarcity and drought at the national level                                        | 251          | 4.40        | 0.259           | 1        |
| T2 Weaknesses of existing laws in water management                                         | 231          | 4.05        | 0.238           | 2        |
| T3 Unfulfilled promises and commitments of officials                                       | 231          | 4.05        | 0.238           | 2        |
| T4 Fragmented agricultural lands in the region                                             | 232          | 3.93        | 0.231           | 3        |
| T5 Inconsistency of implemented projects with local conditions                             | 205          | 3.86        | 0.227           | 4        |
| T6 Lack of credit and difficulties in accessing it                                         | 216          | 3.85        | 0.226           | 5        |
| T7 Unsystematic planning and failure to fulfill declared commitments by implementers       | 226          | 3.83        | 0.225           | 6        |
| T8 Weak culture of participation and collaboration in collective actions                   | 202          | 3.81        | 0.224           | 7        |
| T9 Negligence of contractors in addressing defects and continuing the remaining operations | 224          | 3.79        | 0.223           | 8        |
| T10 Transfer of responsibilities to beneficiaries without adequate authority               | 212          | 3.78        | 0.222           | 9        |
| T11 Absence of consistent financial support mechanisms for associations                    | 211          | 3.76        | 0.221           | 10       |
| T12 Cultural issues among beneficiaries, such as individualism                             | 209          | 3.73        | 0.219           | 11       |
| T13 Weakness and deterioration of irrigation infrastructure and physical facilities        | 213          | 3.73        | 0.219           | 11       |
| T14 Lack of a clear definition of responsibilities transferred to farmers                  | 205          | 3.72        | 0.219           | 11       |
| T15 Distrust of members toward projects presented by executive agencies                    | 206          | 3.67        | 0.216           | 12       |
| T16 Distrust of members toward the government's proposed management app                    | 199          | 3.61        | 0.212           | 13       |
| T17 Weak participation and cooperation of related organizations with implementing agencies | 189          | 3.50        | 0.205           | 14       |

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263 Although water scarcity and drought are natural phenomena, their negative consequences for  
 264 WUAs can lead to competition among farmers over the use of resources, thereby affecting  
 265 farmers' participation and cooperation. This process gradually undermines and threatens the  
 266 legitimacy and collective functioning of WUAs. Furthermore, the weakness of existing laws in  
 267 water management as a threat is not merely the core problem of legal insufficiency; rather, it  
 268 is the lack of realism, lack of up-to-dateness, lack of enforcement guarantees, and the  
 269 inconsistency of existing laws with regional conditions. Upstream laws in water management  
 270 are often formulated in a centralized manner and lack the necessary flexibility to adapt to local  
 271 needs. The root of this threat can be traced to the absence of effective mechanisms for resolving  
 272 existing legal conflicts within WUAs. In such circumstances, if an issue or problem arises  
 273 within WUAs, due to the lack of clear and situation-appropriate laws or deficiencies in existing  
 274 laws, the resolution process becomes highly time-consuming, effectively depriving the  
 275 associations of the ability to respond quickly and effectively. Moreover, the threat of unfulfilled  
 276 promises by government officials may stem from the officials' lack of a long-term vision, which

can lead to an institutional cycle of distrust between officials and farmers, to the extent that even if an official makes a practical and feasible promise, farmers and WUA members do not believe it. In the long term, this distrust will lead to a decline in voluntary member participation and ultimately to the weakening of WUAs.

