



4th Intercontinental Geoinformation Days

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Land use change forest scenarios on the Horizon 2025

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Keywords

Scenario Wizard
Key factors
MICMAC
Land Change Use
Forest Fandoqho

Abstract

The purpose of this research is to identify the key factors affecting the land use that changes in the forest area of Fandoqho. At the beginning of the research, 19 factors are designed in forest that use in various economic, social, natural and political dimensions in a 19-19th dimension questionnaire and provided experts to weigh from numbers 3 to 0, with three highlights. The effect and effectiveness of variables were analyzed directly and indirectly in MICMAC software. Finally, eight effective factors were determined in changing the forest use of the Fandoqho area. At last, among the key factors of land use, distance from the village and population, cutting and harvesting, vegetation, motivation for agriculture to residential and height are the most important key factors in the future of the region's system. after that with the opinion of experts and solutions were designed in three favorable, static and critical spectrum. and after the final confirmation a questionnaire was designed and re-addressed to the research experts, which was used to weigh the numeric between 3- and 3+ Used, and finally the results were entered into the wizard scenario software and the result was obtained in three spectres, 2 favorable scenarios to strong scenarios 5 scenarios and 275 poor scenarios, and ultimately scenarios are achieved as favorable scenarios in three rating spectres Of these, seven scenarios were selected as the most desirable scenario for planning for the future of forest use and in line with its protection.

1. Introduction

Forest is one of the most important and valuable natural resources that is urgent in the world for environmental balance (Bell 2003). Deforestation, especially in developing countries, is the largest threats for biodiversity protection from carbon watershed and storage (Kramer et al. 2004; Hansen et al. 2013). The reasons for deforestation come from several local stimuli and regional scales related to human population for example growth, politics, technology, and cultural norms (Hesenama 2002; Gist and Lambin 2005). the differences are the result of interaction in space and time in human and biological-physical dimensions. Therefore, it also has works on natural and social land (Veldkamp and Verburg 2004). Land use changes are mainly influenced by large scale factors such as global economy and climate issues, and issues such as demographic changes and local policies, along with the factors, have a decisive role (Geist and Lambin. 2006). And including climate change, water and soil and the loss of environmental diversity, which is

the largest concern of today's population. Therefore, the management and monitoring of the negative consequences of changing land coverage for the continuation of essential resources production has become an important issue. Performing land use researchers for researchers and politicians around the world over time is very necessary (Mishra 2014; Li 2011). In a dynamic space system, by changing the forces and stimulus processes, another challenge is that the design of integrated systems to deal with uncertainty about the future process that has no historical background is a constant challenge to create models that are directly planned to plan. And environmental management is related to (Paegelowa 2013). One of the right tools of the future architecture in terms of uncertainty and in terms of our world is full of surprises of various instruments is the scenario planning. Scenario planning is a method for future paradigms that have been developed in response to the main challenges of the present age, such as the instability of the future environment, the presence of magnes and the future of

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Cite this study

Sadeghni, M., Kamran, K. V., Hejazi, S. A. (2022). Land use change forest scenarios on the Horizon 2025. 4th Intercontinental Geoinformation Days (IGD), 139-146, Tabriz, Iran

deep uncertainties (Volkery 2009). Futurist futures is an appropriately approach to defining strategic development priorities that are systematically discovered by combining elements .2012 Weber). One of the most common means of futurism is to climb by entering the arena of a cytological approach from the 1960s. Theodore Gordon and Alfa Helmar also raised the analysis of structural effects, interactions in 1966 and an analysis of the interactive structural effects method for analyzing the probability of occurrence of a subject in a set forecast. The probabilities of this issue can be adjusted with judgments of the potential interaction between the subject, with the judgments of the potential, the interaction between the predicted issues. Planning based on scenario is a systematic way for creative thinking about uncertain future and possible (Peterson, 2003). The purpose of this scenario is based on the probable future and purpose of making scenarios, reveal the dominant trends. and possible data rupture is the competitive environment of the future (Goodet et al. 2008). (1994 Gordon). In their research examined the factors affecting the urban future and economic factors of social impact on deforestation (Benzhaf and Lowry 2010) in an article entitled Can Land Taxes Prevent Distribution? Using demographic data and land use information and examines the Pennsylvania city pattern those taxes can reduce land. Taghi Lou (2018) examines the changing scenarios of rural areas of Qala-e-Dehstan-Urmia with the aim of determining land use change scenarios. Mick Mac software and Scenario Wizard software were used to analyze the data. Lands were in that place.

