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Place attachment, activation of personal norms, and the role of emotions to save water in scarcity

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ABSTRACT

Water bodies across (semi)arid regions are being pressured by climate change and agriculture. Aptly, in Iran, Urmia Lake's fate is in contestation of these two stressors. Whereas climate change mitigation mandates a huge far-lasting global endeavor, some regional adaptations may support the lake to survive ecologically. This needs accountable actions by both institutions and individuals, contributing to the agricultural dynamism. To ensure the effectiveness of institutional lake restoration plans, the consent, cooperation, and active participation of farmers are essential. The critical issue is to know how to persuade farmers and foster prudent water consumption as the prime strategy. This requires understanding farmers intention and behavior in relation to water conservation. To explore this in the region, a specific sociopsychological model was developed. Utilizing the Norm Activation Model enriched by the constructs of Place Attachment and Expression of Emotion, farmers' moral water conservation behavior in the Urmia Lake Basin was investigated. The results of structural equation modeling revealed that all factors of the model influence the water conservation intention and behavior. While awareness of consequences strongly affects personal norms and appraisal of responsibility, place attachment and appraisal of responsibility positively impact emotions and correspondingly emotions and place attachment affect intention significantly. Whereas personal norms were influenced by awareness of consequences and appraisal of responsibility, they impact behavior and intention significantly and eventually intention makes the strongest relationship with behavior. Uncovering this, the study aims to expose further pragmatic insights for credible and sustainable environmental management policies.

1. Introduction

The agricultural sector is a major global water consumer (Scanlon et al., 2007; D'Odorico et al., 2020). Water consumption for agriculture raises significant concerns in (semi)arid areas (Maliva and Missimer, 2012; Nouri et al., 2023). Agriculture's dual role—as both a driver and victim of climate change—underscores the need for fundamental reforms to mitigate water scarcity (Vermeulen et al., 2012; Ensor and Harvey, 2015). Experts emphasize reducing agricultural water consumption and advancing water conservation as critical priorities (Hamdy et al., 2003; FAO, 2019; Vinayagam et al., 2023; Seijger and Hellegers, 2023).

In water-scarce countries like Iran, significant institutional and individual-level changes are deemed essential for sustainable water management (Saatsaz, 2020; Arjomandi A., 2023). Individual behaviors, shaped by various contextual and socio-economic factors, play a substantial role in water conservation and affect broader governance efforts (Tal et al., 2006; Dessart et al., 2019; Arjomandi A. et al., 2024).

Iran's prioritization of agricultural development since the 1990s, often at the expense of environmental concerns, has intensified its water and ecological crises, as seen in the severe desiccation of Urmia Lake, once the world's second-largest hypersaline lake (Ehsani, 2006; Madani, 2014; Shadkam et al., 2016; Nabavi, 2017). This decline is attributed to climate factors, persistent drought, and overuse of water resources for agriculture, which have weakened the lake's resilience to climate change (Shadkam et al., 2016; Schulz et al., 2020; Esmailzadeh et al.,

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2023).

To support the revitalization of Urmia Lake, the Urmia Lake Restoration Program (ULRP) was established with governmental backing (Bakhshianlamouki et al., 2020; Shadkam et al., 2020). A key factor in the program's success has been the active participation of farmers in implementing water-saving practices, essential for reducing regional water consumption (Daneshi et al., 2021). Consequently, understanding farmers' water conservation behaviors is crucial for developing credible, consensus-driven, and sustainable policies. To this end, scholars have applied rational sociopsychological models to identify factors influencing these behaviors within the Urmia Lake Basin (e.g., Abadi, 2019; Arjomandi A. et al., 2023).

On the other hand, scientists argue that moral respect can lead individuals to prioritize collective over personal interests (Van der Werff and Steg, 2015). For instance, adhering to environmentally protective practices, such as reducing water use—even if it affects personal income or convenience—reflects altruistic behavior (Charnov and Krebs, 1975). This suggests that farmers who decrease their water usage to support environmental and regional well-being may forgo immediate benefits, such as higher yields or income. Despite potential impacts on their livelihoods, farmers may adopt these practices out of ethical commitment (Hamid et al., 2021).

Additionally, educational and awareness initiatives by the ULRP in the Urmia Lake Basin (ULB) can be instrumental in enhancing farmers' environmental awareness and moral responsibility regarding water conservation. Such programs, which address climate change and environmental degradation, may heighten farmers' moral consciousness toward sustainable water use.

Thus, recognizing the moral dimensions influencing water use behavior is crucial, as these factors go beyond rational calculations to include ethical motivations for pro-environmental actions (Fernandes and Guiomar, 2016). In studying these behaviors, researchers frequently apply moral models like the Value Belief Norm (Stern et al., 1999; Stern, 2000) and the Norm Activation Model (Schwartz, 1977), which have been used to explore pro-environmental behaviors across various regions (De Groot and Steg, 2009; Onwezen et al., 2013; Park and Ha, 2014; Van der Werff and Steg, 2015).

To investigate water conservation behavior (WCB) among farmers in the southern areas of the ULB, Valizadeh et al. (2020, 2021) incorporated a sort of socio-psychological model. Their study's results (Valizadeh et al., 2020) provided detailed information about the effects of 'identity' and 'place attachment' variables on moral norms regarding water conservation. However, their model did not specifically align with conventional moral models such as the Norm Activation Model (NAM) or the Value-Belief Norm (VBN). On the other hand, their investigation, which incorporated NAM to understand participatory-based water conservation among farmers in the same area (Valizadeh et al., 2021), included some rational variables, primarily aligning with constructs from the Theory of Planned Behavior (Ajzen, 1991). To specifically focus on altruistic factors and further develop moral studies through investigating other determinants that may influence farmers' WCB, this study aimed to make use of the NAM enriched by additional latent moral variables. To this end, the constructs of Place Attachment (PAT) and Expression of Emotions (EOE) were incorporated into the Norm Activation Model. Valizadeh et al. (2020) have reported that the Agricultural Jihad-Organization of West Azerbaijan Province, the western agricultural authority in the basin, has advised that PAT be investigated as a potential influencer of farmers' WCB in the region. This variable is already underlined by researchers as a determinant of pro-environmental behavior in several studies (e.g., Scannell and Gifford, 2010; Song and Soopramanien, 2019; Daryanto and Song, 2021). Other than PAT, the EOE was included in the model for the purpose of studying its potential role as a moral effector of such behavior. The concept of EOE has been proposed by researchers (e.g., Rees et al., 2015; Bissing-Olson et al., 2016; Zelenski and Desrochers, 2021) as a determinant of pro-environmental behaviors in different contexts. According to experts, this variable can have a close association with PAT (e.g., Correia et al., 2017; Hosany et al., 2017; Zheng et al., 2019). Therefore, besides PAT, the research aimed at examining the EOE's potential effect on WCB in the ULB.

Ultimately, this research aimed to identify moral influential factors of farmers' WCB within the region using the NAM extended by the proposed additional variables. The objective was to explore further altruistic determinants of consent and sustainable water-saving actions among farming communities, in order to develop more efficient policies for safeguarding the primary goal of reviving Urmia Lake. Broadly, this seeks to foster the socio-ecological indicators of the community-environment-development nexus in regions severely impacted by climate change, where community participation and conservation efforts play a critical role in improving natural resource management and achieving sustainable development goals.

2. Theory and background

In 1977, Schwartz pioneered the introduction of the concept of Personal Norms (PN) as a framework to elucidate altruistic behavior (Schwartz, 1977). PN encompass the internalized self-expectations regarding particular actions in specific circumstances, which are recognized as manifestations of moral obligation (De Groot and Steg, 2009). These norms are forged through a synthesis of value-based perceptions, cultivated through social interactions, guiding individuals on how they ought to conduct themselves in various situations (Rosenthal and Ho, 2020). A robust personal norm signifies an individual's intrinsic motivation to advocate for pro-environmental behaviors, regardless of associated costs or sacrifices (Van der Werff et al., 2013).

