Prioritization of Factors Influencing People's Participation in Watershed Management Projects of Siyahposh Basin, Ardabil Province, Iran

Reza Talaei[a*], Amin Salehpour Jam[b], Bayramali Beyrami[c]

[a]Assistant Professor, Soil Conservation and Watershed Management Research Department, Ardabil Agricultural and Natural Resources Research and Education Center, Agricultural Research, Education and Extension Organization (AREEO), Ardabil, Iran
[b]Associate Prof, Soil Conservation and Watershed Management Research Institute (SCWMRI), Agricultural Research, Education and Extension Organization (AREEO), Tehran, Iran
[c]MSc in Geography, Soil Conservation and Watershed Management Research Department, Ardabil Agricultural and Natural Resources Research and Education Center, Agricultural Research, Education and Extension Organization (AREEO), Ardabil, Iran

Abstract

People's Participation (PP) in watershed management and development projects in the Iran, in addition to reducing implementation costs, can lead to the success and more effective implementation of projects. Several factors can cause People's Non-Participation (PNP) in Watershed Management Projects (WMPs), and the purpose of this research is to identify, classify and prioritize these factors in the Siyahposh basin in Ardabil province from the point of view of watershed residents and experts. After determining the sample size and completing the questionnaires, by applying the Fuzzy Analytic Hierarchy Process (FAHP) model and the Friedman test, the main component and sub-component affecting the non-sustainable participation of the people in the WMPs of the Siyahposh basin were prioritized. The results showed that from the point of view of experts, economic, legal and educational and extension components have a greater role in PNP than social and planning and implementation components. From the people's point of view, economic and educational-promotional components are the first and second priorities in the Siyahposh basin. From the point of view of experts, the sub-component of "ignoring people's income as a direct economic incentive (X1)" and "non-continuity of WMPs in the basin (X13)" have the maximum and minimum importance, respectively. From the point of view of local communities, the sub-component of "ignoring people's income as a direct economic incentive (X1)" and "low level of literacy and awareness (X4)" have the highest and lowest levels of importance in PNP, respectively. Two sub-components "ignoring people's income as a direct economic incentive (X1)" and "defects in the laws of natural resources exploitation by people (X16)" are placed in the first six priorities from the point of view of both groups. Considering the interests of the watershed residents, decentralizing the decision-making power, increasing the Non-Governmental Organizations and training the users, and changing the rules for the exploitation of natural resources and the rules for the allocation of water rights can create the basis for trust and attracting the active participation of people in projects.

Keywords: Ardabil Province, Public Participation, Ranking, Watershed Management Projects, Watershed.

1. Introduction

During the last few decades, the rapid growth of the population, especially in developing countries such as Iran, has increased the pressure on agricultural and pasture lands to provide food. In other words, today's needs of the country have increased the pressure on all kinds of renewable and perishable natural resources to such an extent that it has exceeded its tolerance range and has created grounds for the regression of agricultural lands. For a long time, the phenomenon of soil erosion and its consequences, especially in the last few

decades, has become a major obstacle in the development of the country in various fields related to soil, water, plants and environment resources. The quantitative and qualitative decline of agricultural products, the destruction of pastures, the reduction of forest land production, the destruction of wetlands, the instability of slopes, destructive floods, the decline of groundwater resources, irreparable damage to the environment, and ultimately economic poverty and social instability are among the effects of soil erosion in basins. In the opinion of natural resources and environment experts, it will not be possible to get out of the current crisis in countries that are facing economic and social problems, without considering the position of human as the main cause of destruction in the areas under his activity (Salehpour Jam et al., 2017). The role of People's Participation (PP) has been accepted as a fundamental principle for the successful implementation of watershed management and soil protection projects (Wehn and Almomani, 2019; Mosaffaie et al., 2019; Chen, 2020; Samanta and Jana, 2020).

The experience of many countries shows that the activities and actions of the governments do not have the necessary efficiency and it is necessary to develop a strategic planning that can base the most basic and common needs, or in other words, be comprehensive, systematic and democratic (Clayton, 2005). Also, public participation plays an important role in planning and implementing projects and protecting them in watershed management (Johnson et al., 2002; Micha et al., 2018; Dodds, 2020). For the success of Watershed Management Projects (WMPs), four conditions including: investment and financial provision, development of technical and managerial capacity, the existence of a suitable political culture and the application of clear national laws are necessary (Catacutanb and Duqueb, 2006). Community participation reduces costs in gathering information, determining solutions, agreement, drafting laws, coordination of community members, monitoring and better enforcement of laws (Singleton and Taylor, 1992). So far, many researches have been conducted in connection with the investigation of effective factors in public participation (Sultana, 2009; Bagdi and

Kurothe, 2014; Sharma and Sisodia, 2016; Agidew and Singh, 2018; Soleimanpour et al., 2020).

Despite technological and scientific advances, the involvement of local communities of interest in soil conservation projects faces many obstacles. A deep understanding of obstacles, incentives and motivations is necessary to attract real public participation (When and Almomani, 2019). In this regard, various factors have been identified and introduced as obstacles to public participation in the implementation of WMPs. The results of previous studies have shown that paying attention to demographic factors and planning plays an important role in PP in WMPs (Bagherian, 2013; Ghorbani et al., 2015; Elyasi et al., 2018; Hore et al., 2020). Based on the results of Duram and Brown (2010) studies in 64 watersheds in the United States, increasing awareness of watershed conditions, promoting inter-agency cooperation, consensus in natural resource management plans, and the targeting of final plans play an important role in public participation. The results of the investigation of factors affecting natural resource management programs from a social and economic point of view showed that social factors such as awareness, interest and economic factors such as financial support for projects are factors influencing participation in projects (Bohnet et al., 2011). Sharma and Sisodia (2016) introduced the formation of a user committee in the pre-implementation phase of WMPs as an important factor for promoting PP. According to experts in Moradabad watershed of Meymand in the southwest of Fars province, Iran "low fiancial benefits for the local communities", "ignoring the income for the people with the view of direct economic motivation in the implementation of WMPs", "not training the residents for the projects and its goals" and "lack of literacy and awareness" are among the most important factors of People's Non-Participation (PNP) in WMPs (Soleimanpour et al., 2019b). But in the opinion of the people in this basin, the most important factors affecting the non-participation of watershed residents in WMPs are: "low income of the basin residents", "lack of interest in regarding to provide the basis for working of native

people in implementation of projects (employment)", "ignoring income for watershed residents as a direct economic incentive in the implementation of WMPs" and "low level of literacy and awareness" (Soleimanpour et al., 2020). In the Teleyayen sub-basin in Ethiopia, the security of land ownership and the gender of the household head play an important role in PP in WMPs (Agidew and Singh, 2018). From the point of view of experts and watershed residents of the Bezijan basin of Markazi province, Iran, education and promotion is the most important component of PNP (Davudirad et al., 2021). The results of the analysis of barriers to the participation of local communities in Khuzestan province, Iran show that the most important barriers to public participation in natural resource projects to deal with dust include educational, socio-cultural, economic, technical and technical barriers, respectively (Savari and Almasieh, 2023). Studies by Apipoonyanon et al. (2020) in the forests of Udon Thani province, Thailand shows that education, household income and expenses, employment, number of years of residence and decision-making in the management plan are among the most important factors affecting PP in the management of this forest. In Ziarat basin in Golestan province, Iran, the three factors of non-compliance of projects with the needs of beneficiaries, lack of financial incentives and failure of similar projects are the most important in the reluctance of villagers to participate in WMPs (Farajollahi et al., 2021). In Vers basin in Qazvin province, Iran, from the point of view of local communities and experts, management and economic factors play a major role in the lack of public participation compared to social factors and education (Mosaffaie and Salehpour Jam, 2021). Ignoring people's income and centralization of decision-making power in government organization have been introduced as the most important factors of PNP in WMPs in Vardij-Varish basin in Tehran province, Iran (Salehpour Jam et al., 2022). Also, educational-promotional activity (Schusler et al., 2003; Perkins, 2011; Gebretsadik and Debara, 2017; Adusumilli and Wang, 2018), awareness level (Welu and Solomon, 2015; Mango et al., 2017), income level of residents (Tenge et al., 2004;

Salehpour Jam et al., 2017), economic benefits (Wąs et et. al., 2021), public trust in organizations and the results of soil and watershed conservation projects (Mosaffaie et al., 2017; Powlen and Jones, 2019) and membership in rural institutions (Shamsoddini et al., 2020) play an important role in the participation of watershed residents in projects. Although in these studies, various factors affecting PP in WMPs have been identified and ranked, but this prioritization has only been done based on the views of experts or watershed residents.