Rostami Kia and Sharifi (2017) examined the causes of Fandoghlo Forest's change in the world's largest forest storage, and the conversion of forest and rangelands into agriculture, deliberate and unusual fire and cutting of trees from the main factors influencing the destruction of the forest of Fonaxel they said. 1399, Mozghan Arasteh et al), with the futures approach to identifying the status of the metropolitan resilience system of Mashhad with a futuristic method with MICMAC and SCENARIO WIZARD software, identifying key factors and analyzing Mashhad metropolitan patterns. According to studies, further use of future research methods with urban issues has not been associated with environmental planning and research forest which is considered to be a research innovation. This research aims to identify the factors affecting the change in forest use of Fandoghlo and the analysis of the probable status of forest jungle changes in the wizard scenario in 2025.

2. Method

2.1. Study area

The studied area is the tropical trail of tropical forests of Guilan province, located 25 kilometers northeast of Ardebil city to Astara and 10 km from the city. The study area is 1322 to 2345 meters in terms of height from sea level. Fadoghlo Ardabil Forest in Geographical Coordinates 38° 29' 4.70" Up to 38° 9' 16.75" North Width and 48° 40' 32.55" E up to 48° 32' 84" Has been placed. The area of the study area

179/3288 Kilometer. It is 32 kilometers from its area (Valizadeh Kamran et al, 2021).

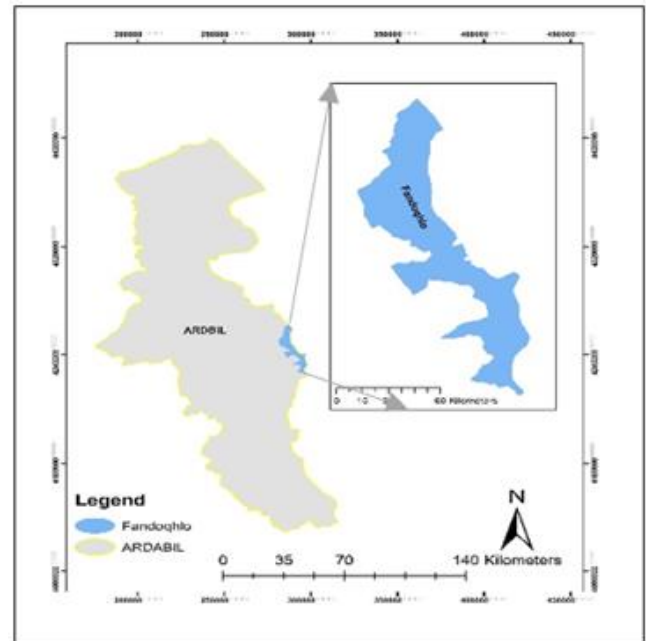


Figure 1. Study area

2.2. Data used

The data used in the present study is descriptive in terms of purpose, user of nature. The necessary information was collected based on the nature of the research in two libraries and questionnaires. To collect data and identify the initial variables. after examining the various studies of decorated and colleagues, 1399 on average, with 30 questionnaires in Among specialists, the average results of about 20 completed questionnaires in Mac MIC software (structural analysis of the severity of influence and relationships that exist between factors. In the next round, the Delphi method of the questionnaire was designed in the form of structural analysis. those were experts and a slight weight between zero and three, which is zero as a non-impact, three with high impact, two and one, with moderate and low impact, which occurs on average with 30 questionnaires among specialists. The mean results from about 20 questionnaires completed by experienced professors specializing in this field, the factors of the Organization of Natural Resources and Watershed of Ardabil and the city of Namin, PhD students and Masters in MICMAC software (structural analysis) are severely influenced and relationships between There are factors and factors that have high impact were extracted as key factors.