As a mechanism of PN operation, the NAM delineates the dynamics of altruistic behavior through the channel of moral obligation. However, such feelings of obligation, contingent upon the perceived appropriateness or intensity of the obligation, can be counteracted by defensive cognitions (Schwartz, 1977). When individuals acknowledge the repercussions of their actions on others, including the environment, and assume responsibility for their behavior, personal norms are activated. Nonetheless, the activation of norms may not necessarily align with situations that entail substantial costs to the actors due to the introduction of a remedial action. This phenomenon is associated with the denial of personal responsibility, which is manifested through defensive cognitions. Consequently, individuals are inclined to adopt an altruistic approach only when personal norms are activated in conjunction with the rejection of interfering defensive cognitions (Schwartz, 1977). Scholars have underlined that the attribution of personal responsibility can be stimulated by an awareness of consequences, thereby engendering the development of a personal norm with the ultimate aim of fostering altruistic intentions and behaviors (e.g., Clark et al., 2003; Bamberg and Möser, 2007; De Groot and Steg, 2009). This suggests that in social communities such as farming communities, reductions in water consumption are more likely to occur when individuals feel ethically responsible for their actions. This proactive stance can reinforce their adherence to a robust personal norm aimed at conserving water resources.

The NAM stands as one of the most prevalent methodologies utilized in the assessment of pro-environmental behaviors. A number of studies have leveraged the NAM to explore pro-environmental attitudes across diverse contexts. For instance, Bamberg and Möser (2007) employed the NAM to scrutinize individuals' intentions regarding the utilization of public transportation over personal vehicles, while Van der Werff and Steg (2015), along with other scholars (e.g., Clark et al., 2003; Wittenberg et al., 2018; Song et al., 2019), applied it within the realm of energy conservation to evaluate energy-saving practices. Moreover, the NAM has been instrumental in the assessment of pro-environmental behaviors aligned with carbon footprint reduction initiatives (Vaske et al., 2015; Qiao and Gao, 2017), as well as in investigating intentions toward the adoption of eco-friendly technological appliances (Ho and Wu, 2021), among other applications.

This model (NAM) comprises three pivotal behavioral determinants within its evaluative framework, namely: i) Awareness of Consequences (AC), ii) Ascription of Responsibility (AR), and iii) Personal Norms (PN). As explicated, PN play a crucial role in individuals' conceptualization of moral obligation, thereby influencing their propensity to engage in specific actions, such as environmentally friendly behaviors (Thøgersen, 2006). PN, delineated across various domains, have emerged as significant drivers of pro-environmental behaviors, such as recycling (Thomas and Sharp, 2013; Nketiah et al., 2022), water conservation (Rahimifayzabad et al., 2016; Boazar et al., 2019; Savari et al., 2021), and electricity conservation (Zhang et al., 2013; Song et al., 2019).

Behavior-specific approaches should be advocated alongside an awareness of consequences, as emphasized by Van der Werff and Steg (2015). For instance, in endeavors to reduce water consumption within a region, users ought to be sensitized to the ramifications stemming from excessive or improper water usage, thereby enhancing their understanding of the resultant problems. Consequently, AC assumes a foundational role in behavior-specific approaches, constituting a mainstay in behavioral assessments facilitated by the NAM. Similarly, AR has been emphasized as a central tenet of the NAM (Winingsih et al., 2022). AR encapsulates individuals' sense of responsibility regarding the adverse outcomes arising from their failure to undertake corrective actions in precarious situations (Bamberg et al., 2007; De Groot and Steg, 2009). Numerous studies have identified AR as a determinant of pro-environmental behavior across several domains, involved but not limited to residents' waste separation practices (Wang et al., 2019b), purchasing behavior pertaining to organic food (Lafontaine et al., 2021), drivers' adherence to speed limits (Javid et al., 2021), and water consumption arrangements (Gómez-Llanos et al., 2020).

In addition to the NAM's factors (PN, AC and AR), the influence of place attachment variables on moral orientations toward pro-environmental behaviors has been elucidated throughout several studies. For instance, the impact of place attachment has been examined in relation to citizens' recycling intentions (Nketiah et al., 2022), tourists' engagement in pro-environmental behaviors (Ritchie et al., 2022), water conservation practices (Valizadeh et al., 2020), and the preservation of native vegetation (Raymond et al., 2011), among other contexts. Place attachment (PAT) denotes the intricate human experience encompassing affective dimensions such as feelings, moods, and emotions, which individuals perceive and interpret in diverse manners and degrees, while being situated within the contexts of their birthplaces, residences, and activities. This phenomenon extends to the relationships individuals foster with others who inhabit and engage with the same locales (Giuliani, 2003). Low and Altman (1992) provided a comprehensive exploration of attachment to various locales, including homes, plazas, neighborhoods, and landscapes, across different life stages such as childhood, middle years, and later years. They annotated the insights of researchers from diverse disciplines who conducted integrative analyses of PAT, drawing upon theoretical and methodological frameworks from fields such as landscape architecture, psychology, social ecology, sociology, and urban planning.

Conventionally, a significant proportion of farmers, spanning generations including predecessors, grandparents, parents, and relatives, have established enduring residence in the region over many years. This enduring presence engenders a collective memory and emotional connection that imbues farmers' moral feelings towards the area. Consequently, farmers' behaviors are theoretically influenced not only by initiatives rooted in personal norms but also by their PAT. In line with this rationale, the statements of scholars (e.g., Gosling and Williams, 2010; Bonaiuto et al., 2016) and the recommendations of the Agricultural Organization (Valizadeh et al., 2020), this study integrates PAT into the NAM as an extended, context-based variable.

Moreover, emotions are recognized as influential parameters in shaping moral orientations (Pizarro, 2000). Emotions are inextricably linked to normative processes and may signify the affective response to (pro-environmental) behaviors, depending upon alterations in personal norms or other determinant variables associated with those behaviors (Onwezen et al., 2013; Yazdanpanah et al., 2024). This aligns with Schwartz's (1977) proposition that adherence to a personal norm can evoke positive emotions, while deviation from it may elicit negative emotions in one's self-perception.

According to studies, the influence of emotions on behavior can be not only mediated by personal norms (Schwartz, 1977) but also exert an independent effect on intention/behavior (e.g., Han et al., 2017; Wang et al., 2019a; Rosenthal and Ho, 2020). On the other hand, awareness of the consequences of an environmental issue, coupled with a sense of disengagement from its resolution, may provoke anticipated negative emotions if the problem persists (Han et al., 2017). Although, theoretically, negative emotions primarily pertain to self-attributions based on norm activation, strong PN in aggregation with AC may amplify concerns beyond individuals' immediate locus of control, prompting them to undertake actions transcending their individual responsibility regarding an environmental problem (Rosenthal and Ho, 2020).

