

**ORIGINAL PAPER**

**The role of ethics in water, food and environmental security from the perspective of farmers: case study at Lordegan in Chaharmahal and Bakhtiari province, Iran**

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**Abstract:** The overexploitation of natural resources leads to environmental degradation and negative impacts to present and future generations. Therefore, the efficient and rational use of the natural resources is vital because their regeneration involves very costs and time. The water issue is so important that it is not just technical data that need to be addressed to solve its crisis, but also social, moral and cultural data must be used. So far, agricultural water use ethics have been discussed as a topic related to field of environmental ethics. Water ethics should be considered as an applied ethics that is based on the recognition of water as a requirement for life. Water is the major limiting factor in agricultural production. Therefore, it is important to utilize it correctly, especially in agricultural activities. In the present study, the general objective was to analyze the principles (human dignity, mutual good, solidarity, supervision, and justice) of the water ethics in the viewpoint of farmers, in the Lordegan township in Chaharmahal and Bakhtiari province, Iran. The present research was performed using a descriptive-analytical method, with field information through questionnaires. The research sample consisted of 219 people selected using Cochran's formula. The results of the research indicate that the farmers have a high average age (54 years). 32.9% of the respondents are illiterate and only 14.2% had a university degree. Farmers are well acquainted with and adhered to the principles of water ethics. But even though they know that harvesting water from underground aquifers is immoral, in practice more than half of them do so, indicating that long-term water scarcity will lead to ethical disrespect. The results of the research show that in times of water crisis, including climate change, support to farmers should be strengthened, especially in economic and income terms, so that their cultural and environmental gifts are not threatened.

**Keywords:** Environment, development, natural resources, sustainability.

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## Introduction

Demographic, economic, and technological trends have been changing the environment throughout the world, both consciously and unconsciously. Human activities it has contributed substantially to these changes, including climate (Montt et al., 2018; Zhang et al., 2022). One of these effects is a change in the quantity and quality of potable water for a significant proportion of the global population, and in more extreme situations can lead to conflict (McMichael and Lindgren, 2011; Lopez-Gunn et al., 2012; Cosgrove and Loucks, 2015; Guo and Wang, 2023). Water is critical for socio-economic development in addition to the basic needs to human survival (He et al., 2021; Ren et al., 2022; Farzi et al., 2023).

In the socio-economic drought type (deficit in water-dependent economic goods and agricultural products leading to societal impacts) (AghaKouchak et al., 2021), it is the result of aggressive development in which decision-makers must realize that, through structural and technological solutions, nature cannot be controlled to maximize economic benefits (Madani et al., 2016).

Naturally, the exploitation of the nature and its resources is one of the first rights to human survival. Therefore, the sustainable use of the natural resources (optimizing consumption and preventing pollution of the same) is vital to meet the needs of the present without compromising the ability of future generations (Swing et al., 2019; Sakalasoorya, 2021), observing two principles of environmental ethics of justice and not harming others (McGowan and Buttrick, 2017; Shayan et al., 2022).

On average, 70% of the world's freshwater resources are consumed in agriculture, which is higher in low- and middle-income countries (Armstrong, 2009; Rahimi et al., 2016; Wellington, 2018; Groenfeldt, 2019a). Therefore, in order to reduce the degradation of water resources, the appropriate behavior of farmers as the largest water consumers in

the world seems necessary and the first step in this direction is to understand their current behaviors (Rahimi et al., 2016).

Agriculture in Iran is highly dependent on water, accounting for around 90% (Boazar et al., 2019). The reason for this is that the pattern of cultivation in each region does not match the amount of available water resources and the traditional methods of agriculture and irrigation (Jafary and Bradley, 2018; Nazari et al., 2018; Amiri et al., 2021). The water crisis is currently very serious in Iran (Moshizi et al., 2023). This is evident in the drying up of lakes, rivers, wetlands, and declining groundwater levels (Khatibi and Arjjumend, 2019; Saemian et al., 2022; Khorsandi et al., 2023).