In the next step, after identifying key factors, by importing them in the Scenario Wizard software, system-compatible scenarios in a range of the most desirable conditions may be presented within the framework of the moderate, desirable and disaster scenarios.

3. Results

3.1. Justifiability Stability analysis

In the previous stages, with the average examination of expert theories, the results for extracting key

propellers entered the Mick Mac software based on the number of input matrix input variables 19*19, with the results of matrix stability in Table (1) it has been shown. The degree of desirability and optimization of the 96% impact matrix\r and 99% and the impact is 98% and 100%.

Table 1. Results of the direct effects of the Mick Mac matrix

Ingredient	Number
Dimension matrix	19
Number of Iteration	2
Number of 1	36
Number of 0	114
Number of 1	130
Number of 2	81
Number of all	325
Percent of Fill Homes	90

3.2. Indirect Impact and Impact Assessment (MDI) Evaluation Results (MII)

The relationships between variables in MICMAC software provide two types of graphs and analyzes, one direct impact and other indirect effects on each other. The dispersion analysis of variables is based on direct and indirect effects. The dispersion of variables around the influence-effectiveness indicates the status of the system because in stable devices and the role of each of the factors is clear; But in unstable systems, the situation is complex and variables are distributed around the diagonal axis. Due to the dispersion of variables in Figure (1), the system of the study area was considered unstable system (figure on the right).

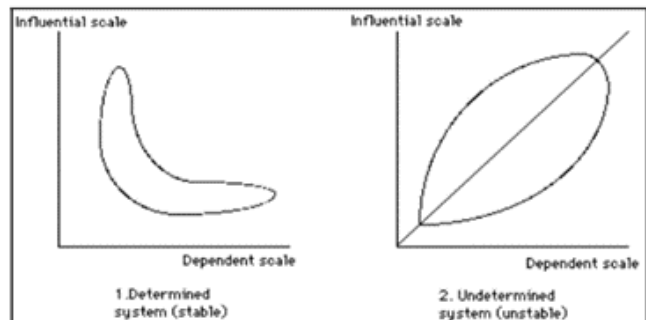


Figure 2. the shape of the unstable system key factors affecting forest land use change in Fandoqhlo region

3.3. Before situations for key factors

Previous situations for general factors in the previous stage were determined using a structural analysis method in Mac software software. Out of the total 19 primary factors influencing the future of the use of the forest area of the forest area, 8 factors were selected as key factors, but at this stage, research scenarios should determine the first step in defining probable situations; Therefore, with theoretical studies on each of these factors and also the opinion of experts for each of these key factors, three conditions in the desired, neutral and

undesirable spectra were defined. It is the change of use of the forest. Possible situations for each factor are different from other factors and the only common feature between them is the existence of a range of favorable to unfavorable situations. is the situation in front of each of the key drivers of possible situations for screenwriting (Table 2).

Table 2. Results of the key facture

Row	Variable	Direct (MDI)	Variable	Indirect (MI)
1	land use	696	land use	745
2	Herbaceous covering	680	Herbaceous covering	648
3	Visitor	538	Number of the households (population)	632
4	Motivation to change from agricultural to residential	583	slop	599
5	Village of Space	567	Fire point	538
6	Outage and Removal	567	slop	551
7	Number of households (population)	551	Number of households (population)	551
8	High	534	Variable	534

After analyzing the analysis of the structural analysis of the results, there are eight key factors in three different situations: he proper solution for each of the situations was collected in a questionnaire of experts. The questionnaire was designed and available to experts. Experts with the plan that if any of the 24 situations occur, what impact does it affect? To complete the weighted questionnaire between 3 and 3, the effect of each situation on the system identified the system. Finally, the results of analysis were analyzed and accompanied by probable determinants entered the Scenario Wizard software. Results from analyzing analysis in scenario software.

3.4. The results of the analysis in the scenario software

In general, the results of analysis are subject to 3 scenario categories: a) Strong scenarios: 5, B) Baccaladic scenarios or high compatibility scenarios: 27 and c) Weak scenarios: 275.