Axelrod and Lehman (1993) stated that individuals are motivated to address problems perceived as relevant to something of importance to them. Expanding upon this notion, which resonates with Giuliani's conceptualization of PAT in association with feelings and emotions (Giuliani, 2003), as well as the aforementioned elements, the authors included the expression of emotions (EOE) besides PAT variable in the structure of the NAM. To this end, it is noteworthy to highlight that researchers have documented the impact of emotions on individuals' responses in circumstances characterized by climate risk or water insecurity (e.g., Wutich and Ragsdale, 2008; Acharibasam and Anuga, 2018). Remarkably, Rosenthal and Ho (2020) incorporated community attachment and anticipated negative emotion factors into the NAM when examining litter-related behaviors management. They examined various combinations of the model based on the relationships among contributing variables. Given the similarity in substance between their work and the objectives of this study, the authors adopted certain concepts from their optimal predictor model to inform the current study's approach. Eventually, an extensive norm activation model enriched with PAT and EOE variables was deployed to investigate farmers' intentions and behaviors towards water conservation, emphasizing altruistic motivations. To the best of the authors' knowledge, this study represents the first application of the developed extended NAM in studying farmers' behaviors regarding water and environmental conservation in the ULB. The proposed model aims to integrate evidence on socio-ecological indicators of the community-environment-development nexus to promote adaptive strategies and informed policy-making in the region.

3. Methodology

3.1. Case study

3.1.1. Physical and socioeconomic characteristics

Among the six major Iranian basins delineated by the Food and Agriculture Organization (FAO, 2008), the ULB situated in northwest Iran (geographic coordinates 35° 40′-38° 30′ N; 44° 07′-47° 53′ E) was strategically chosen as the focal area for this study (Fig. 1). This selection is featured by the convergence of multiple factors, notably the pervasive impacts of climate change alongside recurrent anthropogenic-induced water and environmental challenges, as documented extensively in the literature (e.g., Karami, 2018; Amini, 2019; Schmidt et al., 2021).

Urmia Lake (Figs. 1 and 2) is the largest wetland in Iran (Moghaddasi et al., 2017). It represents an endorheic waterbody of considerable ecological significance. Recognized as a UNESCO protected biosphere and designated as a Ramsar wetland (Nhu et al., 2020), it has historically served as a vital sanctuary for diverse avian species (Eimanifar and Mohebbi, 2007), a habitat on its islands for endangered fauna such as the Iranian yellow deer, and harbors a unique ecosystem conducive to

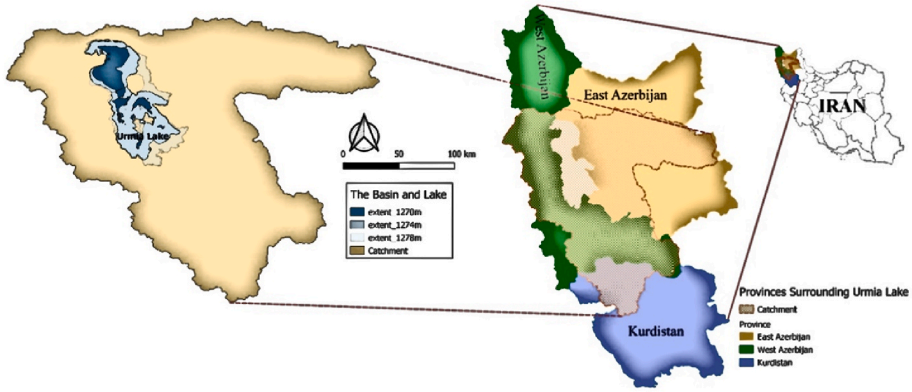

Fig. 1. The geographical position of Urmia Lake and its basin.

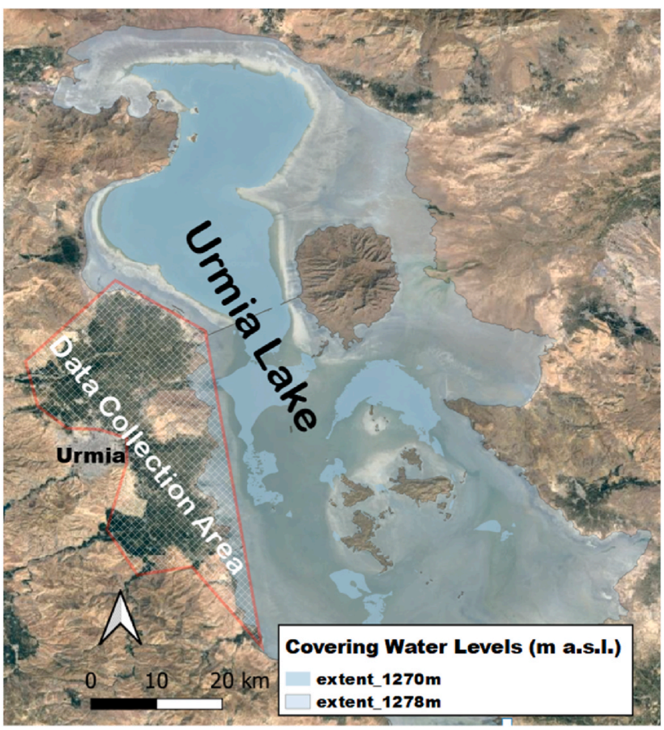

Fig. 2. Case study catchments, western side of Urmia Lake, Iran.

the proliferation of the brine shrimp Artemia Urmiana (Asem et al., 2014), despite confronting inherently high levels of salinity ranging from 140 to 280 gL−1 (Karbassi et al., 2010; Sharifi et al., 2018). However, the pronounced volumetric diminution experienced by the lake in recent decades, leading to a salinity surge exceeding 300 gL−1, has precipitated deleterious repercussions on its ecological equilibrium and associated ecosystems (Eimanifar and Mohebbi, 2007). The spatial extent of the ULB at its maximum historical coverage has been documented to span between 5000 and 6000 sq. km with an average depth ranging from 5 to 6 m (Sabbagh-Yazdi et al., 2020).

The ULB encompasses an expansive area spanning approximately 52,000 sq. km, accommodating a population of approximately 6.5 million individuals (Bakhshianlamouki et al., 2020).

Climatically, the ULB falls within the Mediterranean pluviseasonal–continental classification, exhibiting distinct seasonal fluctuations. Winter months are characterized by a mean annual temperature hovering near or below −10 °C, placed alongside summers with temperatures averaging around 40 °C (Sharifi et al., 2018). Notably, Urmia Lake exerts a modulating influence on local temperature extremes, mitigating climatic oscillations within the vicinity (Delju et al., 2013).

The economy and income in the ULB mainly rely on agricultural and industrial sectors (Fazel et al., 2018). Alongside, the agricultural sector is the largest user of water which consumes around 94% of the total available water in the basin (MOE Deputy of Water and WastewaterMacro Planning Bureau, 2013c). A significant development of reservoirs capacity and irrigation area in the region was followed during 1990s (Shadkam, 2017). This endeavor coupled with the climate change and other factors and flamed adverse effects in the region such as the dramatic shrinkage of Urmia Lake (Shadkam et al., 2016; Ženko and Menga, 2019; Schulz et al., 2020; Schmidt et al., 2021; Arjomandi A. et al., 2022; Arjomandi A. et al., 2024).

3.1.2. Environmental consequences and top-down refurbishments

The environmental ramifications stemming from the fluctuation of Urmia Lake water levels have been multifaceted and far-reaching. These consequences encompass a broad spectrum of ecological, hydrological, and socio-economic impacts, including but not limited to: increased temperature, extinction of wildlife, flooding; alteration of the cultivation pattern, reduction in pasture area, dust storms, soil and water salinity, groundwater decline and depletion, air pollution, plant species extinction, drought, the destruction of surrounding agricultural lands, the incidence of various diseases (including respiratory, skin, and various cancers), livestock disease, problems in the food chain, disruption in the ecosystem structure of the lake, and decreased livability in surrounding cities (Maleki et al., 2018; Samadi et al., 2019, 2020; Mohammadi et al., 2019; Dehghani et al., 2020; Hamidi et al., 2021; Mohammadi Hamidi et al., 2022; Feizizadeh et al., 2021, 2022).