In general, it can be said that Iran has suffered from water bankruptcy. Where the demand for water exceeds the supply of natural water. Moral commitments to future generations demand that, in addition to economic value, water must also be considered as a social and cultural element. The way water is allocated must be sustainable (Wellington, 2018).

The result of different researches shows that water is not available naturally and evenly, and this is very clear, which will not be available to a large part of the world's population in the future. Therefore, it is necessary to create and implement ethical codes and appropriate technologies in an integrated and codified way, in order to provide adequate and fair access to water. Ultimately, this leads to a reduction in poverty, hunger, malnutrition and common diseases among the people (Villholth, 2009; Dinka, 2018).

Because 75% of the world's 1,200 million poor people depend on agriculture as their primary source of income, therefore, the implementation of ethical commitments in this area leads to the sharing of increasingly limited water resources. This in turn leads to justice in access to water for various human activities (Villholth, 2009; Ike, 2019). Groundwater is the principal source of water used for domestic and agricultural purposes in Iran

(Jafary and Bradley, 2018). Although groundwater reserves have long been a visible biological resource, these reserves are under serious threat due to population growth (Farzi et al., 2023). Such a reality forces us to try to avoid unconventional and excessive use of water while using it to meet human needs (Hoechstetter et al., 2016; Moncaleano et al., 2021).

The term “water ethics” is rarely encountered in the water literature. Therefore, a notion of the water ethics has emerged only recently due mainly by observation of water conflicts (Grunwald, 2016; Groenfeldt et al., 2021). The United Nations Educational, Scientific and Cultural Organization (UNESCO) previously examined the question of water ethic and identified some fundamental principles, as follows: human dignity, participation, solidarity, equality human, common good, stewardship, transparency and universal access to information, inclusiveness, and empowerment (Liu et al., 2011). In water ethics, the goal is to promote public awareness of water use in society, and the term ethics aims to educate users, managers and the general public in taking responsibility and cultivating ethical attitudes towards water users, which ultimately leads to governance. Water will be healthier in all sections of society in the contemporary era (Brown and Smith, 2010; Smith, 2017).

Water values and ethics are divided in five categories – environmental, economic, social, cultural, and governance (Groenfeldt et al., 2019b). Water ethics shows that all components of the natural world should benefit from water resources. Local people should be involved in the design and implementation of water management, as different communities in the developing world have their own water management systems that are effective and environmentally friendly (Kelbessa, 2022).

Principles of water ethics in fact express specific requirements and norms about human behavior with water, adapt to specific situations and can be used in

different scales. Topics in the field of water ethics in the world are mostly included in the topic of environmental ethics. In the present study, human dignity, mutual good, solidarity, supervision, and justice principles were addressed in the Lordegan township in Chaharmahal and Bakhtiari province, Iran. Summarizing the concepts at level of awareness, belief and obligation to observe water ethics in the viewpoint of farmers.

### Material and Methods

The present research was performed using a descriptive-analytical method. The method of data collection was documentary (reading articles, books and Internet resources) and with field information through questionnaires. First, the level of familiarity of farmers with the principles of water ethics was examine. These principles were evaluated using a 5-point Likert scale (very low = 1 and very high = 5) to measure attitudes and opinions of the farmers.

The study population comprised the farmers of Lordegan township in Chaharmahal and Bakhtiari province in Iran, which includes 17,450 people. The sampling method was multi-stage random. The research sample consisted of 219 people selected using Cochran’s equation, as shown below.

$$n = \frac{\frac{Z^2 pq}{d^2}}{1 + \frac{1}{N} \left[ \frac{Z^2 pq}{d^2} - 1 \right]} \quad (1)$$

Where: n – number of research samples (219); Z = 1.96; p = 0.5; q = 0.5; d – sampling accuracy (0.05 to 0.1); N – number of research statistical population (17,450).