3.5. How to categorize scenarios

The nature of the software scenario software is its nature as the dimensions. In these meanings, it seems reasonable and between strong limited scenarios and poor scenarios are, scenarios with compatibility one. The distance in a fact is the expansion of strong scenarios as a unit towards weak scenarios.

Table 2. Results of the key facture

Key factors	of possible situations
Land use(a)	Favourable : Coordination of organizations and government agencies not to issue any permits for land use change Static : Preserving current landscapes Undesirable and critical: Lack of monitoring and unprincipled use of applications
Herbaceous covering (b)	Favourable : Cut down dried trees and rehabilitate them by planting Static: Maintain the status quo Undesirable and critical: Inability to manage crisis in the region (such as fire)
Visitor (c)	Favourable: planning to develop and preserve the natural landscape Static : Continuation of the current situation Undesirable and critical: development of recreational facilities without ecotourism empowerment
Motivation to change from agricultural to residential (d)	Favourable: Establishment of production workshops and greenhouses with the cooperation of local people and under the supervision of Jihad Keshavarzi Static: if necessary and with minimal environmental degradation Undesirable and critical: selling to local investors (non-permanent residents) and non-locals due to financial needs of residents
Outage and Removal (e)	Favourable felling and harvesting: Cutting down dried trees and planting and rehabilitating by planting Static : Creating integrated agriculture Undesirable and critical : cutting down forest trees for agricultural development
Height (f)	Favourable : protection of vegetation and trees of the slopes and its non-plowing Static : Optimal use of environmental capabilities for optimal production Undesirable and critical: Destruction by overgrazing of slopes
Village of distance (g)	Favourable Determine the buffer or privacy for the development of the village and determine the pattern appropriate to the environment Static Support plans for the livelihood of local people and reducing the pressure of destruction Undesirable and critical development of the village into forested areas
Number of households (population)(h)	Favourable : Failure to issue a construction permit for a non-resident population Static : : Continuation of normal growth process Undesirable and critical : Lack of supervision and neglect of village development

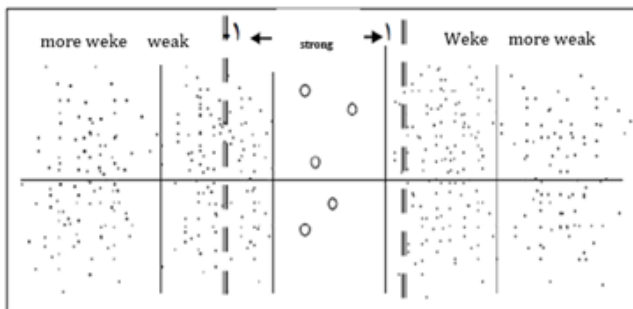


Figure 3. How to select compatibility scenarios 1 from a multitude of scenarios (Zali 2009).

Strong scenarios derived from the scenario of Wizard based on this feature, the possibility of increasing the domain of strong scenarios may be possible and therefore with a unit of increase that the standard unit increases this domain based on the software is 23 logical scenarios for planning and policy was obtained.

Analysis of selected and probable scenarios for the future of the forest use of the Fandoghlo Ardabil region that according to the previous explanation of 27 scenarios, as the most probable scenario for the future of the Change Forest District, was evaluated by wizard scenario software. These scenarios are also derived from the occurrence between the status of each of the factors in relation to the status of each factor that the occurrence of a situation on the probability of occurrence by strengthening and empowering other situations or even limiting other situations. The impact can have the main base of the formation on scenarios that require the same time as they are known the scenario table. The possible

situations clearly show the scenario and the key factor to facilitate understanding of the scenario and weight conditions. The desired and undesirable page of this page was divided into three situations based on key factors status and defined by specified colors.

Table 4. Defining the concept of colors, numbers and situations on the scenario page

Feature	status	color	rating
Optimal approach in order to protect the process of forest land use change	Optimal	green	+3
approach Continue the current trend	static	yellow	1
Critical and undesirable approach in order to protect forest land use change	Critical and undesirable	red	-3

3.6. Poor scenarios

24 * 24 cross matrix obtained in 275 scenarios. These scenarios, which are unlikely to occur, were not logical to analyze, and a large number of them were omitted from their analysis. Analysis of high compatibility scenarios (believable scenarios).