The exigent circumstances arising from the environmental repercussions compelled the Iranian government to institute a dedicated program aimed at the restoration of Urmia Lake (Saemian et al., 2020). To this end, the establishment of the Urmia Lake Restoration National Committee (ULRNC) served as a fundamental instrument, providing the mandate for the implementation of the Urmia Lake Restoration Program (ULRP) commencing in 2013 (Salimi et al., 2019). The ULRP operated within a structured framework comprising three distinct phases: (i) stabilization, (ii) restoration, and (iii) final restoration (Nikraftar et al., 2021). Central to its mission was the concerted effort to effectuate the ecological rejuvenation of Urmia Lake through the adoption of comprehensive water management strategies, with particular emphasis on promoting sustainable agricultural practices within the basin (Bakhshianlamouki et al., 2020). A primary goal of this initiative was to achieve a significant reduction, approximately 40%, in water allocation to the agricultural sector, thereby mitigating stress on the lake's fragile ecosystem.

While the top-down strategies outlined in the ULRP have been implemented in an effort to alleviate the lake's deteriorating condition, its survival remains precarious, subject to the intricate interplay of global climate change dynamics, regional water management and individual water conservation initiatives (Yazdanpanah et al., 2014; Schulz et al., 2020). To this end, securing the cooperation of farmers in adhering to water conservation policies emerges as a critical factor (Arjomandi A. et al., 2023). Therefore, the identification and understanding of farmers' pro-environmental behavior determinants, essential for the effective implementation of water-saving strategies, represent a certain concern addressed by this study, aiming to contribute further insights into this crucial aspect.

3.2. Method

3.2.1. Preparation, participants and the context

An exhaustive examination of pertinent literature, augmented by detailed desk research and insights gained from both local and international experts, was undertaken to envisage the moral determinants of WCB among farmers. To this end, particular attention was devoted to exploring the ethical implications associated with the depletion of Urmia Lake, thereby enriching the discourse on sustainable water management strategies. Correspondingly, a quantitative cross-sectional survey was designed to target a cohort of 300 selected farmers through a multi-stage, clustered, random sampling methodology, focusing on agriculturally significant areas. Emphasis was specifically placed on the western catchments of the ULB, particularly in the vicinity of Urmia City, the administrative center of West Azerbaijan province (Fig. 2). In these areas, variations in surface water availability and the severity of saline dust storms originating from the lake shores are contingent upon proximity to the lake. This spatial attribute is intimately linked with the dwindling volume of surface water (i.e. rivers) as it traverses towards the lake (Arjomandi A. et al., 2023).

3.2.2. Survey

To accurately capture relevant parameters and socioeconomic characteristics, a structured questionnaire was developed. This process was informed by contextual factors, an extensive literature review, and in-depth consultations with scientists, experts from the Agricultural Jihad-Organization of West Azerbaijan Province, local farmers, and community stakeholders. This design approach involved explicitly defining the primary constructs and their manifest variables, based on a thorough analysis of NAM applications related to water and environmental challenges, particularly those concerning climate change and water scarcity (e.g., Valizadeh et al., 2020; Rosenthal and Ho, 2020; Savari et al., 2021; Zobeidi et al., 2022).

To comprehensively assess farmers' intentions and behaviors regarding water conservation in the ULB, the questionnaire incorporated additional moral and behavioral dimensions beyond the core constructs of the NAM. These supplementary elements included farmers' emotional responses and their attachment to their community and environment. These expanded features were integrated into the NAM framework through carefully formulated hypotheses (Hs) aimed at examining the societal and ecological impacts of Urmia Lake's potential disappearance. The hypotheses propose that farmers are inclined to reduce agricultural water use—even at a personal cost—to support Urmia Lake's restoration efforts, as follows.

H1. Awareness of the consequences of Urmia Lake drying up has a significant positive effect on ascription of responsibility about it.

H2. Awareness of the consequences of Urmia Lake drying up has a significant positive effect on personal norms.

H3. Awareness of the consequences of Urmia Lake drying up has a significant positive effect on expression of emotions about it.

H4. Ascription of the responsibility to Urmia Lake drying up has a significant positive effect on personal norms.

H5. Ascription of the responsibility to Urmia Lake drying up has a significant positive effect on expression of emotions about it.

H6. Place attachment has a significant positive effect on expression of emotions.

H7. Place attachment has a significant positive effect on personal norms.

H8. Expression of emotions about Urmia Lake drying up has a significant positive effect on water conservation intention.

H9. There is a positive relationship between awareness of consequences and water conservation intention, which expression of emotions mediates.

H10. There is a positive relationship between ascription of responsibility and water conservation intention, which expression of emotions mediates.

H11. There is a positive relationship between place attachment and water conservation intention, which personal norms mediate.

H12. There is a positive relationship between place attachment and water conservation intention, which expression of emotions mediates.

H13. Place attachment has a significant positive effect on water conservation intention.

H14. Personal norms significantly and positively affect the intention.

H15. Intention toward water-saving significantly and positively affects behavior.

H16. Personal norms significantly and positively affect behavior.

Based on scholars' advice (e.g., Allen and Seaman, 2007; Chyung et al., 2017), to mitigate the statistical challenge of extreme skewness, a 5-point Likert scale (ranging from 1 to 5, denoting strongly disagree to strongly agree) was crafted for all variables within the theoretical framework during the formulation of the questionnaire (Table 1). In adherence to ethical standards, farmers were accorded the autonomy to either consent to or decline participation in the interviews, with assurances provided regarding the confidentiality of their responses. The survey was administered in person by researchers at selected locations during the initial months of 2022, ensuring direct interaction through face-to-face interviews. Importantly, participants were not offered any financial or other incentives to encourage their involvement in the study. Data collection predominantly occurred at the residences of farmers, with each questionnaire typically requiring approximately 40 min for completion.

3.2.3. Analysis technique

The study uses Structural Equation Modeling (SEM) to evaluate pro-environmental behavior among farmers, providing a robust framework for analyzing complex relationships among latent variables. SEM evolved as a synthesis of multiple disciplines, including mathematical statistics, psychology, sociology, and economics, for modeling complex relationships among observed and latent variables. SEM originated from early 20th-century advances: Pearson's (1901) matrix algebra for biometrics, Spearman's (1904) factor analysis for latent variables in psychology, Wright's (1921) path analysis for causal structures in biology, and Fisher's (1925) multivariate methods for genetics. In the 1960s–1970s, Jöreskog and Blalock integrated path analysis and confirmatory factor analysis (CFA), creating models linking latent variable measurement with structural relationships (Jöreskog, 1970). Since the 2000s, SEM has expanded to include multilevel and longitudinal modeling, becoming essential for studying complex psychological, social, and economic behaviors (Muthén and Asparouhov, 2002).

SEM is particularly suited to fields with abstract constructs, such as psychology and social sciences, where factors like attitudes, norms, and intentions shape behavior (e.g., MacCallum and Austin, 2000; Ramkissoon et al., 2013; Stone, 2021; Kline, 2023). Unlike traditional

Table 1
The internal reliability and validity of latent variables in the Norm Activation Model setup of the study.