Identifying and evaluating obstacles to public participation in the implementation of WMPs plays an important role in planning to promote the voluntary participation of watershed residents (Batáry et al., 2015; Salehpour Jam et al., 2017; Wąs et al., 2021). The important role of incentives in attracting public participation should not be ignored (Wehn and Almomani, 2019; Adeoti, 2021). Considering various obstacles in public participation and paying attention to the weak points in the previous and current planning related to the projects are very important to solve these obstacles (Tomićević et al., 2010; Soleimanpour et al., 2019a; Eskandari-Damaneh et al., 2020; Savari, 2020). Not paying attention to the obstacles of public participation in the implementation of soil conservation plans can lead to unsupported decisions by policy makers and managers and may have negative consequences (Miller and McGee, 2001; Decker and Bath, 2010). Various mechanical, biomechanical, biological and management measures are carried out every year by Iran's Forests, Range and Watershed Management Organization in different basins of the Iran to protect water and soil (Salehpour Jam et al., 2021). In recent decades, special attention has been paid to PP in the implementation of WMPs, but unfortunately, the level of PP in these projects has been low (Rezaei et al., 2012; Mehrdoust et al., 2014; Karimi and Karami Dehkordi, 2016; Savari et al., 2020).

Covering 9400 hectares of the 10103 hectares of the Siyahposh basin is pasture and the other 703 hectares are used for agriculture and gardens. Despite the economic importance of this basin in the livestock and agriculture sector of the region and the villagers, the

application of unprincipled exploitation methods and climate changes in the past few years have aggravated various problems such as soil degradation and erosion, weakening of vegetation and desertification (Yaghmaieyan et al., 2017). In this regard and in order to improve the quality of water resources, soil and vegetation in the basin, several watershed management operations have been carried out in the last few years. The lack of effective participation or the very low participation of people in the various stages of the implementation of these operations has caused their efficiency to decrease. In addition to imposing high costs on project implementing organizations, this issue has also reduced the effectiveness of watershed management. It has also challenged the possibility of implementation and success of other operations in this basin and other basins of the region. Considering the necessity of implementing watershed management operations in the Siyahposh basin and neighboring basins in order to properly manage of water resources, soil and vegetation and the need for PP as one of the main components of success in the design, implementation and maintenance of the WMPs in rural areas and basins, this research has been carried out. By conducting this research, the obstacles to the participation of rural communities in WMPs in the Siyahposh basin were identified and evaluated, so that based on the results, these obstacles will be removed and the level of public participation will increase. Therefore, it is expected that with the increase of PP, the management in the Siyahposh basin and the basins of the region will become more effective and stable.

The evaluation of the available literature review shows that no study has been done in the past regarding the barriers to PP in WMPs in the Siyahposh basin and other basins in the region. In this research, the reasons for non-participation of people in WMPs were investigated and compared based on the opinions of experts and residents of Siyahposh basin, which has been less considered in studies of other basins in Iran. In this research, selected components and sub-components for evaluating the main obstacles to public participation in WMPs were determined based on the opinions of both groups of experts and

residents of this basin, for this reason, some of the questions in the prepared questionnaire are specific to this research.

Considering that experts are the main focus of study, design and implementation of WMPs and are the main advisors of managers in the development of collaborative planning, the incorrect view of this group can lead to negative results in the collaborative management of the watershed. Also, the planning of experts without knowing the views of the residents may prevent the realization of the goals of cooperative projects. This is especially important in countries with low levels of public participation. Therefore, the results of this study can both lead to the joint identification of the views of experts and residents, and be a stimulus for their convergence in future planning for the collaborative implementation of soil protection plans. Therefore, this study examines the barriers to PP in soil protection projects in Siyahposh basin. In this research, based on the views of experts and local communities, three main goals are pursued: (1) identifying and ranking the obstacles to public participation in WMPs, (2) giving priority to the importance of obstacles to public participation in the implementation of the soil protection plan from the point of view of experts and the local community, and (3) evaluating the opinions of both groups regarding the importance of barriers to public participation in the implementation of soil protection plans.

2. Materials and Methods
2.1. Geographical location of the basin
Siyahposh watershed with an area of 101.03 square kilometers between the geographical coordinates of 48° 7' 00" to 48° 16' 30" longitude and 37° 46' 20" to 37° 54' 18" latitude in the southwest of Ardabil and is located in the south of Nir city (Figure 1). The average height of the basin is 1969.6 m and its weighted average slope is 23.8%. The executive operations of the Siyahposh basin have been carried out in 257 and 10 hectares of the basin area, respectively, biologically (seeding, board seeding, pit seeding, etc.) and afforestation. The volume of mechanical operations (loose stone check dam, cemented stone check dam and construction of Gabion check dam) implemented was equal to 3418

cubic meters and the length of the protection belt was 9.5 km (Habibzadeh, 2016), which was gradually implemented from 2008 to 2023.
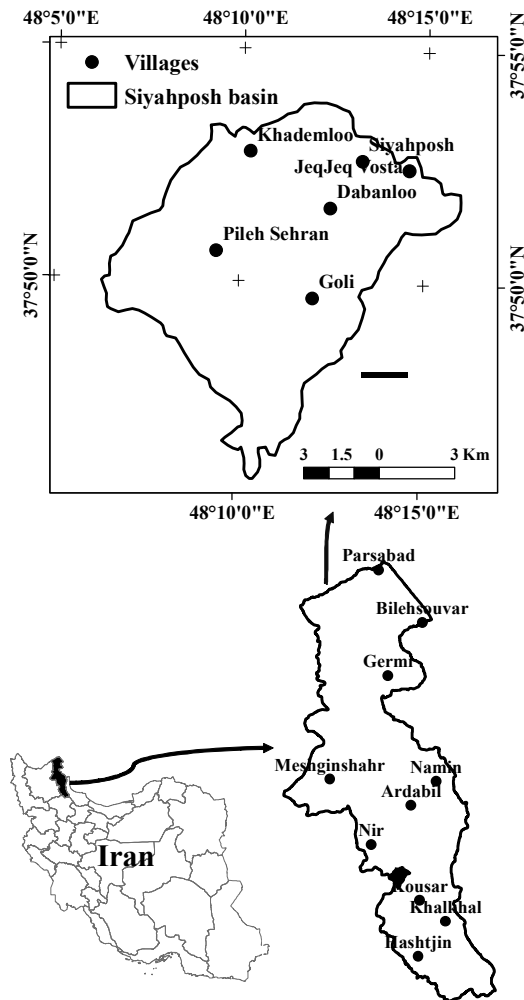

Fig. 1. Location map of Siyahposh basin in Ardabil province

2.2. Research methodology
a) Data collection

Several factors can hinder PP in WMPs, which were classified in the form of five components and seventeen sub-indices in this research. In order to identify the barriers to PP in WMPs and the sub-components of each of them, library and field studies were carried out using questionnaires as a tool for surveying experts and interviews. There has been a meeting with the residents and beneficiaries of the area.

b) Ranking and prioritization of components and sub-indices of PNP based on a survey of experts

In general, the statistical investigations of factors affecting PP in WMPs can be classified into three categories:

(1) Identifying factors affecting PP by using statistical methods such as correlation analysis and a factor analysis (Bagherian et al., 2009; Coulibaly-Lingani et al., 2011; Mehrdoust et al., 2014; Mohammadi Golrang et al., 2017; Rahemh Ardakani et al., 2018; Shamsoddini et al., 2020).