Cronbach’s alpha – a (Equation 2) was used to assess the reliability of the questionnaire questions. The Cronbach’s alpha coefficient for the category of water ethics questions was 0.89 (Table 1). Thus, the reliability of the questionnaire was confirmed.

$$a = \frac{k}{k-1} \left[ 1 - \frac{\sum_{i=1}^k s_i^2}{\sigma^2} \right] \quad (2)$$

Where:  $k$  – number of questions per component;  $s_i$  – variance of each component;  $\sigma^2$  – total variance of the test.

The data of the variables involved were analyzed using descriptive statistical analysis. In order to describe the magnitude of the relationships among the variables analyzed, the Pearson correlation coefficient was calculated. Statistical analysis was performed using SPSS22 software.

Table 1: Cronbach's alpha coefficient of the principles studied in the research

Indicators	Number of items	Cronbach's alpha coefficient
Human dignity	12	0.921
Common good	5	0.895
Solidarity	5	0.842
Justice	3	0.810
Surveillance	4	0.884

## Results

There is a high age of farmers in the study population, on average, 54 years. 32.9% of the respondents are illiterate and only 14.2% had a university degree. Also, the results of the present study showed that in ranking the items of water ethics has the best viewpoint among farmers, such as: the interests of human beings are interrelated; water is a common resource; water and food security is a long-term benefit for us.

The results of description of the indicators of knowledge of the principles of water ethics by farmers showed an overall average of 90.8% (Table 2). Also,

knowledge of the principle of common good showed highest average (97%), whereas the minimum of 76.3% was recorded for the principle of the human dignity. In the analysis of principle of the human dignity (Table 3), the results showed that rationality and peace indicators had a higher highlight in water ethics.

The results of the research showed that according to the viewpoint of farmers, illegal harvesting of the water for irrigation is an immoral act (Table 4). 94.1% of respondents believe that unauthorized extraction of water from aquifers is immoral and practically forbidden.

Table 2: Indicators of the principles of water ethics

Indicators	Number of items	Mean	Mode	SD	CV
			(%)		
Human dignity	12	76.3	73.6	11.4	15.5
Common good	5	97.0	100	6.1	6.1
Solidarity	5	94.8	99	5.9	6.0
Justice	3	92.6	97	10.5	10.8
Surveillance	4	93.4	98	9.7	9.9

SD – standard deviation; CV – coefficient of variation.

Table 3: Indicators for the principle of the human dignity

Indicators	Number of items	Mean	Mode	SD	CV
				(%)	
Growth and excellence	3	75.9	73.2	17.0	22.4
Faith and piety	3	67.1	72.0	16.3	24.3
Rationality	3	83.0	98.8	16.5	19.9
Peace	3	79.5	72.2	15.3	19.2

SD – standard deviation; CV – coefficient of variation.

Table 4: Description of the unauthorized water withdrawal variable (attitude)

Item	Viewpoint of farmers (%)				
	Strongly agree	Agree	Medium	Disagree	Strongly disagree
Illegal harvesting of irrigation is an immoral act	77.2	16.9	1.4	1.8	2.7

According to Table 5, the results showed that 59.8% of farmers, despite knowing that unauthorized water withdrawals are unethical, in practice attempt to harvest water illegally. In other words, they agreed to the unauthorized extraction of water, despite considering it immoral.

One of the questions of the present study was whether the level of farmers' familiarity with the principles of water ethics is appropriate or not?

To answer this question, hypothetical research was tested: H0 – it seems the

farmers are not be well acquainted with the principles of water ethics; H1 – it seems the farmers are well acquainted with the principles of water ethics. To answer this hypothesis, the principles of water ethics were asked by the farmers from a questionnaire of 28 variables in a 5-point Likert scale. The results of the ratio test show that the hypothesis H0 can be rejected with 99% probability (Table 6). In other words, the level of familiarity of farmers with the principles of water ethics is appropriate.