Variable	Item
	Please express the extent of your agreement with the item (5-point scale from "Strongly Disagree" to "Strongly Agree")
Extended variables	
Expression of Emotions (α: 0.785, CR: 0.79, AVE: 0.56, mean: 4.041, SD: 0.684)	
1	When I consider how much the drying up of the lakes affects my farming,
2	I feel depressed
3	When I consider how much the drying up of the lake affects my life, I get annoyed
	I cringe when I think about how much the drying up of the lake will affect my agriculture
Place Attachment (α: 0.936, CR: 0.93, AVE: 0.71, mean: 3.927, SD: 1.021)	
1	I am proud to live in this area
2	I feel belonging to this area
3	I strongly feel my roots with this region
4	Living in this area gives me a sense of peace that I don't have anywhere else
5	I am happy inside when I am in this area
6	This area is the best place to do what I enjoy
Main variables	
To save the lake by means of modification of agricultural practices and water saving:	
Awareness of Consequences (α: 0.741, CR: 0.77, AVE: 0.54, mean: 4.326, SD: 0.684)	
1	Violation, transgression and crimes such as theft, guilt, and so on will increase in the region
2	The probability of migration of villagers from their place of residence will increase.
3	Summers will be hotter, winters will be drier, and environmental conditions will become more difficult for living
Ascription of Responsibility (α: 0.900, CR: 0.91, AVE: 0.72, mean: 3.038, SD: 1.101)	
1	I think I play a role in the lake drying up
2	Agriculture and farmers are responsible for the high consumption of agricultural water
3	I think agriculture and farmers are to blame for the drying up of the lake
4	I feel responsible for the reckless use of water and preventing the lake from drying up
Personal Norms (α: 0.721, CR: 0.70, AVE: 0.53, mean: 3.270, SD: 1.011)	
1	I feel that I owe my debt to protect the lake
2	Regardless of the performance of others, based on my principles/values, I feel obligated to this matter.
Intention (α: 0.790, CR: 0.79, AVE: 0.56, mean: 3.816, SD: 0.913)	
1	I tend to use farming methods that require less water.
2	I want to change my cultivation type to reduce water consumption
3	I intend to take protective measures such as watering at night to reduce water consumption
Behavior (α: 0.861, CR: 0.89, AVE: 0.72, mean: 3.464, SD: 1.140)	
1	I reduce my water consumption by optimizing the route, shape, dimensions, and cover of waterways
2	I implement fallow agriculture in my land.
3	I encourage other friends or people to reduce agricultural water consumption

regression analysis, SEM allows for the simultaneous estimation of multiple relationships (Bagozzi and Fornell, 1982). By integrating both measurement and structural modeling, SEM enables researchers to examine direct and indirect effects among variables while accounting for measurement error, thereby enhancing the reliability and validity of findings (Bagozzi and Edwards, 1998; do Nascimento and da Silva Macedo, 2016; Hair et al., 2021).

SEM comprises two main components: the measurement model (validated through Confirmatory Factor Analysis, or CFA) and the structural model that defines hypothesized relationships among constructs (Loehlin, 2004). CFA verifies that indicators accurately reflect their intended constructs, a prerequisite for testing relationships within the structural model (Bagozzi and Edwards, 1998; Harrington, 2009). Each indicator should load onto only one latent construct to ensure construct accuracy and minimize cross-loadings, strengthening validity (Lambert and Newman, 2023). Once the measurement model is validated, SEM tests complex relationships, such as mediating and moderating effects, within a unified framework, providing comprehensive insights into factors influencing pro-environmental behaviors (Menidjel and Bilgihan, 2023).

Model fit in SEM is assessed using indices like the Comparative Fit Index (CFI), Normed Fit Index (NFI), and Root Mean Square Error of Approximation (RMSEA), following recommended thresholds (Goretzko et al., 2024; Hu and Bentler, 1999; Steiger, 2007). Meeting these criteria supports the validity of both measurement and structural models, ensuring that relationships among constructs are interpretable and reliable (Schreiber et al., 2006; Marsh et al., 2014). This SEM approach, with CFA validating the measurement model, allows researchers to systematically examine factors influencing behavior. It is particularly useful for understanding determinants of pro-environmental behaviors, such as water conservation practices among farmers, where SEM clarifies the interconnected roles of socio-psychological factors (e.g., Liu et al., 2020; Castillo et al., 2021; Savari et al., 2021).

4. Results

To evaluate the developed questionnaire and implement necessary improvements to ensure its appropriateness for the main survey, a pilot survey was conducted with 30 farmers from the region. This preliminary assessment tested the internal reliability of the questionnaire using Cronbach's alpha (Cronbach, 1951). Results indicated reliability scores ranging from acceptable to excellent, with values spanning from 0.721 to 0.936 (Table 1). These findings confirmed the questionnaire's clarity, relevance, and credibility, supporting its suitability for the full survey.

The primary survey was administered to a sample of 300 farmers from the region, distinct from those who participated in the pilot test interviews. The study population comprised exclusively male individuals aged 24–75 years, with a mean age of 54.06 years and a standard deviation (SD) of 9.73 years. Notably, female farmers within the designated catchment areas declined participation in the survey, thereby limiting gender diversity in the sample. Regarding educational attainment, the participants demonstrated a diverse spectrum: 5% reported no formal education, 26% possessed a high school diploma, 36% held a diploma, 22% attained an upper diploma certificate, while 10% and 1% respectively held bachelor's and graduate degrees. The average family size within the sample was recorded at 3.97 individuals per household. In this society, as individuals age, the family dimension tends to increase; however, the level of education tends to decrease among older age groups (Fig. 3).

In terms of land ownership, over 70% of the participants held ownership rights to their agricultural lands. Additionally, the majority of respondents relied on groundwater extraction for irrigation purposes, with only a minority (six farmers) exclusively utilizing surface water resources. Notably, 32% of participants employed a combination of both surface and groundwater sources to meet their irrigation needs.

After conducting preliminary statistical analyses on the demographic and socioeconomic characteristics of the participants and assessing the internal reliability of constructs using Cronbach's alpha coefficient in JASP (Version 0.16; Love et al., 2019), Pearson's correlation test was employed to explore the correlations among the constructs.

The findings of this analysis (Table 2) indicated that all contributing variables demonstrated a statistically significant correlation with water-saving intention. However, PAT and AR exhibited no discernible correlation with behavior, contrasting with the strong correlations observed with other variables. Notably, the primary constructs of NAM—namely, AC, AR, and PN—displayed significant correlations with each other. Additionally, EOE exhibited strong correlations with PAT and AR. Nevertheless, EOE reflected a negative correlation with AC.