(2) Predicting the level of PP by determining the level of relationship between the factors affecting the level of PP using regression methods (Lise, 2000; Dolisca et al., 2006; Bagherian et al., 2009; Coulibaly-Lingani et al., 2011; Agidew and Singh, 2018; Savari et al., 2020).

(3) Prioritizing the importance of factors affecting the level of public participation using non-parametric statistical tests such as Friedman's test (Mosaffaie et al., 2017; Soleimanpour et al., 2020).

Also, in some studies, Multi-Criteria Decision-Making (MCDM) method such as Fuzzy Analytic Hierarchy Process (FAHP) have been used to prioritize factors affecting PP (Afrough et al., 2018; Salehpour Jam et al., 2020).

b-1) In the analysis of the results of this research and in order to determine the ranking and prioritization of components and sub-components of PNP in WMPs based on a survey of experts using the FAHP (based on pairwise comparison method) assuming independence of components and sub-components and linear relationship between them, from a five-point Likert scale including: very low (1), low (2), medium (3), more (4) and too much (5) has been used as a measurement tool. So that after preparing a checklist of components and sub-components effective in PNP in WMPs extracted from research results and study reports (Table 1), screening the components and sub-components of PNP by two groups including experts and stakeholders was done by using non-present and face-to-face questionnaires, respectively.

In this research, the entire statistical community of experts who had a lot of experience in the studies and implementation of WMPs were selected to complete the questionnaire. All 27 of these experts

completed the relevant questionnaires during
face-to-face interviews.

Table 1. Important main components and sub-component (Variable) affecting people's participation in
implementation of warershed management projects

Row	Symbol	Main component	Sub-component (Variable)	Source
1	X1		Ignoring people's income as a direct economic incentive	Soleimanpour et al., 2019a
2	X2	Economic	Late profitability of projects	Soleimanpour et al., 2020
3	X3		Low fiancial benefits for the local communities from the implemented projects	Tenge et al., 2004; Salehpour Jam, 2017
4	X4		Low level of literacy and awareness	Welu and Solomon, 2015; Mango et al., 2017; Soleimanpour et al., 2019a
5	X5	Social	Ethnic and local conflict	Soleimanpour et al., 2019b
6	X6		Public mistrust about the benefits of projects	Powlen and Jones, 2019; Mosaffaie and Salehpour Jam, 2021
7	X7		Land tenure security	Agidew and Singh, 2018
8	X8		Lack of attention to local decision-makers in watershed planning	Talaei and Beyrami, 2019
9	X9		Centralization of decision-making power in goverment organization	Talaei and Beyrami, 2019; Mosaffaie et al., 2017
10	X10		Lack of interest in regarding to provide the basis for working of native people in implementation of projects	Talaei and Beyrami, 2019; Mosaffaie et al., 2017
11	X11	Planning and implementation	Lack of attention to Non-Governmental Organizations (NGOs) in watershed manegment planning	Talaei and Beyrami, 2019; Mosaffaie et al., 2017
12	X12		Lack of attention to the opinions and suggestions of wtershed residents in different levels of the survey, planing and implementation of projects	Coulibaly-Lingani et al., 2011; Mengistu and Assefa, 2020
13	X13		Non-continuity of WMPs in the basin	Talaei and Beyrami, 2019
14	X14	Educational and extension	Lack of education of watershed residents regarding the projects and relevants goals	Schusler et al., 2003; Perkins, 2011; Moghadam et al., 2013; Gebretsadik and Debara, 2017; Adusumilli and Wang, 2018
15	X15		Not using native promoters	Mosaffaie et al., 2017
16	X16		Defects in the laws of natural resources exploitation by people	Talaei and Beyrami, 2019
17	X17	Legal	Legal problems related to water right assignment in the areas of implementation of WMPs	Talaei and Beyrami, 2019

Regarding the number of people from local communities whose opinions should be questioned, the sample unit of the rural household was selected and the Cochran's formula (Eq. 1) was used to calculate the sample size as follows:

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

where n is the number of samples (selected households) from the statistical population in the Siyahposh basin, Z is the 95% confidence level and is equal to the standard value of 1.96, P is the estimated ratio is equal to 0.5, q is equal to 0.5, d is the allowable error value is equal to 0.05 or 0.1 and N is the number of people (households living in the Siyahposh basin) (Cochran, 1977). After knowing the number of households in the settlements of the basin (Statistical Center of Iran, 2016), the sample size was calculated based on Cochran's formula and in order to complete the questionnaire. Out of 85 households living in 6 villages of Siyahposh basin, 77 households were selected to complete the questionnaire (Table 2).

After collecting the completed questionnaires by the experts, the validity of the questionnaire items was confirmed by the content method according to the confirmation

by the experts, and the reliability of the questionnaire items was also confirmed by using Cronbach's alpha value.

b.2) In order to determine the weights of components and sub-components, the method of FAHP was used as follows:

1. Definition of fuzzy numbers in order to perform pairwise comparisons. The elements of the matrix of pairwise comparisons considering triangular fuzzy numbers are presented in Table 3.

Table 2. Demographic characteristics of questionnaire participants in Siyahposh basin

Basin	City	District	Rural district	Name of the village	Number of households	Population	Number of selected households
Siyahposh	Nir	Kurayim	Eastern Yurchi-ye	Pileh Sehran	7	29	6
				Jeq Jeq Vosta	4	11	4
				Khademloo	14	57	12
				Dabanloo	6	21	6
				Siyahposh	24	84	22
				Goli	30	127	27
Total					85	329	77

Table 3. Linguistic variables and triangular fuzzy number scale (Saaty, 1980; Ballı and Korukoğlu, 2009)

Linguistic Variable	fuzzy numbers	Triangular fuzzy numbers (TFN)	Triangular fuzzy reciprocal scale
Equally important (E)	1	(1,1,1)	(1,1,1)
Between equally important (E) and weakly important (W)	2	(1,2,3)	(0.33,0.50,1.00)
Weakly important (W)	3	(2,3,4)	(0.25,0.33,0.50)
Between weakly important (W) and fairly important (F)	4	(3,4,5)	(0.20,0.25,0.33)
Fairly important (F)	5	(4,5,6)	(0.17,0.20,0.25)
Between fairly important (F) and strongly important (S)	6	(5,6,7)	(0.14,0.17,0.20)
Strongly important (S)	7	(6,7,8)	(0.13,0.14,0.17)
Between strongly important (S) and absolutely important (A)	8	(7,8,9)	(0.11,0.13,0.14)
Absolutely important (A)	9	(8,9,10)	(0.10,0.11,0.13)

2. Creating a matrix of pairwise comparisons based on fuzzy numbers. Comparisons between criteria were made using the measurement scale provided by Saaty (1980) and similar triangular fuzzy numbers, so that linguistic variables and the corresponding fuzzy scale were used depending on the relative importance of the criteria.

3. Calculating the consistency ratio (CR): In this step, the consistency ratio of the judgments and the decision matrix are calculated with the aim of checking the possibility of fuzzy ranking of options (Eq. 2).

$$CR = \frac{CI}{RI} \qquad (2)$$

where: *RI* is the random inconsistency index obtained from Table 4 and *CI* is the consistency index which can be calculated from Eq. 3:

$$CI = \frac{\lambda_{max} - n}{n - 1} \qquad (3)$$

where: *n* is the number of options in the

decision matrix (matrix rank) and λ_{max} represents the average persistence vector.