Table 5: Description of the unauthorized water withdrawal variable (act)

Item	Viewpoint of farmers (%)				
	Strongly agree	Agree	Medium	Disagree	Strongly disagree
Unauthorized withdrawal of water in practice	38.8	21.0	3.2	5.0	32.0

Table 6: Ratio test (farmers' familiarity with the principles of the water ethics)

Item	Grouping	Frequency	Percent	Sig
Farmers' familiarity with the principles of water ethics	3 >	35	16	0.000
	3 ≤	184	84	

Another issue that was examined in the present study was the environmental knowledge and awareness of farmers as well as their social responsibility. The relationship between farmers' social responsibility as well as their environmental

knowledge and awareness of water ethics was tested by correlation coefficient. The results showed that there is a positive, direct and significant relationship between these variables at the level of 99% (Table 7).

Table 7: Relationship between farmers' social responsibility, environmental knowledge and awareness with the principles of the water ethics

	Water ethics	Social responsibility	Environmental knowledge	Social capital
Water ethics	1	-	-	-
Social responsibility	0.401** 0.000	1	-	-
Environmental knowledge	0.325** 0.000	0.250** 0.002	1	-
Social capital	0.193** 0.004	0.330** 0.000	0.165* 0.015	1

\* and \*\* significant at  $p < 0.05$  and at  $p < 0.01$ , respectively.

## Discussion

The degradation of natural resources shows that man in the face of nature has gone beyond the limits of morality (Malek-Hosseini et al., 2021; Tsesmelis et al., 2022). Ethics regarding the use of natural resources has been widely discussed in recent decades. However, in spite of numerous studies there is no consensus on this issue, especially in developing countries (Malekhoseini et al., 2019).

Water is the major limiting factor for agricultural production in both quantitative and qualitative terms (Neway and Zegeye, 2022; Khorsandi et al., 2023). Therefore, its rational use is especially important in agricultural activities. To solve the water issue, social, moral and cultural data must be used in addition to the technical data. Ethics is a social and cultural phenomenon

that can be examined in various dimensions. As a new science, water ethics is based on the recognition of water as a requirement for life (Schmidt and Shrubsole, 2013; Schmidt, 2023).

In developing countries like Iran, the main attention of governments and governance has been to solve the problems of access and provision of water resources (Saatsaz and Rezaei, 2023; Sarami-Foroushani et al., 2023). That presents good historical and traditional roots (as moral and social gifts) in water resources management. These rules can be considered as the principles of traditional water ethics, and while emphasizing to farmers, they can be considered as opportunities for the development and revival of water resources in rural communities.

In the present study, the farmers population mostly believe in the principles of water ethics, but do not behave ethically. To justify their work, they say that they have to do it for their survival because agriculture is their only source of income. As the problem of water scarcity and crisis intensifies, the ugliness of this practice disappears in practice, as if they consider it their right to extract water from underground aquifers. The principles of water ethics are well understood by the farmers. Although, 32.9% of them are illiterate. However, there is still a long way to go, especially in terms of value and practice in environmental and water.

The results of the research show that the average age in the study population is high. When the average age in a business rises, they show that the business is not very prosperous and its activity is not attractive for young people. In many developed countries of the world, there are organizations called farmers of the future to be able to transfer this valuable job from generation to generation in the country by creating a culture and promoting it, and prevent young people from leaving the countryside and migrating to the city.

The results showed that the more water resources are restricted, the more the sanctity of knowing the unauthorized withdrawal of water is violated (Tables 4 and 5). Therefore, it can be predicted that as the water resources crisis intensifies, the sanctity of ethical principles will be further violated, so that farmers in the region will over-harvest groundwater resources due to recent droughts. The results showed that there is a positive and significant relationship between variables such as environmental awareness and knowledge, social capital and social responsibility with the principles of water ethics (Table 7). This indicates that these influential variables in society can lead to responsible behavior and the conscious person will definitely behave more responsibly and will be more sensitive to his surroundings.

In summary, regarding the causes of unauthorized harvesting of water resources from the perspective of farmers, the following factors can be mentioned: drought and climate change; lack of government support and supervision; lack of smart water meter; development of agricultural activities and growth of water demand.

### Conclusions

In the study population, people are well acquainted with and adhered to the principles of water ethics. But even though they know that harvesting water from underground aquifers is immoral, in practice more than half of them do so, indicating that long-term water scarcity will lead to ethical disrespect.

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