3.7. Scenarios analysis whit Strong Adaptability

Analysis of data related to different situations with the advanced scenario software has evaluated the probability of occurrence of 27 scenarios more than other scenarios. These scenarios are interconnected between the status of each of the factors associated with the status of each of the factors are no longer extracted that happening The situation on the likelihood of occurrence or strengthening and empowering other situations, or even limiting other situations that can be the main base of the formation of scenarios, which requires simultaneous factors and complex situations that can be analyzed from mind and the human ability is out and only smart processors are able to analyze their simultaneously. According to the previous explanation of 27 scenarios as the most probable scenario for the future of changing, the forest area is evaluated by Vizard Scenario Software as you seen clearly depending on the scenario and key factor Gives to facilitate understanding of the scenario page and Weight of favorable and undesirable conditions on this page statements of key factors to three situations as described the following was divided and defined with specific colors. Results from the analysis of wizard scenario provided that a combination of purposes especially static and desirable situations in scenarios. In general, 216 situations for 27 scenarios have been identified that 89 of these 216 cases are defined in favorable condition, which form 41% of these scenarios. 116 cases and status of 27 scenarios based on the number of replicates of the 3 spectra for each static status scenario with 46% scenarios. They have had an undesirable scenario of 26 cases with 12 percent of scenarios, which figure 4 also shows the frequency of scenarios status.

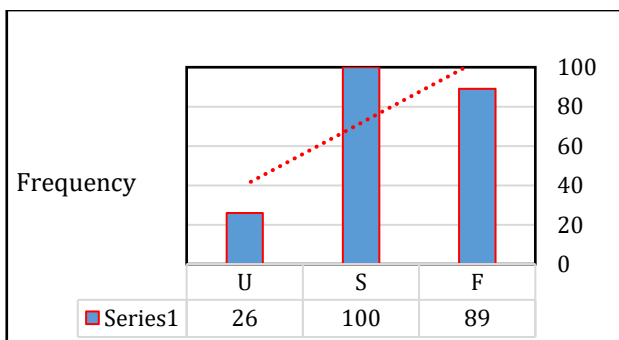


Figure 4. Graphic representation of the frequency of each of the three optimal, static, and critical states

Table 5. Scenario status table guide

Static	Unfavorable	Favorable
S	U	F

Prioritizing each scenario according to the results of Table 4-31 based on the number of each situation is calculated compared to the numerical sum of eight key factors with multiplication of 100 and the status of each scenario is marked with the star sign. According to the results of the first, second and sixth scenarios and Tajiri scenarios. The desired process of the future in line with the forest changes in the area of the Fandoghlo (Namin) region shows that the scenario results are not quite

optimal and 100%, but 75% are acceptable for the desirability of a scenario, and this is the reason for the score of the scenario, but the scenario 21 quite static and there is not any good or bad feature.

Table 7. Determine the status of each scenario based on the triple spectrum

scenario	a	b	c	d	e	f	g	h
s1	F	S	F	F	F	U	F	F
S2	F	S	F	F	S	U	F	F
S3	F	S	F	S	S	U	F	F
S4	S	S	F	S	S	U	F	F
S5	F	S	F	S	S	S	F	F
S6	F	S	F	F	S	S	F	F
S7	F	S	F	S	S	S	F	F
S8	S	S	F	S	S	S	F	F
S9	F	S	F	S	S	U	S	F
S10	F	S	F	S	S	U	S	F
S11	F	S	F	S	S	U	S	F
S12	F	S	F	S	S	S	S	F
S13	S	S	F	S	S	S	S	F
S14	S	S	F	S	S	U	S	F
S15	F	S	F	F	S	S	F	S
S16	F	S	S	F	S	S	F	S
S17	S	S	S	F	S	S	F	S
S18	S	S	F	S	S	S	F	S
S19	S	S	F	S	S	S	F	S
S20	S	S	S	S	S	S	F	S
S21	S	S	S	S	S	S	S	S
S22	S	S	S	F	S	S	S	S
S23	S	S	S	F	S	S	S	S
S24	S	U	S	F	S	U	S	S
S25	S	U	S	F	S	U	S	S
S26	S	S	S	F	S	U	S	S
S27	U	U	U	U	U	U	U	U