Table 4. Random consistency index (Saaty, 1980)

N	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.46	1.49

4. Calculation of S_i related to the rows of the pairwise comparison matrix: In this step, S_i was calculated based on Eq. 4:

$$S_i = \sum_{j=1}^{m} M_{gi}^j \left[\sum_{i=1}^{n} \sum_{j=1}^{m} M_{gi}^j \right]^{-1} \qquad (4)$$

where *i* represents the row number, *j* represents the column number, and M_{gi}^j is triangular fuzzy numbers of pairwise comparison matrices. The values, $\sum_{j=1}^{m} M_{gi}^j$, $\sum_{i=1}^{n} \sum_{j=1}^{m} M_{gi}^j$ and $\left[\sum_{i=1}^{n} \sum_{j=1}^{m} M_{gi}^j \right]^{-1}$ can be calculated from Eqs. 5 to 7, respectively:

$$\sum_{j=1}^{m} M_{gi}^{j} = \left(\sum_{j=1}^{m} l_j, \sum_{j=1}^{m} m_j, \sum_{j=1}^{m} u_j \right) \qquad (5)$$

$$\sum_{i=1}^{n} \sum_{j=1}^{m} M_{gi}^{j} = \left(\sum_{i=1}^{n} l_i, \sum_{i=1}^{n} m_i, \sum_{i=1}^{n} u_i \right) \qquad (6)$$

$$\left[\sum_{i=1}^{n} \sum_{j=1}^{m} M_{gi}^{j} \right]^{-1} = \left(\frac{1}{\sum_{i=1}^{n} u_i}, \frac{1}{\sum_{i=1}^{n} m_i}, \frac{1}{\sum_{i=1}^{n} l_i} \right) \qquad (7)$$

In the above equations, l_i, m_i and u_i are the first to third components of fuzzy numbers, respectively.

5. Calculation of the degree of magnitude of S_i relative to each other: If $M_1=(l_1,m_1,u_1)$ and $M_2=(l_2,m_2,u_2)$ are considered as triangular fuzzy numbers, the degree of magnitude of M_1 compared to M_2 is defined as follows. (Eq. 8):

$$V(M_2 \geq M_1) = hgt(M_1 \cap M_2) = \mu_{M_2}(d)$$

$$= \begin{cases} 1 & if \ M_2 \geq M_1 \\ 2 & if \ l_1 \geq u_2 \\ \dfrac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)} & otherwise \end{cases} \qquad (8)$$

6. Calculating the weight of criteria and options: For this purpose, Eq. 9 was used.

$$d'(A_i) = MinV(S_i \geq S_k), \ k = 1, 2, ..., n \quad k \neq 1 \qquad (9)$$

Therefore, the unnormalized weight vector will be as follows (Eq. 10):

$$w' = \left(d'(A_1), d'(A_2), ..., d'(A_n) \right)^{T} \quad i = 1, 2, ..., n \qquad (10)$$

7. Calculation of the final weight vector: In this step, the final weight vector was calculated based on the normalization of the weight vector obtained from the previous step (Eq. 11):

$$w = \left(d(A_1), d(A_2), ..., d(A_n) \right)^{T} \qquad (11)$$

b.3) In general, the Friedman two-way analysis of variance by ranks tests, evaluated the hypothesis that k peer groups are taken from a single continuous distribution or from several distributions with the same mean, or in case of symmetry of the distributions with the same mean (Eq. 12):

$$\chi^2 = \frac{12}{Nk(k+1)} \sum_{j=1}^{k} R_j^2 - 3N(k+1) \qquad (12)$$

where: k is the number of columns or questions, N is the number of rows and the sum of ranks in the jth column. In this case, the degree of freedom is $k-1$ (Mansourfar, 2018). In order to compare the results of the questionnaires of experts and residents of the basins, the Kolmogorov-Simirnov test was used (Mansourfar, 2018).

3. Results and Discussion

In order to prioritize the factors affecting PNP in watershed management activities, Siyahposh basin, where watershed management operations were implemented in the past years, was selected. According to the census of 2015 of Iran Statistics Center, there are 6 villages in Siyahposh basin with a population of 329 people living in 85 households (Statistical Centre of Iran, 2016). In each village, the number of selected households to complete the questionnaires was selected based on the Cochran relationship and the number of households living in each village (Table 2). Out of 77 questionnaire items, 61 items were completed and delivered.

3.1. Prioritization of factors affecting non-participation of people from the perspective of experts

The statistical population related to experts who had a lot of experience in the studies and implementation of WMPs in the basins of the study area were surveyed. All the selected experts were experts of the General Department of Natural Resources and Watershed Management of the studied province, who had more than 20 years of experience in the field of studies and implementation of watershed operations. After completing the hierarchical analysis questionnaires by 27 experts, the components affecting PNP in WMPs were prioritized.

The calculated consistency ratio is equal to 0.016 and less than 0.1 (CR ≤ 0.1), which is acceptable. The prioritization of components affecting PNP in WMPs shows that economic and design-implementation components have maximum and minimum priority respectively (Table 5). For all 17 factors (sub-index), Cochran's alpha statistic is equal to 0.789, which indicates the acceptable validity of the questionnaire.

The significance level value less than 0.01 (Sig = 0.00) in the Friedman test indicates a significant difference in the relative importance of the factors affecting PNP at the level of one percent (Table 6).

Based on this, from the experts' point of view, the sub-index "ignoring people's income as a direct economic incentive" with an average rank of 12.76 has the highest relative priority and the sub-index "non-continuity of WMPs in the basin" with an average rank of 4.44 has The lowest relative priority is the non-participation of people in WMPs.

Table 5. Consistency ratio and normalized computational weight of components

Main component	CI	RI	CR	L	M	U	Normalized weight
Economic				0.1766	0.2479	0.3416	0.311
Legal				0.1223	0.1694	0.2316	0.135
Educational and extension	0.01738	1.12	0.016	0.1115	0.1535	0.2073	0.076
Social				0.1503	0.2003	0.2692	0.205
Planning and implementation				0.1658	0.2287	0.3146	0.273

Table 6. Results of Friedman's test to prioritize the people's participation barriers from views of experts

Rank	Symbol	Sub component (Variable)	Mean rank	Number	Chi-Square	Degree of freedom	P-value
1	X1	Ignoring people's income as a direct economic incentive	12.76				
2	X3	Low fiancial benefits for the local communities from the implemented projects	12.72				
3	X2	Late profitability of projects	11.44				
4	X16	Defects in the laws of natural resources exploitation by people	10.94				
5	X17	Legal problems related to water right assignment in the areas of implementation of WMPs	10.15				
6	X14	Lack of education of watershed residents regarding the projects and relevants goals	10.06				
7	X15	Not using native promoters	9.93				
8	X4	Low level of literacy and awareness	8.96				
9	X5	Ethnic and local conflict	8.94	27	99.492	16	0.00
10	X7	Land tenure security	8.31				
11	X6	Public mistrust about the benefits of projects	7.83				
12	X9	Centralization of decision-making power in goverment organization	7.78				
13	X10	Lack of interest in regarding to provide the basis for working of native people in implementation of projects	7.78				
14	X11	Lack of attention to Non-Governmental Organizations (NGOs) in watershed manegment planning	7.41				
15	X8	Lack of attention to local decision-makers in watershed planning	7.02				
16	X12	Lack of attention to the opinions and suggestions of wtershed residents in different levels of the survey, planing and implementation of projects	6.52				
17	X13	Non-continuity of WMPs in the basin	4.44				

3.2. Ranking of factors affecting non-participation of people from the perspective of local communities

After completing the popular questionnaires by the residents of Siyahposh basin, the Cronbach's alpha value for the questions in the questionnaire was calculated as 0.855, which according to the higher than 0.7 of this coefficient, the measurement tool (questionnaire) has good reliability and in other words, the assumed sub-indices have good reliability and internal consistency (George and Mallery, 1999). The results of the analysis of the Likert questionnaires completed by the local communities and the implementation of Friedman's test to prioritize the components affecting PNP in WMPs are presented in Table 7. As can be seen, the range of the average values of the ranks varies between 3.57 and 2.49. Also, the value of the significance level is less than 0.01 (Sig = 0.00) in the Friedman test, indicating a significant difference in the relative importance of the factors affecting PNP at the level of one percent.