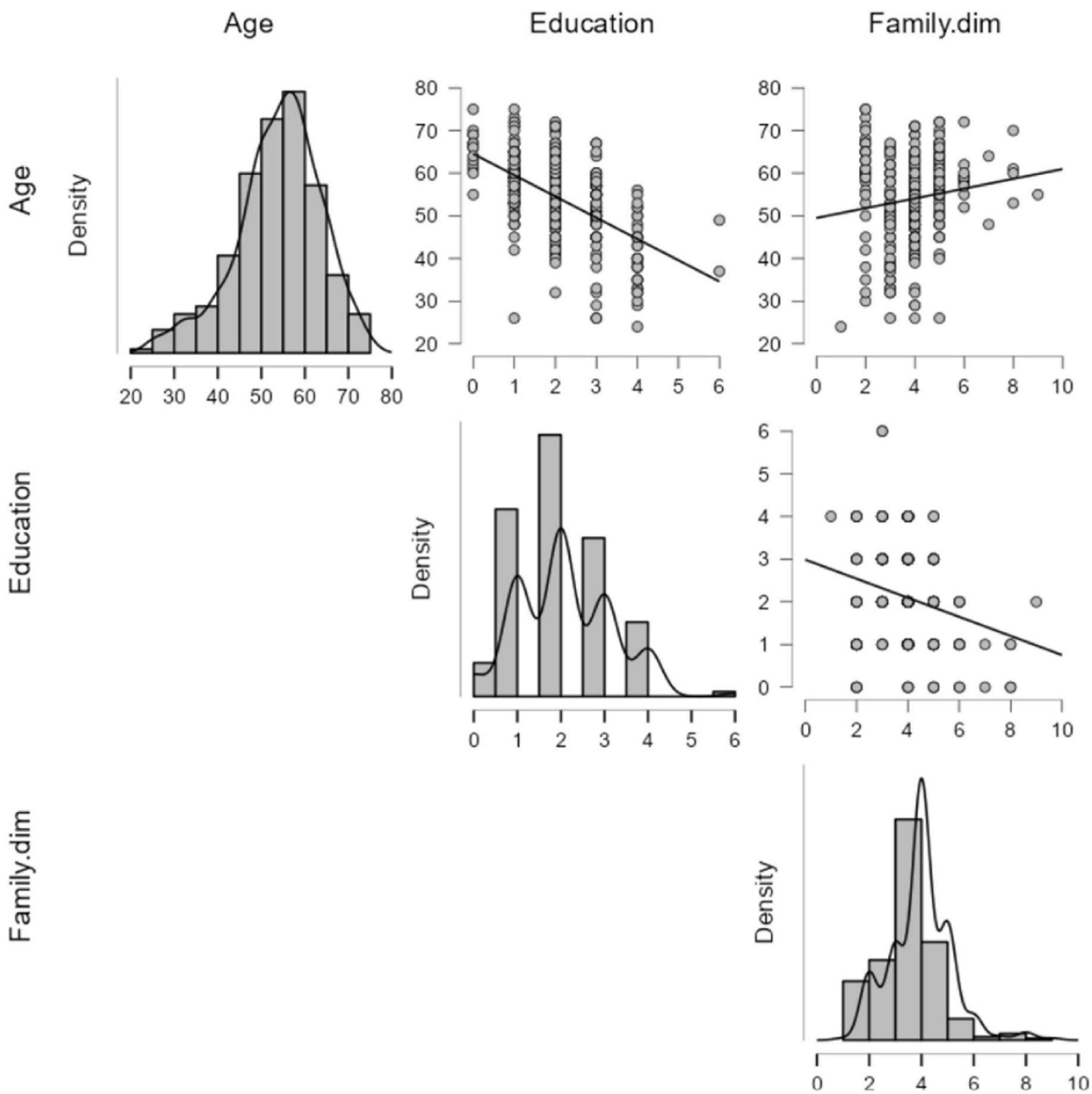

Fig. 3. The correlations among demographic parameters—including age, education level, and family size—in the surveyed population.

Table 2
Correlation between constructs and discriminant validity.

Variable	Personal Norms	Awareness of Consequences	Ascription of Responsibility	Expression of Emotions	Place Attachment	Intention	Behavior
1. PN	***0.728***						
2. AC	0.403[c]	***0.735***					
3. AR	0.331[c]	0.362[c]	***0.849***				
4. EOE	−0.075	−0.116[a]	0.138[a]	***0.748***			
5. PAT	−0.109	0.099	0.080	0.156[b]	***0.843***		
6. Intention	0.182[b]	0.263[c]	0.298[c]	0.381[c]	0.226[c]	***0.748***	
7. Behavior	0.355[c]	0.402[c]	0.102	0.256[c]	0.077	0.506[c]	***0.849***

[a] $p < .05$.
[b] $p < .01$.
[c] $p < .001$, the ***bolded*** values denote the square root of the average variance extracted (AVE) of each latent variable.

Also, the Confirmatory Factor Analysis (CFA) was carried out to evaluate the reliability and validity of the measurement model. CFA is a valuable tool for verifying the underlying structure of a test instrument, such as a questionnaire, by examining the relationships between constructs and their manifest variables, as indicated by factor loadings (Brown, 2015). Within the CFA framework, latent variables are inferred from manifested variables (Jackson et al., 2009), and the ensuing measurement model comprises these latent variables and their associated observable variables. This model allows for the correlation between factors, thereby facilitating a comprehensive analysis. A fundamental requirement of CFA is the unidimensionality of the indicators for each factor, serving as a foundational criterion for assessing construct validity within the model. To assess the construct validity of the measurement model, both convergent and discriminant validity were employed (Shrestha, 2021; Kline, 2023). Convergent validity refers to the degree to which two or more items that are theoretically related to a construct exhibit actual correlation (Bagozzi et al., 1991). This is evaluated using indices such as the average variance extracted (AVE) and composite reliability (CR). For adequate convergent validity, the AVE values for each latent construct should exceed the threshold of 0.5, while the CR values should be above the acceptable threshold of 0.7 (Hair et al., 2009). In this study, both criteria were satisfactorily met (Tabel 1). Moreover, discriminant validity refers to the principle that two or more constructs, which are theoretically distinct, should not exhibit a significant relationship with one another. Discriminant validity is established when the square root of the AVE values for each of the two latent constructs exceeds the correlation coefficient between these constructs (Fornell and Larcker, 1981). In our research, this criterion has been fully satisfied (Table 2).

The evaluation of the validity of the measurement model encompasses various considerations, with particular emphasis placed on the fit of the model according to the observed data. A number of approximate fit indices have been identified by scholars as being of relevance in assessing model fit in a comprehensive manner (Marsh et al., 2014). Notably, expert-recommended thresholds for these indices commonly include a relative chi-square (χ^2/df) ≤ 3, the comparative fit index (CFI), normed fit index (NFI), and goodness-of-fit index (GFI) ≥ 0.9, and root mean square error of approximation (RMSEA) ≤ 0.08 (Hu and Bentler, 1999; Steiger, 2007). Upon completing our assessment, the CFA results demonstrated that the fit criteria met the high standards recommended by scientists (Table 3).

Following the rigorous evaluation of the construct/model validity of our research instrument, this study proceeded to investigate the influence of predictor variables on dependent variables, subsequently examining their impact on intention and behavior. To empirically verify the formulated hypotheses, Structural Equation Modeling (SEM) was applied (see Section 3.2.3 and Fig. 4), using JASP Version 0.16 software.

The results of SEM (Table 4, and Fig. 4) revealed that AC had a significant direct effect on AR ($\beta = 0.43$, $p < 0.001$) and predicted 19% of its variance, furthermore AC had a significant effect on PN ($\beta = 0.54$, $p < 0.001$), also, AR ($\beta = 0.19$, $p = 0.004$) and PAT ($\beta = -0.20$, $p < 0.001$) had significant positive and negative relationships with PN respectively. The influencing factors predicted 44% of the variance in PN overall. Regarding EOE, the determinant variables reflected significant relationships. However, PAT ($\beta = 0.22$, $p < 0.001$) and AR ($\beta = 0.24$, $p < 0.001$) projected a positive relationship and AC ($\beta = -0.26$, $p < 0.001$) a negative one with EOE, furthermore, the contributing variables predicted 12% of EOE's variance. Moreover, all hypothesized factors endorsed their relationship with intention. To this end, PN ($\beta = 0.39$, $p < 0.001$), EOE ($\beta = 0.46$, $p < 0.001$)—encapsulating the effects of their influencing factors—and PAT ($\beta = 0.26$, $p < 0.001$) showed a significant positive effect on intention. Finally, both PN ($\beta = 0.32$, $p < 0.001$) and intention ($\beta = 0.50$, $p < 0.001$) displayed their significant positive effect on behavior and the model predicted 41% and 46% of the variance in intention and behavior, respectively.

5. Discussion

Consistent with the formulated hypotheses, AC, AR, PN, also PAT, and EOE demonstrated eventual strong relationship with both water-saving intention and behavior. The constructed model effectively accounted for 41% and 46% of the variance in intention and behavior, respectively. Notably, in terms of predictive efficacy, the proposed model exhibited a comparable performance to previous studies utilizing the NAM to investigate water conservation behaviors within Iranian settings (e.g., Savari et al., 2021; Zobeidi et al., 2022), reflecting a cogent predictive capability akin to these referenced studies.