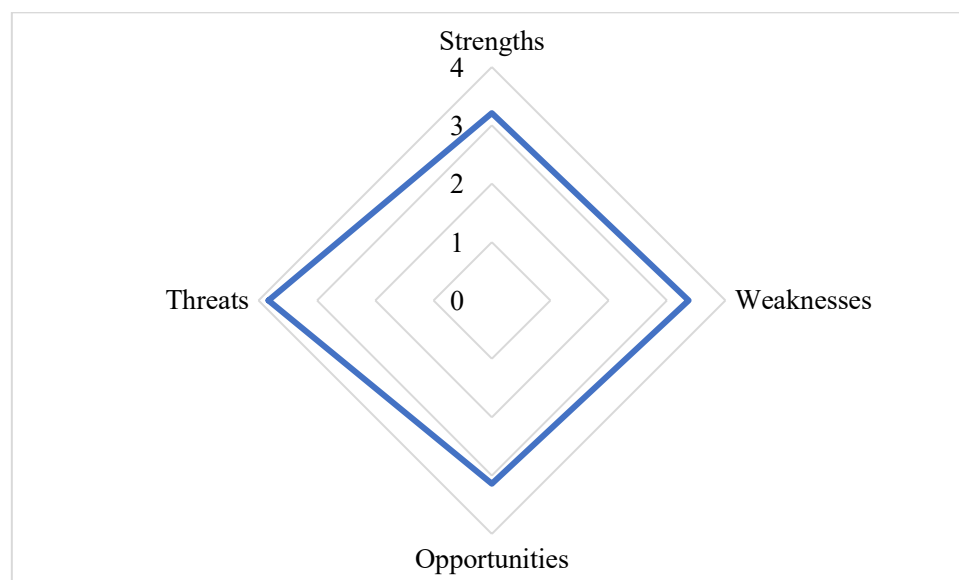
### SWOT Analysis Results

The review of stakeholders' and board members' opinions regarding the strengths, weaknesses, opportunities, and threats of WUAs indicates that the weaknesses and threats outweigh the cooperatives' strengths and opportunities. This situation highlights the need to develop strategies that leverage the cooperatives' strengths and opportunities to address their weaknesses and external threats. According to Figure 2, stakeholders and board members primarily emphasized the threats facing WUAs, followed by weaknesses, opportunities, and strengths in that order.

Based on the results of the SWOT analysis of WUAs, Table 5 presents four strategic approaches aimed at improving their performance and enhancing their sustainability. The purpose of these strategies is to maximize internal strengths and effectively utilize external opportunities, while simultaneously reducing weaknesses and mitigating threats. These approaches can serve as a foundation for strategic planning in the management, efficiency improvement, and their sustainable development.

The strategies presented in Table 5 were developed using the TOWS matrix approach. The TOWS matrix is a useful tool for identifying strategic options. It is an effective technique that, while analyzing internal strengths and weaknesses, emphasizes external opportunities and threats. The matrix systematically matches internal factors (strengths and weaknesses) with external factors (opportunities and threats) to generate strategic options (Alhassan et al., 2020). It helps identify four main types of strategies, namely WT, WO, ST, and SO strategies (Hiriyappa, 2013). Following the logic of the TOWS framework, WO strategies were formulated by linking internal weaknesses with external opportunities, SO strategies by combining strengths with opportunities, ST strategies by using strengths to address external threats, and WT strategies by minimizing weaknesses and reducing exposure to threats. To enhance transparency and traceability, the specific SWOT factor codes associated with each strategy are provided in Table 5, enabling readers to identify the factors that contributed to the formulation of each strategic recommendation. As shown in Table 5, WO strategies were designed to address weaknesses by utilizing available opportunities. For example, delegating

greater authority to farmers through government policies aimed at reducing government involvement in water services can help overcome institutional weaknesses. Furthermore, expanding economic activities within cooperatives may reduce their dependence on water management activities alone. Similarly, SO strategies were formulated by leveraging existing strengths to capitalize on opportunities. Examples include utilizing local expert consultants to improve planning and water-use efficiency, adopting successful management models for optimizing water utilization, and strengthening organizational cooperation in network maintenance and rehabilitation. WT strategies focus on minimizing weaknesses and reducing vulnerability to external threats through defensive measures, whereas ST strategies seek to strengthen and diversify the existing capacities of WUAs to cope with threats. Accordingly, each proposed strategy reflects the interaction between the most influential internal and external factors identified through the SWOT analysis.