The results of the analysis of the Likert questionnaires completed by the local

communities and the implementation of the Friedman test to prioritize the sub-indices and determine their relative importance on the non-participation of the people in the WMPs of the Siyapoosh basin are presented in Table 8. As can be seen, the range of the average values of the ranks varies between 13.10 and 4.96. Also, the value of the significance level is less than 0.01 (Sig = 0.00) in Friedman's test, indicating a significant difference in the relative importance of the factors affecting PNP at the 1% level.

Table 7- Results of main component Friedman's test to prioritize the people's participation barriers from the viewpoint of residents

Rank	Main component	Mean rank	Number	Chi-Square	Degree of freedom	P- value
1	Economic	3.57				
2	Educational and extension	3.30				
3	Social	2.93	61	24.064	4	0.000
4	Legal	2.71				
5	Planning and implementation	2.49				

Based on this, from the perspective of local communities, the sub-index of "ignoring people's income as a direct economic incentive" with an average rank of 13.10 has the highest relative priority and the sub-index of "low level of literacy and awareness" with an average rank of 4.79 has the lowest priority in the non-participation of people in WMPs. Also, other main reasons for the lack of PP in this basin can be mentioned in order such as: the centralization of decision-making power in goverment organization, lack of interest in regarding to provide the basis for working of native people in implementation of projects, lack of attention to the opinions and suggestions of watershed residents in different levels of the survey, planing and implementation of projects, defects in the laws of natural resources exploitation by people, and lack of attention to local decision-makers in watershed planning. The comparison of the results of prioritization of components and sub-components affecting PNP in WMPs from the perspective of two groups of experts and local communities is presented in Tables 5 to 8. As can be seen, there are differences in the priority order of components and sub-indices according to the opinions of experts and residents of the basin. In order to check more closely and to compare the evaluation results of questionnaires of two groups of experts and residents of Siahpoosh basin, the results of the Kolmogorov-Smirnov test are summarized in Table 9. As can be seen, there is no significant difference in any of the components, so the opinions of experts and people of Siahpoosh basin are the same in these five components.

Participatory management increases capabilities and optimal productivity of resources in the basin. Today, participatory management is known as the most efficient type of management in watersheds and plays a significant role in the goals of comprehensive watershed management. The participation and cooperation of executive agents with local communities and the recognition and belief of the common authority of these communities on the part of experts have a great role in increasing the efficiency of participatory management. Considering the importance of the participation of watershed farmers and villagers in the success of soil protection projects and the maintenance of implemented projects, watershed management activities should always be accompanied by the acceptance and approval of local communities.

One of the most important measures that can be taken in order to remove the obstacles to the participation of local communities in WMPs is to identify, categorize and rank the factors that cause their non-participation in these projects. In this research, after identifying 17 components or sub-components that caused the non-participation of the basin residents in WMPs, these components were categorized into five main groups: economic, social, design-implementation, educational and promotional and finally legal group. In the Siyahposh basin in Ardabil province, Iran, the results of the weights obtained from the FAHP method for ranking the components affecting PNP from the point of view of experts indicate that the economic, legal components, and finally the educational and extension, have

played the biggest role in the lack of participation of these communities in WMPs in the basin. Salehpour Jam et al. (2017) investigated and prioritized the factors affecting the non-participation of stakeholders in WMPs in the watersheds overlooking the city of Tehran, Iran. The first priority of the economic index is consistent with the results of this research. In studies of Soleimanpour et al. (2021), based on the opinion of the users, the main reason for the lack of popular participation is economic motives. The results of studies by Mousaei et al. (2010) shows that according to the experts opinions of Fars province, Iran, the most effective factors in increasing the level of public participation are economic factors. In the study of Salehpour Jam et al. (2018) planning index (design-executive) is in the second priority, while in this research it is ranked as the fifth priority, i.e. the last priority. Comparisons and examination of the results of studies in different parts of the Iran show that usually the priorities have been different in some components and sub-components, as according to some studies, the index related to education and promotion has the minimum level of importance (Feiznia et al., 2006; Mansouri et al., 2016; Salehpour Jam, 2017; Mosaffaie and Salehpour Jam, 2021), but in the recent research, it is in the third priority out of five priorities.

Table 8. Results of sub component (Variable) Friedman's test to prioritize the people's participation barriers from the viewpoint of residents

Rank	Symbol	Sub component (Variable)	Mean rank	Number	Chi-Square	Degree of freedom	P-value
1	X1	Ignoring people's income as a direct economic incentive	13.10				
2	X9	Centralization of decision-making power in goverment organization	11.71				
3	X10	Lack of interest in regarding to provide the basis for working of native people in implementation of projects	10.94				
4	X12	Lack of attention to the opinions and suggestions of wtershed residents in different levels of the survey, planing and implementation of projects	9.82				
5	X16	Defects in the laws of natural resources exploitation by people	9.80				
6	X8	Lack of attention to local decision-makers in watershed planning	9.78				
7	X14	Lack of education of watershed residents regarding the projects and relevants goals	9.75				
8	X3	Low fiancial benefits for the local communities from the implemented projects	9.55	61	179.812	16	0.00
9	X17	Legal problems related to water right assignment in the areas of implementation of WMPs	9.41				
10	X5	Ethnic and local conflict	9.02				
11	X7	Land tenure security	8.59				
12	X11	Lack of attention to Non-Governmental Organizations (NGOs) in watershed manegment planning	8.49				
13	X6	Public mistrust about the benefits of projects	7.48				
14	X2	Late profitability of projects	7.38				
15	X15	Not using native promoters	7.28				
16	X13	Non-continuity of WMPs in the basin	5.95				
17	X4	Low level of literacy and awareness	4.96				

Prioritization of Factors Influencing People's ...

Table 9. Testing the agreement on the importance of people's participation barriers from the viewpoint of both groups by using tow-sample Kolmogorov-Smirnov method

Main component	Kolmogorov-Smirnov statistic	P-value	Sub component (Variable)	Symbol	Kolmogorov-Smirnov statistic	P-value
Economic	0.315	1.00	Ignoring people's income as a direct economic incentive	X1	0.985	0.286
			Late profitability of projects	X2	2.587	0.000
			Low fiancial benefits for the local communities from the implemented projects	X3	1.363	0.049
Social	0.961	0.314	Low level of literacy and awareness	X4	2.175	0.000
			Ethnic and local conflict	X5	1.203	0.111
			Public mistrust about the benefits of projects	X6	1.090	0.186
			Land tenure security	X7	1.345	0.054
Planning and implementation	0.856	0.456	Lack of attention to local decision-makers in watershed planning	X8	1.713	0.006
			Centralization of decision-making power in goverment organization	X9	1.605	0.012
			Lack of interest in regarding to provide the basis for working of native people in implementation of projects	X10	1.807	0.003
			Lack of attention to Non-Governmental Organizations (NGOs) in watershed manegment planning	X11	1.027	0.242
			Lack of attention to the opinions and suggestions of wtershed residents in different levels of the survey, planing and implementation of projects	X12	1.277	0.077
			Non-continuity of WMPs in the basin	X13	1.960	0.001
Educational and extension	0.770	0.594	Lack of education of watershed residents regarding the projects and relevants goals	X14	0.475	0.978
			Not using native promoters	X15	0.880	0.421
Legal	1.200	0.112	Defects in the laws of natural resources exploitation by people	X16	0.930	0.353
			Legal problems related to water right assignment in the areas of implementation of WMPs	X17	0.609	0.852

Therefore, it can be concluded that the difference of expert views can be different according to the conditions of the region and different reactions of the people. The results of Friedman's test for ranking the components affecting PNP from the point of view of local communities also have similarities and differences with the ranking based on expert opinions (Table 10). The experts of the province and the residents of Siyahposh basin have the same opinion regarding the factor of economic incentives, in other words, benefiting from material profit and earning money from participating in soil protection projects. As the experts and residents of this basin have put the economic factor as the first priority. According to the residents of Siyahposh basin, the weak factor in education and extension is similar to the opinion of experts and they consider it as one of the main factors in the reduction of PP in soil protection projects. Contrary to the opinion of experts, the residents of the basin have evaluated social factors as relatively important in the lack of public participation in projects. Contrary to the experts, the residents of Siyahposh basin

consider factors such as lack of knowledge about WMPs and their lack of trust in the positive results of these projects (social index) to be effective components in the lack of public participation. From the point of view of the experts, the sub-indices of "ignoring people's income as a direct economic incentive" and "non-continuity of WMPs in the basin" have the maximum and minimum importance in PNP, respectively. Such a result was also obtained in the studies of the Moradabad watershed of Meymand in the southwest of Fars province, Iran (Soleimanpour et al., 2019 and 2020).