Indeed, the results of the SEM analysis demonstrated that, in line with the hypotheses, AC has a significant positive direct effect on both AR and PN, while PN strongly and directly affects intention and behavior. AR, on the other hand, exerts its influence on intention and behavior through the intermediary roles of EOE and PN. Hence, it can be inferred that AC possesses the potential to ultimately influence both intention and behavior. This underscores the significance of AC, thereby emphasizing the necessity of raising awareness. Consequently, an increase in AC associated with the effects of lake desiccation—such as a higher probability of conflict, increased soil salinity, or migration—can evoke water-saving intentions in response. To this end, the increase in the level of awareness is posited as a means of arousing perceptions of the threats (Kagoya et al., 2018; St-Laurent et al., 2019). Scholars have postulated that environmental awareness can enhance the value associated with the conservation of natural resources, thereby increasing users' perception of the consequences of resource diminishment (e.g., Slimak and Dietz, 2006; Shahangian et al., 2022). Thus, enhancing AC represents a primary objective in both rational and moral approaches to behavioral change.

Similar to AC, PAT functions as a purely predictive factor within the model. Two hypotheses relevant to PAT exhibit obedient relationships, while one hypothesis exposes a contrast relationship. In this context, PAT demonstrated a significant positive direct effect on intention and EOE, whereas its relationship with PN was significant but negative. To elucidate this phenomenon, we cite the findings of Portes (1998), which revealed that certain dimensions of PAT can manifest opposing characteristics, such as dampening norms that resist the imposition of excessive obligations and restrictions that impede innovation and entrepreneurship. In analogy to farmers' production initiatives, this suggests that, in the early aftermath of the drying up of Urmia Lake, farmers may be less inclined to fulfill their moral obligations, which could limit their immediate water abstractions for the improvement of their place in the future. On the other hand, they exhibit a strong attachment to their place (Table 1), which is further associated with their feelings and EOE. This attachment causes anxiety or fear if they perceive their place as being threatened. To reconcile these conflicting attributes, they attempt to alter their norms through defensive cognitions (Schwartz, 1977). Consequently, in this instance, an inverse correlation between PAT and PN can be observed. Moreover, emotions and intentions may be influenced in tandem with the residential environment (Giuliani, 2003). This characteristic is clearly annotated within this study, as PAT demonstrates a statistically significant positive effect on both intention and EOE. To this end, beyond the inherent senses of belonging and happiness associated with the PAT variables (Table 1), there is a significant correlation between PAT and EOE (Table 2) regarding the effects of the lake drying up. This correlation also extends to the intention to conserve water through more appropriate farming practices and water-saving methods, which can ultimately help protect their environment and community. These insights underscore a critical tension between development ambitions and environmental protection within farming communities, stressing the importance of the socio-ecological dimensions of the community-environment-development nexus.

According to the hypothesis, EOE shows a significant positive effect on intention. Additionally, PAT and AR displayed their positive and significant relationship with EOE. However, in the context of this study, a negative and significant association was observed between EOE and AC. In illuminating such a scenario, Schwartz (1968) underscores, based on his research findings, that individuals may employ defense

Table 3
Approximate fit indices (confirmatory factor analysis).

Indexes	RMSEA	Cmin/df	CFI	NFI	IFI	GFI
Recommended value	≤0.08	≤3	0.9≤	0.9≤	0.9≤	0.9≤
Extended Norm Activation Model	0.075	2.67	0.911	0.867	0.912	0.984

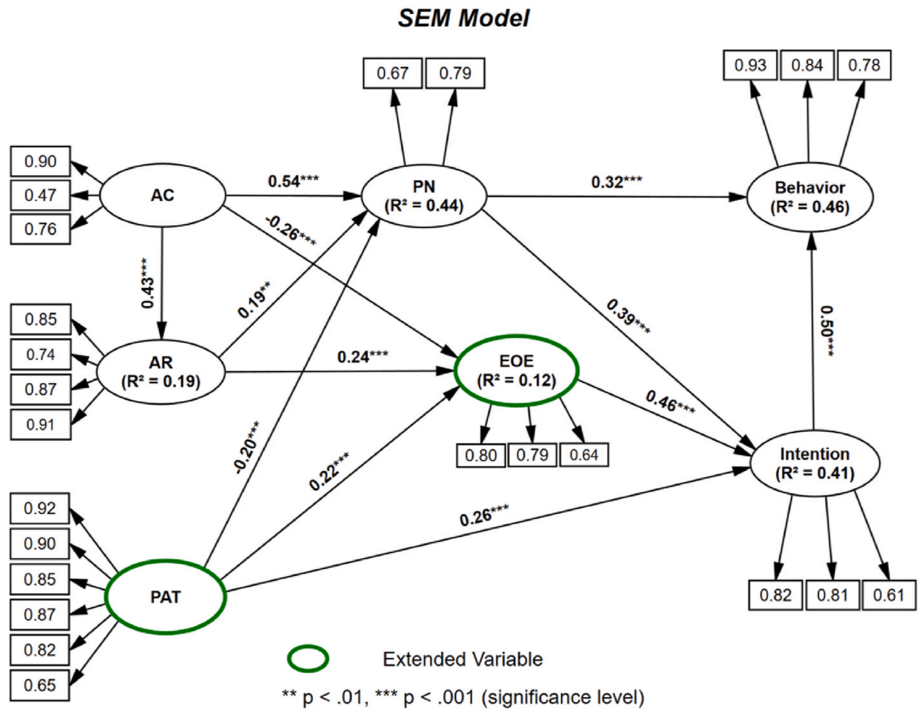

Fig. 4. SEM outputs for the Extended Norm Activation Model, incorporating PAT and EOE factors.

Table 4
The effects of the estimators on the dependent variables.

Predictor	Outcome	P-Value	β
AC	AR	<0.001	0.434
Intention	Behavior	<0.001	0.504
PN	Behavior	<0.001	0.320
PAT	EOE	<0.001	0.223
AC	EOE	<0.001	−0.264
AR	EOE	<0.001	0.244
PN	Intention	<0.001	0.386
EOE	Intention	<0.001	0.459
PAT	Intention	<0.001	0.256
AR	PN	0.004	0.193
AC	PN	<0.001	0.540
PAT	PN	<0.001	−0.205

mechanisms to mitigate unsettling anticipatory emotions. This can manifest through either denial of the anticipated repercussions of their actions on the well-being of others or denial of personal accountability for said actions. Pertinent to the purview of this study, Schwartz (1968) suggests that farmers attempt to attenuate the influence of their emotions by denying the severe consequences that imprudent water consumption may impose on the lake. Subsequently, AC exhibits a negative influence on EOE within the context of Urmia Lake's circumstances. Another interpretation may arise concerning the statistical mean of AC. Acquaintance with the potential repercussions of a problem to a certain degree can evoke cognitive concern. However, if these consequences are perceived as exceedingly dire or insurmountable, individuals may opt to dismiss the concern to alleviate its impact on their emotions (e.g., Janis and Mann, 1977; Lazarus and Folkman, 1984; Bandura, 1999). Notably, the mean value of AC (Table 1) is explicitly high (4.326), indicating that while a majority of farmers possess a sufficient awareness of the complications of Urmia Lake's desiccation, they may view these consequences as too extreme to be promptly remedied. Consequently, they may venture to assuage their emotions by suppressing feelings of sadness or apprehension regarding the repercussions. This dynamic can potentially contribute to the observed negative relationship between EOE and AC in this instance. Despite this issue, when considering the strong positive effects of AR and PAT, EOE emerged as the most significant influencer of intention.