**Figure 2.** SWOT Position of WUAs.

Table 5. Strategy matrix for improving the status of WUAs.

| Internal Factors                                                                                      |                                        |
|-------------------------------------------------------------------------------------------------------|----------------------------------------|
| Weakness (W)                                                                                          |                                        |
| Strengths (S)                                                                                         |                                        |
| External Factors                                                                                      | Opportunities (O)                      |
|                                                                                                       | Threat (T)                             |
|                                                                                                       | WO Strategies (reformative)            |
|                                                                                                       | SO Strategies (competitive/aggressive) |
|                                                                                                       | WT Strategies (defensive)              |
|                                                                                                       | ST Strategies (diversification)        |
| Note: WO=Weakness–Opportunities; SO=Strength–Opportunities; WT=Weakness–Threats; ST=Strength–Threats. |                                        |

### Strategy Prioritization and Core Strategy Selection

According to the results presented in Table 6, which ranks the strategies based on their relative weights, the defensive strategy (WT) received the highest score (3.60). It was therefore identified as the core strategy. The relative weights of the other strategies are as follows: diversification strategy (ST) with 3.52, reformative strategy (WO) with 3.25, and aggressive strategy (SO) with 3.17. Hence, to enhance the performance and resilience of WUAs in the studied counties, the main emphasis should be placed on implementing defensive strategies.

Table (6). Strategy Prioritization and Identification of the Core Strategy.

|                   | Weakness (W) |                 | Strengths (S) |                 |
|-------------------|--------------|-----------------|---------------|-----------------|
|                   | WO           | Strategy        | SO            | Strategy        |
| Opportunities (O) | 3.25         | Relative Weight | 3.17          | Relative Weight |
| Threats (T)       | WT           | Strategy        | ST            | Strategy        |
|                   | 3.60         | Relative Weight | 3.52          | Relative Weight |

## DISCUSSION

The aim of this study was to identify and analyze the challenges facing WUAs in East Azerbaijan Province using SWOT analysis. The results of the analysis of internal and external factors revealed the strategic position of the WUAs.

The findings revealed that water scarcity and drought, weaknesses in existing water management laws, and the unfulfilled promises and commitments of officials were identified as the most serious threats facing WUAs, indicating widespread environmental and institutional vulnerability associated with these organizations. At the internal level, the lack of



sufficient training on cooperative management and administration, lack of knowledge and skills in irrigation network management, and lack of accurate information regarding water storage volume, water demand, and distribution timing were identified as the most important internal weaknesses, which may undermine the performance of WUAs. The findings of the strategic prioritization analysis clearly showed that the defensive strategy (WT), with the highest score, was selected as the dominant strategy. This finding emphasizes that, given the prevailing conditions, the most effective approach for enhancing the resilience and sustainability of WUAs and reducing their vulnerability is the implementation of preventive and supportive measures, which can simultaneously address internal weaknesses and effectively mitigate external threats.

Overall, the findings indicate that strengths, weaknesses, opportunities, and threats are not independent; rather, they are dynamic and characterized by complex interrelationships that may either reinforce or weaken one another. For example, lack of sufficient training, weak and limited managerial capacity, and a shortage of qualified human resources (weaknesses) may lead to inefficient decision-making. On the one hand, this can reduce trust among members and limit effective participation and cooperation within WUAs. On the other hand, it may intensify external threats such as members' distrust of projects introduced by implementing agencies, distrust of government-proposed management programs, institutional inefficiency, and weak collaboration among stakeholders. Similarly, the financial dependence of WUAs on government support, identified as a weakness, is directly associated with reduced organizational autonomy, thereby limiting the ability of these associations to capitalize on opportunities such as institutional coordination and local innovation.

Conversely, the strengths of WUAs, such as a high level of cohesion and coordination among stakeholders, can act as mitigating factors against both internal weaknesses and external threats. For instance, strong cohesion among members and participatory, coordinated decision-making processes may enhance informal knowledge sharing and compensate for deficiencies in training and managerial capacity. Likewise, opportunities such as the presence of supportive local institutions and policy attention at the national level can contribute to strengthening institutions cohesion and technical competence within WUAs.

Therefore, strengths, weaknesses, opportunities, and threats should not be viewed as separate and independent analytical dimensions; rather, they should be considered as interconnected components of a coherent and dynamic system in which internal and external factors continuously interact. Recognizing these interrelationships among strengths, weaknesses,

opportunities, and threats enhances our understanding of the functioning of WUAs and highlights the need for integrated policy interventions.