Table 10. Comparing the priorities of the main component based on the opinions of experts and residents in the Siahposh basin

Rank	Local community	Experts
1	Economic	Economic
2	Educational and extension	Legal
3	Social	Educational and extension
4	Legal	Social
5	Planning and implementation	Planning and implementation

Residents of Siyahposh basin and experts have determined the sub-component of "ignoring people's income as a direct economic incentive" as the first factor of non-participation in WMPs. Salehpour Jam et al. (2017) have identified and introduced the sub-component "ignoring people's income as a direct economic incentive" as the first factor of the economic index that has caused PNP in natural resources projects overlooking the city of Tehran; that is in line with the results obtained regarding the opinion of experts and residents of Siyahposh basin in this research. The local communities of Bezijan Basin of Markazi Province, Iran, like the residents of Siyahposh basin, consider "ignoring the interests of watershed residents as a direct economic incentive" to be one of the main obstacles in public participation (Davudirad et al., 2021). The component of "low level of literacy and awareness" has been placed in 17 priorities based on the opinion of experts and residents of Siyahposh basin. Contrary to the results obtained from this research, Mohammadi Golrang et al. (2017), in a study conducted under the title of examining factors affecting the participation of users in pasture and WMPs in Razavi Khorasan, Iran, found

the component "low level of awareness of residents about WMPs" as the most important reason for the lack of public participation in these plans have been determined.

It should be noted that in the responses of the experts and residents of the basin, the lack of attention to the opinion of decision makers, promoters and the lack of use of native and local labor are mentioned as part of the important reasons for the lack of public participation in WMPs. This issue can be concluded from giving priority to the sub-components of "not paying attention to local decision-makers in watershed planning", "not using native promoters", "not paying attention to local forces in the implementation projects (creating employment)" and "centralization of decision-making power in goverment organization". The sub-component of "centralization of decision-making power in goverment organization" is ranked fourth and second from the point of view of the residents of Siyahposh basin. Ranking second and fourth of this sub-component indicates that the local communities of Siyuahposh basin are not involved in making decisions and this issue causes the lack of participation of residents in various stages of projects.

Salehpour Jam et al. (2017) also identified and introduced the sub-component "centralization of decision-making power in goverment organization" as one of the most important components that caused PNP in natural resources projects overlooking the city of Tehran, Iran, which is in line with the results of this research. The rank or relative importance of the sub-component "lack of attention to the opinions and suggestions of wtershed residents in different levels of the survey, planing and implementation of projects" from the point of view of the local communities of the Siyahposh basin is equal to 4, and has a large difference with the opinion of experts. According to experts, this sub-component has a priority of 16 and is not very important. The reason for this issue is not unrelated to the fact that local communities are less aware than experts regarding the amount of approved and allocated credits for basin projects. The experts believe that the lack of full allocation of executive credits at the appointed time will cause executive projects to remain half-finished and as a result create a

kind of lack of optimism towards watershed executive projects."Not paying attention to local decision-makers in watershed management planning" is placed in the sixth priority from the point of view of the residents of the Siyahposh basin, but according to the experts, it has little importance and is ranked in the fifteenth priority. The reason for this difference should be found in the compilation and design of basin projects by the Consulting Engineers Company, which probably designed and compiled projects for the basin without asking the residents of the basin, while the experts of the studied province believe that a survey was conducted among the watershed residents in this regard.

Although, based on the results of the statistical test, the order of obstacles to PP in WMPs is different and some sub-components are placed in the last priorities, but these results do not mean that these sub-components are unimportant, because the mere identification of them indicates their role in the lack of popular participation, and a low rank for a priority only indicates a lower relative importance compared to other sub-components identified in the basin.

4. Conclusion

Paying attention to increasing the income of the residents of the basin before implementing WMPs can be very effective in removing obstacles to public participation. Also, in the implementation of WMPs, the participation of local communities in the various stages of monitoring, studies, needs assessment, implementation, and maintenance can lead to the decentralization of decision-making power in the center and headquarters, and the grounds for gaining the trust of active participation and cooperation of the people in the aforementioned stages. Holding educational and extension meetings can be effective in increasing people's awareness of hidden goals and interests and finding plans and increase public participation. Also, the project implementers can prevent projects from being incomplete by staging the implementation of the projects and with more detailed planning in accordance with the actual credits of the projects and in order to increase the efficiency of the project. The results of the research show that some of the laws of exploitation of natural resources need to be revised and updated from the point of view of both expert groups and local communities.

• Conducting similar research in other basins of the province from the perspective of experts from executive bodies, research centers and also the opinions of local communities

• Providing conditions for the active participation of watershed residents in various stages of decision-making, design-implementation and maintenance and repair of projects.

• Local trustees, along with local officials and people's organizations, can play the role of local promoters for the people of the region, and by promoting the goals of the projects, they can provide the basis for attracting PP in the mentioned projects.

• Providing conditions for the employment of local forces and village people in the implementation of projects and creating some kind of employment for them.

• Holding training courses and classes with the aim of increasing information and knowledge of local communities with soil protection projects.

• Implementation of educational and extension programs in the meetings and also organizing soil conservation days.

• Providing the necessary suggestions to the relevant officials in order to correct the legal issues regarding the exploitation of individuals

• Suggesting to the managers and officials to establish the necessary conditions in order for the residents of the basin to benefit from the economic benefits of the projects.

5. Conflict of Interest

No potential conflict of interest was reported by the authors.

6. References
Adeoti, O. (2021). Barriers to mainstreaming gender in water resources management in Nigeria. *Water Science*, *35*(1), 127-134.

Adusumilli, N., & Wang, H. (2018). Analysis of soil management and water conservation practices adoption among crop and pasture farmers in humid-south of the United States. *International Soil and Water Conservation Research, 6*(2), 79–86.

Afrough, A., Mehrjerdi, M. Z., Amirtaimoori, S., Khalilabadi, H. R. M., & Baniasadi, M. (2018).

Identification and ranking of factors affecting lack of participation of local beneficiaries in management, preservation and reclamation of Lorestan oak forests. *Iranian Journal of Forest and Poplar Research*, *26*(3), 393–405.

Agidew, A.M. and Singh, K.N. (2018). Factors affecting farmers'participation in watershed management programs in the Northeastern highlands of Ethiopia: a case study in the Teleyayen sub-watershed. *Ecological Processes, 7*, 15, 1-15.

Apipoonyanon, C., Kuwornu, J. K., Szabo, S., & Shrestha, R. P. (2020). Factors influencing household participation in community forest management: evidence from Udon Thani Province, Thailand. *Journal of Sustainable Forestry*, *39*(2), 184-206.

Bagdi, G.L., Kurothe, R.S. (2014). People's participation in watershed management programmes: Evaluation study of Vidarbha region of Maharashtra in India. *International soil and water conservation research, 2*(3), 57-66.

Bagherian, R. (2013). Analyzing local community participation in watershed management programs in Iran. *Applied Science Reports*, *1*(3), 79-86.