Table 7. Determining the optimal, static and critical states in each scenario

Scenario number	Frequency situation for each scenario			Percent			Situation final		
	F	S	U	F	S	U	F	S	U
s1	6	1	1	75	13	13	*	-	-
S2	6	1	1	75	25	13	*	-	-
S3	4	3	1	50	38	13	*	*	-
S4	3	4	1	38	50	13	-	*	-
S5	4	4	0	50	50	0	*	*	-
S6	5	3	0	63	38	0	*	-	-
S7	4	4	0	50	50	0	*	*	-
S8	3	5	0	38	38	0	-	*	-
S9	3	4	1	38	50	13	-	*	-
S10	3	4	1	38	50	13	-	*	-
S11	3	4	1	38	50	13	-	*	-
S12	3	5	0	38	63	0	-	*	-
S13	2	6	0	25	75	0	-	*	-
S14	2	5	1	25	63	13	-	*	-
S15	4	3	1	50	38	13	*	*	-
S16	4	4	0	50	50	0	*	*	-
S17	2	6	0	25	75	0	-	*	-
S18	2	6	0	25	75	0	-	*	-
S19	2	6	0	25	75	0	-	*	-
S20	1	7	0	13	88	0	-	*	-
S21	0	8	0	0	100	0	-	*	-
S22	1	7	0	13	88	0	-	*	-
S23	1	7	0	13	88	0	-	*	-
S24	1	7	0	13	88	0	-	*	-
S25	1	5	2	13	63	13	-	*	-
S26	1	6	1	13	75	13	-	*	-
S27	0	0	8	0	0	10	-	-	*

The desired future trend in integrate changes forest user changes. They are quite desirable and 100% in the scenario results is not observed, but 75 percent for the desirability of the scenario is acceptable and this is the reason for the score of the scenario shows, but 21 scenarios are completely static and there is no desirable and negative feature, and scenario 27 that all its features are in critical state and 100% will occur in the event of destruction and change. In general, it can be concluded. Most scenarios obtained to manage stable user change the forest of the Fandoghlo area is in the middle. This indicates that in the planning area and there is no coherence. Sustainability conditions of the area with attention to the rapid changes today in all areas of existence it can cause an incorrect action become the critical situation of the region and if attention and systematic planning in the desired status area to see acceptance.

3.8. Grouping and scenario analysis

Grouping and analyzing scenarios a total of 27 incredible scenarios can be divided into three groups according to Table (7), each of which groups with several scenarios almost common features and Low difference in one or more situations of 8 key factors are that these groups are as follows desirable

Favorable scenario: including first, second and sixth scenarios. It is almost identical in terms of rank lack of licensing to change applications, planning sustainable development of tourism and protection natural landscapes of the region, determining the privacy for the future development of the village proportional to the environment returns of agricultural lands around villages, lack of Issuing construction permits for non-resident population permanent, creating workshops and total manufacturing homes with with the collaboration of local people and agricultural jihad, increasing coordination between local people and organizations, creating integrated agriculture and increasing interest but preventing agricultural production and destruction Forest, optimal use of environmental resources for optimal production and change of use if necessary.

Static scenarios: all three to 26 scenarios except sixth scenario that is desirable and has features natural population growth, coordination of organizations and governmental organs of not being licensed for changing user, determining the privacy and future growth pattern fits the environment, continue the current trend, planning for sustainable tourism development, land use change in the event of necessity and with the minimum destruction of the environment integrated agriculture and cutting harvesting of tree, bushes near the forest development of culture protection vegetation covering area of forest trees and vegetation of slopes and lack of plowing it cut off dry trees and resuscitation with seedlings, lack of supervision and disregard to the development of the village and there is too much sliver and the development of the village into the forest areas.