The findings indicated that weaknesses and threats outweigh the existing strengths and opportunities within the associations. In fact, stakeholders primarily emphasized threats, followed in order by weaknesses, opportunities, and strengths. This finding indicates that the dominant perception among participants in this study was primarily focused on environmental problems and threats, with attention to capacities and opportunities considered at later stages. In other words, the results suggest that, from the stakeholders' perspective, external factors such as water scarcity and drought, weaknesses in policies and legal frameworks, and institutional failures in the implementation of governmental commitments and regulations have the greatest impact on the performance and sustainability of WUAs. Subsequently, internal weaknesses—such as managerial deficiencies and challenges, lack of training, and weaknesses in information systems and accountability—were prioritized. In contrast, opportunities and strengths received relatively less attention from stakeholders. This finding implies that the main focus of stakeholders and managers has been on identifying and addressing current problems and preventing threats, reflecting a problem-oriented and defensive perspective rather than identifying opportunities and leveraging potential capacities to enhance development and improve the performance of WUAs.

This study proposes four strategic approaches aimed at enhancing the performance of WUAs in the province, based on an analysis of their strengths, weaknesses, opportunities, and threats (SWOT). These strategies are classified as competitive/aggressive (SO), reformative (WO), diversification (ST), and defensive (WT).

Given that the competitive/aggressive (SO) strategies focus on exploiting opportunities aligned with the strengths of WUAs, it is therefore recommended, to enhance their capacities, that local expert consultants be employed to address issues related to low water-use efficiency, and that successful management models for the operation and maintenance of networks be implemented to optimize current water-use systems, and collaboration between organizations and WUAs be encouraged in the maintenance, rehabilitation, and dredging of networks to improve the condition of irrigation systems. These actions can primarily be implemented by WUAs, Regional Water Companies, and local expert consultants in the short to medium term.

Given that the objective of reformative (WO) strategies is to address weaknesses in order to capitalize on emerging opportunities, it is recommended to utilize policies aimed at reducing direct government intervention in water and irrigation services to delegate greater authority to

farmers in managing network issues. It is also recommended that the government plans to support complementary economic activities aimed at reducing financial dependency, drawing on the experience and participation of local expert consultants in the management of WUAs. Other proposed measures include utilizing the legal framework for supporting cooperatives under Article 44 of the Constitution to encourage farmers' participation and membership, as well as providing training by local experts on cooperative management and the operation of irrigation networks. Most of these measures require coordinated action by agricultural extension services, governmental agencies, and WUAs over the medium term.

Diversification (ST) strategies focus on leveraging the strengths of cooperatives to mitigate potential threats. In this regard, utilizing the social capital of water users to implement land consolidation programs and reduce land fragmentation in the region, transferring responsibilities to farmers while ensuring they have sufficient authority, and harnessing the cooperative members' team spirit for the maintenance and repair of infrastructure can be effective measures. Furthermore, leveraging members' connections with relevant organizations to build trust among stakeholders, supporting the reform of existing national water management laws, enhancing interaction and collaboration among organizations involved with cooperatives, strengthening cooperation with cooperative institutions, and incorporating the insights and experiences of cooperatives—particularly their deep knowledge of regional challenges—into project design are other key recommended actions under these strategies. It should be noted that their implementation largely depends on cooperation between WUAs, water authorities, and relevant government agencies in the medium to long term.

Defensive (WT) strategies aim to implement preventive measures to reducing and minimizing the impact of weaknesses and threats. It is therefore recommended to undertake actions such as raising public awareness—particularly among cooperative members—about the principles and philosophy of establishing WUAs through mass media, conducting training courses to enhance farmers' understanding of their rights within cooperatives, and revising and improving regulations related to the management of WUAs. Additionally, expanding the economic activities of WUAs to reduce financial burdens, informing farmers and members about key aspects of irrigation management transfer projects, water allocation and distribution procedures, and water rights through periodic sessions, as well as providing necessary training on the operation, maintenance, and management of irrigation and drainage networks, are other important measures under this defensive strategy. These interventions should be prioritized in

the short term and supported by WUAs, agricultural extension services, Regional Water Companies, and policy-making institutions.