Bagherian, R., Samah, B., Samah, A. A., & Ahmad, S. (2009). Factors influencing local people's participation in watershed management programs in Iran. *American-Eurasian J. Agric. & Environ. Sci*, *6*(5), 532-538.

Ballı, S., & Korukoğlu, S. (2009). Operating system selection using fuzzy AHP and TOPSIS methods. *Mathematical and Computational Applications*, *14*(2), 119-130.

Batáry, P., Dicks, L. V., Kleijn, D., & Sutherland, W. J. (2015). The role of agri‐environment schemes in conservation and environmental management. *Conservation Biology*, *29*(4), 1006-1016.

Bohnet, C.I., Roberts, B. Harding, E. & Haugm K.J. (2011). A typology of grazers to inform a more targeted approach for developing natural resource management policies and agricultural extension - programs programs. *Journal of land use policy, 28*(3), 629-637.

Catacutanb, D., & Duqueb, C. (2006). Challenges and opportunities in managing Philippine Watersheds: The case of Manupali watershed in the southern Philippines. In *Conference on Watershed Management in the Philippines, Don Mariano Marcos Memorial University, La Union, Philippines, 2006, May* (pp. 16-18).

Chen, J. (2020). *Evolution and water resources utilization of the Yangtze River*. Springer Singapore.

Clayton, A. (2005). Empowerment people: a guide for participation. Translated by Piroz Izadi. *Research Center Rural Issues, Tehran*.

Cochran, W. G. (1977). Sampling techniques. John Wiley & Sons., 428 pages.

Coulibaly-Lingani, P., Savadogo, P., Tigabu, M., & Oden, P. C. (2011). Factors influencing people's participation in the forest management program in Burkina Faso, West Africa. *Forest Policy and Economics*, *13*(4), 292-302.

Davudirad, A., Salehpou Jam, A., Najmi, M., & Akhondi, O. (2021). Identifying and prioritizing effective factors in preventing participation of rural societies in WMPs: A Case study of Bozijan Watershed, Markazi province, Iran. *Desert Ecosystem Engineering*, *10*(30), 52-64.

Decker, S. E., & Bath, A. J. (2010). Public versus expert opinions regarding public involvement processes used in resource and wildlife management. *Conservation Letters*, *3*(6), 425-434.

Dodds, R. (2020). Using a participatory integrated watershed management approach for tourism. *Tourism Planning & Development*, *17*(1), 1-16.

Dolisca, F., Carter, D. R., McDaniel, J. M., Shannon, D. A., & Jolly, C. M. (2006). Factors influencing farmers' participation in forestry management programs: A case study from Haiti. *Forest ecology and management*, *236*(2-3), 324-331.

Duram, L. A., & Brown, K. G. (1999). Insights and applications assessing public participation in US watershed planning initiatives. *Society & Natural Resources*, *12*(5), 455-467.

Elyasi, A., Shahedi, K., & Rastgar, S. (2018). Effective factors on stakeholders' willingness to participate at WMPs in hezarkhani watershed. *Watershed Management Research*, *8*(16), 259-270.

Eskandari-Damaneh, H., Noroozi, H., Ghoochani, O. M., Taheri-Reykandeh, E., & Cotton, M. (2020). Evaluating rural participation in wetland management: A contingent valuation analysis of the set-aside policy in Iran. *Science of the Total Environment*, *747*, 141127.

Farajollahi, A., Islami, I., & Karimi Sangchini E. (2021). Participation of local communities in WMPs of Ziarat Watershed, Golestan. 10th international Conference on Rainwater Catchment Systems, University of Kurdistan, 24 And 25 November 2021, 9 pages.

Feiznia, S., Jam, A. S., & Kianian, M. K. (2006). Investigation of preventing factors affecting on people participation in natural resources plans (Case study: Roude Shoor Watershed Area). *Journal of Mountainous Environment*, *6*(1), 12-26.

Gebretsadik, T., & Debara, M. (2017).

Assessment of knowledge, attitude and practice of the local community on watershed management at Kindo Koysha Woreda of Wolayta zone, Southern Ethiopia. *International Journal of Agriculture*, *2*(1), 1-17.

George, D., & Mallery, P. (1999). SPSS for windows step by step: a simple guide and reference. *Contemporary Psychology*, *44*, 100-100.

Ghorbani, A., Kavianpoor, A., & Dabiri, R. (2015). Effect of social characteristics of beneficiaries on their participation in watershed cooperatives (Case study: cooperative of Saghezchi-Chaei watershed of Ardabil province). *Natural Ecosystems of Iran*, *6*(3), 59-74.

Habibzadeh, M. (2016) Evaluation of the effects of water management activities carried out in the Siyahposh watershed of Ardabil. *3rd Iranian Scientific Research Congress on Development and Promotion of Agricultural Sciences, Natural Resources and Environment ,* 12 September 2016, Tehran-Iran, 11 pages.

Hore, K., Gaillard, J. C., Davies, T., & Kearns, R. (2020). People's participation in disaster-risk reduction: recentering power. *Natural hazards review*, *21*(2), 04020009.

Johnson, N., Ravnborg, H.M., Westermann, O., & Probst, K. (2002). User participation in watershed management and research. *Water policy, 3*(6), 507-520.

Karimi, K., & Karami Dehkordi, I. (2016). Participation of rural users in pasture management plans and the factors effective on them in Mahneshan Township. *Geography and Development*, *14*(45), 181-196.

Lise, W. (2000). Factors influencing people's participation in forest management in India. *Ecological economics*, *34*(3), 379-392.

Mango, N., Makate, C., Tamene, L., Mponela, P., & Ndengu, G. (2017). Awareness and adoption of land, soil and water conservation practices in the Chinyanja Triangle, Southern Africa. *International Soil and Water Conservation Research, 5*(2), 122-129.

Mansourfar, K. (2018). Advanced methods of statistics with computer programs, University of Tehran Press, Tehran. 394 pages.

Mansouri, A., Salehpour Jam, A., Mohammadi, M., & Kianian, M.K. (2016). Investigation and Prioritizing Preventing Factors of People Participation in Natural Resources Plans (Case Study: Kan Watershed Area, Tehran, Iran). *2th National Conference on Conservation of Natural Resources and Environment, University of Mohaghegh Ardabili, Ardabil.*

Mehrdoust, K., Shams, A., & Dehkordi, E. K.

(2014). Effective factors on rural people participation in WMPs (case study: Dorod Faraman & LalAbad Basin, Kermanshah Province). *Iranian Journal of Agricultural Economics and Development Research (IJAEDR)*, *44*(3). 399–409.

Mengistu, F., & Assefa, E. (2020). Towards sustaining watershed management practices in Ethiopia: a synthesis of local perception, community participation, adoption and livelihoods. *Environmental Science and Policy, 112*, 414–430.

Micha, E., Roberts, W., Ryan, M., O'Donoghue, C., & Daly, K. (2018). A participatory approach for comparing stakeholders' evaluation of P loss mitigation options in a high ecological status river catchment. *Environmental science & policy*, *84*, 41-51.

Miller, K.K., & McGee, C.T.K. (2001). Toward incorporating human dimensions information into wildlife management decision-making. *Human Dimensions of Wildlife, 6*, 205–221.

Mohammadi Golrang, B., Lai, F. S., & Sadeghi, S. H. R. (2017). Evaluation of variables affecting people's participation in soil pasture and WMPs (Case study: Kouskabad Watershed in Khorasan Razavi). *Journal of Research and Rural Planning*, *6*(1), 49-68.

Mosaffaie, J., & Salehpour Jam, A. (2021). Prioritization of factors preventing participation of rural people in soil & water conservation projects (The case of Vers watershed). *Journal of Agricultural Science and Technology (JAST), 23*(5), 975-986.

Mosaffaie, J., Nikkami, D., & Salehpour Jam, A. (2019). Watershed management in Iran: History, evolution and future needs. *Watershed Engineering and Management*, *11*(2), 283-300.