Undesirable and critical scenario: where 27 scenario That's all the negative elements. they cutting the trees Forest and digging tree plants for development agricultural land and inability to organizations in district crisis management, forest destruction and loss of vegetation and agriculture region of non-monitoring or disregard to the development of the village, too much sliver and the development of the village into the forest areas.

These three groups represent the overall trend framework forest changes status for the horizon of 2025 in the study area.

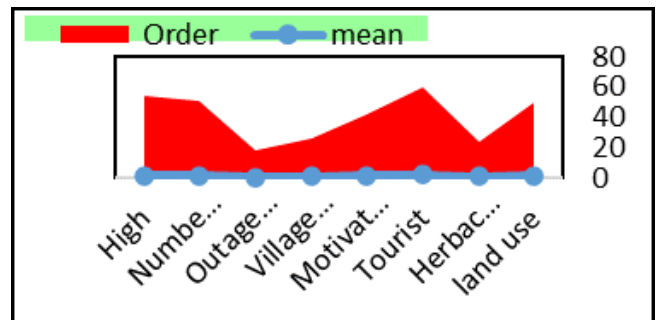


Figure 6. The importance of key factors in the composition of scenarios

Table 8. Ranking of key factors based on the triple status of 27 scenarios

Situation key factor in 27 scenario	Mean	Key factor
47	1/6	land use
21	0/7	Herbaceous Covering
57	1/9	Tourist
39	1/3	Motivation to change from agricultural to residential
23	0/8	Village of Space
15	0/5	Outage and Removal
48	1/6	Number of households (population)
51	1/7	High

According to the results of Table (8) key tourist factors, households, distance the village and land use were identified as the most influential or golden factors in the process of forest use change in the horizon of 2025. In fact, the sustainable future of forest use change depends on how these factors are managed and planned systematically.

4. Discussion and conclusion

Protection and maintenance of natural and environmental cause resources require systematic and prospective reviews. Due to the rate of destruction of natural resources and changes in land cover, due to the effect of different factors over time and human interference, it has led to natural environmental instability; Therefore, identifying the factors affecting environmental changes can be effective for conscious planning in order to protect and sustain the region's system. This research was conducted with the aim of an

overview and identifying factors affecting the use of Fadoghlo Regional Media, which to choose its effective factors and weighing. The peripheral scanning method and structural analysis of bad use in this regard questionnaire to dimensions 19 was designed and completed by expert experts. Then, according to the weight obtained, their relationships were decomposed in the micrograph software environment, resulting in key factors of cutting, harvesting, height and distance from tourist village, the motivation of people to change from agriculture to residential in the category of influential variables they got. Then for each of these factors the overall three situations were defined in desirable, neutral and undesirable spectra. These probable situations are for the future of the study area of the study area, which is the base of the scenario for the future of forest use. In the next step, possible situations were provided to experts as a questionnaire to choose the most appropriate solution and in the round last due to eight key factors and three possible matrix conditions with dimensions: experts based on weight

and the influence of each situation on the system identified the system finally obtained the results of the analysis and with probable determinant situations. In general, the results of Scenario Wizard software analysis in Floy's strong 27 belief scenarios or high adaptation scenarios and 75 poor Narives. To facilitate the understanding of the scenario page and the weight of the desired and undesirable conditions of this page, according to key factors, three specified states were defined and based on the rank of each of the factors in direct influence that these factors play an effective role in this region in the future. They play that land use variables have the highest rank as a key factor, namely any change in work. the expansion of human construction areas can affect the environment. These eight key factors in different natural, physical and empathy dimensions were determined as an effective key factor in changing the forest use of the Fadoghlo region that manages these factors in different dimensions will have a direct impact on the sustainable development of this forest area and also for each of these key factors, liberation was presented by experts who are among the social factors, population changes are the most important factor affecting anabestani to change land use that matches the results. In (2020) and Jafariaarasth et al, the ultimate scenarios for the future of the space system of the region were obtained for sustainable management and development. This area can have a favorable effect.

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