### Limitations and Future Research

This study has several limitations that should be considered. First, the study area was limited to the southwestern part of East Azerbaijan Province, which may restrict the generalizability of the findings to other regions, as environmental and socio-economic conditions may differ. Second, this study was based on respondents' perceptions, which may have been influenced by personal biases. Future research could replicate this study in other regions to assess the consistency of the findings across different contexts. Third, the analysis was conducted at a general level and did not compare different counties, stakeholder groups, or organizations. Future studies may examine such differences to provide more nuanced insights into WUAs. Fourth, one limitation of this study is that SWOT was employed as a standalone analytical framework. Future research could integrate SWOT with methods such as AHP, ANP, or institutional analysis to improve the prioritization of strategic factors and strengthen policy recommendations.

### CONCLUSIONS

This study was conducted to examine the challenges facing WUAs in the southwestern region of East Azerbaijan Province, located within the Lake Urmia Basin. The findings revealed that WUAs are confronted with a complex and intertwined interplay of internal and external factors, wherein weaknesses and threats substantially outweigh the existing strengths and opportunities. The WT strategy emerged as the dominant approach, underscoring the urgent need for preventive, awareness-raising, and supportive measures aimed at enhancing organizational resilience and sustainability. The SO, WO, and ST strategies further offer complementary pathways for reinforcing institutional capacity, operational efficiency, and the social legitimacy of WUAs. Collectively, these strategic approaches can contribute to improved water resource management and enhanced stakeholder participation within the Lake Urmia Basin. Future research should integrate SWOT analysis with multi-criteria decision-making methods and extend the analytical scope to other regions and stakeholder groups in order to validate and refine the findings.

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592 چالش‌های پیش روی تشکلهای آبربران در منطقه جنوب غربی استان آذربایجان شرقی در حوضه  
593 آبریز دریاچه ارومیه

594

595 یوسف آزادی، جواد احدزاده، و جعفر یعقوبی

596

#### چکیده

597 در شرایط کمبود فزاینده آب و خشکسالی، مشارکت گروه‌های محلی و ذینفعان در مدیریت منابع آب اهمیت فزاینده‌ای یافته  
598 است. انجمن‌های کاربران آب، به عنوان یکی از مهم‌ترین پیامدهای این رویکرد مشارکتی، با تسهیل مشارکت کاربران  
599 در برنامه‌ریزی، بهره‌برداری، نگهداری و تأمین مالی شبکه‌های آبیاری، نقش مؤثری در مدیریت پایدار و کارآمد آب  
600 کشاورزی ایفا می‌کنند. این مطالعه با بهره‌گیری از رویکرد پیمایشی و چارچوب تحلیل راهبردی مبتنی بر SWOT، به  
601 شناسایی نقاط قوت، ضعف، فرصت‌ها و تهدیدهای مؤثر بر تشکلهای آبربران و تدوین راهبردهای پیشنهادی در منطقه  
602 جنوب غربی استان آذربایجان شرقی واقع در حوضه آبریز دریاچه ارومیه پرداخت. با استفاده از نمونه‌گیری هدفمند، 60  
603 نفر از ذینفعان کلیدی انتخاب شدند و داده‌ها از طریق پرسشنامه ساختاریافته گردآوری شد. برای دستیابی به هدف  
604 پژوهش، نقاط قوت، ضعف، فرصت‌ها و تهدیدهای تشکلهای آبربران مورد تحلیل قرار گرفت. نتایج تحلیل SWOT  
605 نشان داد که میانگین امتیاز راهبردهای قوت-فرصت (SO)، ضعف-فرصت (WO)، قوت-تهدید (ST) و ضعف-تهدید  
606 (WT) به ترتیب برابر با 3/60، 3/52، 3/25 و 3/17 بوده است. یافته‌ها نشان داد که چهار جهت‌گیری راهبردی شامل  
607 راهبردهای رقابتی/تهاجمی (SO)، اصلاحی (WO)، تنوع‌بخشی (ST) و تدافعی (WT) پیشنهاد شده‌اند. اجرای این  
608 راهبردها می‌تواند ظرفیت نهادی، کارایی عملیاتی و مشروعیت اجتماعی تشکلهای آبربران را تقویت کند. در نهایت،  
609 نتایج این مطالعه می‌تواند به سیاست‌گذاران و برنامه‌ریزان در بهبود و اصلاح نقش تشکلهای آبربران در راستای  
610 حکمرانی بهتر آب، مدیریت پایدار منابع و مشارکت بیشتر ذینفعان در حوضه آبریز دریاچه ارومیه کمک کند.