Mosaffaie, J., Salehpour Jam, A., Tabatabaee, M.R., Sarfaraz, F., Soltani, M.J., & Noroozi, K. (2017). Prioritization of effective factors on preventing sustainable participation of rural societies in watershed management plans of Qazvin province. *Soil Conserv. Watershed Manag. Res. Inst, 79*.

Mousaei, M., Malek Mohammadi, I., Farjolla Hosayni, S.J., & Mirdamadi, S.M. (2010). Effective factors for participation of stakeholders in watershed management project from the view point of natural resources and watershed management extension specialist, in Fars province, Iran. *Journal of crop ecophysiology (agriculture science), 4*(1), 127-139.

Perkins, P. E. E. (2011). Public participation in watershed management: International practices for inclusiveness. *Physics and Chemistry of the Earth, Parts A/B/C*, *36*(5-6), 204-212.

Powlen Kathryn, A., & Jones Kelly, W. (2019). Identifying the determinants of and barriers to landowner participation in reforestation in Costa Rica. *Land Use Policy, 84*, 216-225.

Rahemh Ardakani, A., Esmaeilpour, Y., Mohammadi, Y., & Gholami, H. (2018). Factor Analysis of Obstacles to the Local Communities Participation in the Biological Restoration and Desertification Plans of Carbon Sequestration Project in the Lapui County, Fars Province. *Watershed Management Research Journal, 31*(2), 27-40.

Rezaei, R., Vedadi, E., & Mehrdoost, K. (2012). Studying the effective factors on participation of rural people in watershed plans of khomarak basin (Case study: Deh Jalal village). *Journal of Rural Research, 3*(9), 199-221.

Saaty, T. (1980). The Analytical Hierarchy process: planning, priority, Resource Allocation. Mcgraw-Hill, New York., USA.

Salehpour Jam, A., Mosaffaie, J., & Tabatabaei, M. R. (2021). Assessment of comprehensiveness of soil conservation measures using the DPSIR framework. *Environmental Monitoring and Assessment, 193*(1), 42, 1-19.

Salehpour Jam, A., Rasooli, F., Sarreshtehdari, A., Mosaffaie, J., & Kianian, M. K. (2020). Prioritization of preventing social indices affecting on peoples' participation in natural resources plans using AHP method and nonparametric tests. *Watershed Engineering and Management, 12*(1), 330-339.

Salehpour Jam, A., Sarreshtehdari, A., & Tabatabaei, M. (2017). Prioritizing preventing factors affecting on stakeholders' participation in watershed plans based on experts' idea, case study: watershed area surrounding city of Tehran. *Watershed Engineering and Management, 9*(4), 441-450.

Salehpour Jam, A., Tabatabaei, M.R., Mosaffaie, J., Soltani, M.J., & Shadmani, A. (2022). Barriers to participatory implementation of soil conservation projects: Perspectives and priorities. *Environmental Science and Policy, 131*, 36–45.

Samanta, R. K., & Jana, N. C. (2020). The role of participation of people in watershed management–a study from Ausgram Block–II of Bardhhaman district, west Bengal. *Studies in Indian Place Names*, 40(70), 4043-4054.

Savari, M., & Almasieh, K. (2023). Analyzing the Barriers of Participation of Local Communities in Natural Resources Projects to Deal with Dust in Khuzestan Province. *Environmental Researches, 13*(26), 281-300.

Savari, M., Eskandari Damaneh, H., & Eskandari Damaneh, H. (2020). Factors influencing local people's participation in

sustainable forest management. *Arabian Journal of Geosciences*, 13, 1-13.

Schusler, T.M., Decker, D.J., & Pfeffer, M.J. (2003). Social learning for collaborative natural resource management. *Society and Natural Resources, 16*(4), 309–326.

Shamsoddini, S., Emami, S. N., & Bahmani, S. (2020). Investigation of effective factors on rural participation in watershed management operations in Monj-Bideleh Basin of Lordegan. *Watershed Engineering and Management, 12*(1), 166-176.

Sharma, C., Sisodia, S. (2016). Peoples' participation in watershed development programme: a case study of Rajasthan. *Indian Res. J. Ext. Educ., 8*, 71–72.

Singleton, S., & Taylor, M. (1992). Common property, collective action and community. *Journal of Theoretical Politics*, 4(3), 309-324.

Soleimanpour, S., Hosseini Marandi, H., Salehpour Jam, A., Tabatabaei, M., Rousta, M., & Keshavarzi, H. (2019a). Prioritizing the Affecting Factors on Nonparticipation of Rural Communities in WMPs from a Stakeholders Viewpoint (Case Study: Gheshlagh Watershed, Fars Province). *Extension and Development of Watershed Management, 7*(27), 64-74.

Soleimanpour, S.M., Ghahari, G.R., Salehpour Jam, A., Tabatabaei, M.R., & Hedayatfard, M. (2021). Prioritization of factors affecting the non-participation of exploiters in WMPs (Case Study: Chikan and Morzian Watershed of Sepidan, Fars Province). *Journal of Geographic Space, 21*(73), 87-102.

Soleimanpour, S.M., Salehpour jam, A., Noroozi, A., Khalili, N., & Keshavarzi, H. (2019b). Experts Viewpoints on Prioritizing Factors Affecting Lack of Sustainable Participation of Rural Communities in WMPs on the Moradabad Watershed, Meymand the Province of Fars. *Watershed Management Researches (Pajouhesh-va-Sazandegi), 32*(3 (124), 53-62.

Soleimanpour, S.M., SalehpourJam, A., Noroozi, A.A., & Khalili, N. (2020). Investigation of Stakeholders in Prioritizing Factors Affecting Their Poor Participation in WMPs (Case Study: Morad Abad Watershed in Meymand, Fars Province). *Journal of Range and Watershed Managment, 72*(4), 979-994.

Statistical Centre of Iran, (2016). 8th National Population and Housing Census. Vice Presidency Plan and Budget Organization Statistical Centre of Iran, http://data.roostanet.com

Sultana, F. (2009). Community and participation in water resources management: gendering and naturing development debates from Bangladesh. *Transactions of the Institute of British Geographers*, 34(3), 346-363.

Talaei, R., & Beyrami, B.A. (2019). Prioritization of Effective Factors on Preventing Sustainable Participation of Rural Societies in Watershed Management Plans Case Study: Siyahposh basin in Ardebil Province. Final report of research project, Ministry of Agriculture-Jahad, Agricultural Research, Education and Extension Organization, Soil Conservation and Watershed Management Research Institute, Ardabil Agriculture and Natural Resources Research and Education Center, 61 pages.

Tenge, A., De Graaff, J., & Hella, J. (2004). Social and economic factors affecting the adoption of soil and water conservation in West Usambara highlands, Tanzania. *Land Degradation and Development, 15*(2), 99 – 114.

Tomićević, J., Shannon, M. A., & Milovanović, M. (2010). Socio-economic impacts on the attitudes towards conservation of natural resources: Case study from Serbia. *Forest policy and economics*, *12*(3), 157-162.

Wąs, A., Malak-Rawlikowska, A., Zavalloni, M., Viaggi, D., Kobus, P., & Sulewski, P. (2021). In search of factors determining the participation of farmers in agri-environmental schemes – does only money matter in Poland? *Land Use Policy, 101*, 105190.

Wehn, U., & Almomani, A. (2019). Incentives and barriers for participation in community-based environmental monitoring and information systems: A critical analysis and integration of the literature. *Environmental Science & Policy*, *101*, 341-357.

Welu, G., & Solomon, T. (2015). Perception of local community towards soil and water conservation in the case of Damote Boloso Kebele, Damote Gale Woreda, Wolaita zone. *Journal of Biology, Agriculture and Healthcare, 5*, 149–155.

Yaghmaieyan, N., Asadi, H., & Rezaie, S. (2017). Mapping and Assessment of Land Degradation Risk using MEDALUS Model in Siyahpoush Watershed, Ardabil Province. *Journal of Water and Soil Conservation, 24*(1), 173-187.