The hypothesized relationships concerning AR have been fully confirmed within the model. AR receives a positive significant direct effect from AC, and influences both PN and EOE in the same way. This relationship underscores the impact of responsibility appraisal on moral factors (Rest, 1986). It suggests that ethical considerations are particularly responsive to a sense of responsibility (Small and Lew, 2021). Such initiatives are notable as they can strengthen PN and EOE, encouraging active participation in water conservation and lake preservation efforts.

Ultimately, both intention and PN demonstrated a significant positive effect on behavior, consistent with the formulated hypotheses. While the significant positive effect of PN on behavior occurs both directly, and indirectly through the mediation of intention, intention—encapsulating the cumulative impact of all influencing variables—proved to be the strongest determinant of behavior.

6. Policy insights

The outputs of this research hold significant potential for informing practical strategies in the realms of water conservation and governance. In this regard, they envision tailored insights aimed at entities tasked with water management responsibilities. Specifically, these insights stand to enrich the efficacy of public advisory and agricultural extension services, which play pivotal roles in communicating, educating, and fostering prudent water consumption practices among agricultural stakeholders.

Given the interrelationship between AR and AC, it can be speculated that AC plays an essential role in the triggering of AR for concerned water consumption. In light of this, it is imperative to discover, document, and disseminate the far-reaching consequences of the potential disappearance of Urmia Lake. Indeed, the findings from scientists across diverse disciplines— particularly climatology, hydrology, environmental science, agriculture, and medicine—have sufficiently addressed the challenges posed by Urmia Lake's desiccation and its associated impacts. Nevertheless, the remaining portion of the mission pertains to the communication, illustration, and dissemination of the issue within society, and more specifically within the farming community. Additionally, it is evident that the communication of environmental consequences serves as a levering instrument for raising awareness about them. Drawing from the insights of this investigation, such initiatives possess the capacity to ultimately impact PN, given that AC has been substantiated to exert a direct and positive significant influence on PN. This issue is noteworthy because rising awareness not only reveals its effect on rational intentions and behaviors (Arjomandi A. et al., 2023), but it also can affect personal norms and moral intentions and behaviors regarding water-saving within the farming community in the ULB. Therefore, it is imperative to consider and extend the dimensions of AC within the region through the dissemination mechanisms of public/agricultural organizations or local rural associations.

Another crucial aspect is to provide support to farmers in the tightening of their PAT. Agyeman et al. (2009) recognized climate change as a potential catalyst for place detachment, whereby residents facing the looming threat of climate change impacts may intentionally sever their ties to their current locales and establish connections elsewhere. This issue is pertinent to the scope of this study, as some farmers in the vicinity of the lake have already been adversely affected by the drying up of the lake, resulting in the occurrence of saline dust storms (Arjomandi A. et al., 2023). According to the findings of Agyeman et al. (2009), it is possible that these individuals may have loosened their ties to the area and may be considering moving to other locations. This holds particular significance concerning the exacerbation of immigration trends and their consequential impacts. However, Zheng et al. (2019) identified that while perceived risk can negatively affect certain dimensions of place attachment, the implementation of coping strategies can help to restore these dimensions. This implies that while encouraging farmers to reduce their water consumption, which may lead to a reduction in their income in the short term, they should be assured that they will achieve a reasonable economic condition if they reduce water usage to save the lake and mitigate the side-effects of its shrinkage. Thus, establishing new income-generating activities as a means of economic resilience can enhance the likelihood of farmers remaining in their communities and help prevent the intentional weakening of their ties to their place of residence. Such mechanisms provide an opportunity to enrich the socio-ecological indicators of the community-environment-development nexus within their specific context. Pursuing this objective necessitates investment in tailored programs designed to provide training and education to farmers, enabling them to explore income-generating avenues with minimal water requirements. This may enhance their PN for water conservation, thereby modifying the inverse correlation between PAT and PN as observed in this study. Consequently, in addition to investments and programs designed to enhance awareness of climate change and environmental issues, it is essential to facilitate adaptation by assisting farmers in creating water-conserving revenue streams and growing local enterprises. This could involve providing specific financial assistance and bank loans.

In addition to PAT, PN and emotions play a significant positive role in influencing intention in the model. Furthermore, PN strongly reflects their direct effect on behavior. These attributes reveal a highly promising and positive ethical character within the farmers' personal cognition regarding the situation. This endowment should be valued and reinforced by encouraging and facilitating the farmers' active involvement in the design and implementation of the proposed programs and projects for the lake and water conservation, which will result in an increase in their sense of responsibility to save the lake.

7. Conclusion and limitations

In light of the findings and their implications, this study aimed to expound upon evidence-based considerations. Initially, the original factors in the Norm Activation Model, namely Awareness of Consequences, Ascription of Responsibility, and Personal Norms, demonstrated significant effects on water conservation intention and behavior within the model consistent with the hypotheses. This highlights the efficacy of the Norm Activation Model in investigating farmers' water-saving intentions and behaviors in the Urmia Lake Basin. Additionally, the Norm Activation Model stands to benefit from incorporating Place Attachment and the Expression of Emotions, despite the contrasting relationships observed in their respective domains. This divergence from hypotheses led the research to explore further findings regarding the association and relationship of the incorporated moral factors. Indeed, the extended variables substantiated their significant direct impact on intention, aligning precisely with the formulated hypotheses. Consequently, a socio-psychological framework is proposed that integrates the roles of place attachment and emotions within Schwartz's ethical model (the Norm Activation Model). This expansion aims to enrich the assessment of moral approaches to pro-environmental behaviors, particularly in the context of natural resources management. Besides, the proposed framework holds potential value in participatory approach assessments by acknowledging individuals' inclination to transcend self-interests and engage in altruistic actions for the betterment of others or nature. Accordingly, the research contributes to emphasizing the socio-ecological indicators of the community-environment-development nexus by providing an analytical perspective on measuring and identifying specific community-centered issues within human-environment interactions and their broader implications. This methodological approach is particularly relevant for pragmatic evaluation, as it allows for the integration of findings that assist policymakers in formulating effective strategies for water and environmental conservation, grounded in moral considerations.

To date, no scholarly inquiry has investigated farmers' intentions and actions towards water conservation through the integration of the Norm Activation Model, Place Attachment and Expression of Emotions within the Urmia Lake Basin. Hence, the outcomes of this study hold promise in enriching the expanding corpus of literature employing psychological frameworks in understanding behavioral decision-making processes, particularly in the realm of environmental management. This contribution serves to advance efforts aimed at mitigating agricultural water consumption, thus addressing pressing environmental concerns.

Despite its findings and practical achievements, this research is constrained by some limitations. Primarily, the study lacks gender dimension significance due to the reluctance of female farmers to participate in interviews. Thus, future research can be further developed by incorporating the contributions of female farmers, thereby addressing the gender dimension in water conservation and lake preservation within the region. Furthermore, this research adopts a context-based approach. The hypotheses and the original propositions of the model are formulated in alignment with the specific circumstances of the case study. Data collection relies on self-reported information from farmers within the designated case study region. Future studies that seek to utilize the findings of this research should integrate the proposed model while taking into account the particularities and context-specific factors of their own cases.

CRediT authorship contribution statement

Peyman Arjomandi A.: Writing – review & editing, Writing – original draft, Visualization, Software, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Masoud Yazdanpanah:** Writing – review & editing, Validation, Supervision, Methodology. **Tahereh Zobeidi:** Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Formal analysis. **Nadejda Komendantova:** Writing – review & editing, Resources, Project administration. **Akbar Shirzad:** Supervision, Resources, Project administration, Investigation, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial

interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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