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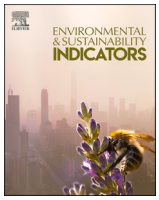

Modeling the environmental behavior of the rural people of Ilam province in the protection of the oak forests of south Zagros

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ABSTRACT

This study aimed to design a model of environmental behavior among rural people in Ilam province, Iran, to protect oak forests in the South Zagros basin. The study used a questionnaire to collect data from a sample size of 416 rural people living in the region, and structural equation modeling was used to validate the conceptual model and assumptions of the study. The results showed that rural people had a favorable attitude towards forest protection and identified selfishness as their top priority. Factors affecting subjective norms, perceived behavioral control, environmental intention, institutional factors, time perspective, and spatial attachment were ranked in order of importance and priority. The study found a significant positive relationship between attitude, subjective norms, and perceived behavioral control and rural people's intention to protect the oak forests. Perceived behavioral control, intention, time perspective, and spatial attachment had a positive effect on their environmental behavior. The independent variables explained 52% and 61% of the changes in the intention and environmental behavior of rural people, respectively. The findings have important implications for promoting forest conservation and sustainable development in rural areas worldwide, and can inform policymakers, environmental organizations, and researchers.

1. Introduction

Forests are a vital natural resource that provides numerous benefits and services to humanity, including maintaining natural resources, protecting soil and water resources, and regulating climate (Ahmed et al., 2020). Forests are also essential in ensuring access to water, as they produce the highest water quality of all ecosystems, vital for ecological needs and human survival (Empidi and Emang, 2021). Moreover, forest vegetation diversity offers a range of benefits and services to humanity, including acting as a barrier against desertification (Ahmed et al., 2020) and providing food, fuel, fiber, and income to millions of individuals globally (Izadi et al., 2022). Forests also offer multiple ecosystem services and create land biodiversity (Börjeson and Ango, 2021; Kok et al., 2017). Therefore, forests are a source of environmental services on a local, regional, and global scale that impact the employment, income, and livelihood of many people worldwide (Izadi et al., 2022). However, forests continue to face threats from human activities, such as agricultural expansion, livestock grazing, and wood harvesting (Börner et al., 2020; Carter et al., 2017). The pressure on land resources, particularly natural forests, is increasing worldwide due to economic and population expansion, as well as associated modifications in consumption (Abdulkarim et al., 2017; Scholes et al., 2018). The global rate of species extinction and the inevitable human impacts on biodiversity have intensified the need to preserve, restore, and sustainably utilize ecosystems (Oettel and Lapin, 2021). In Iran, forest areas cover an area of about 14 million hectares, of which approximately 41% are the forests of the Zagros vegetation region (Mirzaei et al., 2019). Among them, the Zagros oak forests, which are 5500 years old, are of special importance as the oldest oak forest in the world (Alesheikh and Mehri, 2019; Mozafari et al., 2019). The stability and sustainability of ecosystems in Iran are threatened by different factors such as indiscriminate exploitation, livestock grazing, fire, and wood harvesting, leading to a decrease in the population and diversity of plant and animal species in forests (Empidi and Emang, 2021). Moreover, villages located inside the forest or at a close distance from it have limited access to amenities, services, health, and education, and their residents rely on

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the forest to make a living and meet their needs. This situation has caused these people to inadvertently or deliberately harm forests, making human activities the primary cause of forest degradation (Savari and Asadi, 2020; Börjeson and Ango, 2021). Forest governance and management arrangements in developing countries are complex, with informal constraints shaping forest interaction patterns (Persson and Prowse, 2017). Forests have been purposefully managed by humans for long periods of time, indicating the importance of the human perspective in forest protection measures (Balée et al., 2020; Empidi and Emang, 2021). To preserve the world's forests, it is essential to shift towards sustainable conduct collectively (Schneiderhan-Opel and Bogner, 2021). One of the solutions proposed by psychologists and sociologists to avoid environmental harm and destruction is to modify human behavior towards naturalistic dimensions. The first step towards reducing environmental degradation and its effects, including the Zagros oak forest deterioration crisis, is to understand the current behaviors of rural people. Several behavioral theories, such as the theory of planned behavior, have been used to explain human behavior and interactions with the environment. The theory of planned behavior considers the influence of external factors on environmental behavior beyond an individual's control. Therefore, it is more useful in predicting environmental behaviors than the theory of rational action (Hemayatkhah Jahromi et al., 2017). This theory provides insight into predicting people's behavior based on their intentions, which are affected by attitude, subjective norms, and perceived behavioral control. Behavioral beliefs, subjective beliefs, and control beliefs determine attitude towards behavior, subjective norms, and perceived behavioral control, respectively (Bagheri et al., 2019). The aim of this research is to investigate the factors predicting the environmental behavior of rural people in Ilam province in protecting the oak forests of South Zagros using the theory of planned behavior. The research seeks to analyze the environmental behavior of rural people in Ilam province in protecting the oak forests of the South Zagros region and to design a model of appropriate environmental behaviors in rural people for the protection of these forests. The study addresses the knowledge gap on the under-represented role of rural populations in forest maintenance and sustainability in the Zagros forests. The research aims to examine the different dimensions of behavior among rural people to protect forests and provide solutions for improvement. The results of this study can increase the effective role of rural people in protecting forests in the region and similar areas.

2. Literature review

Research related to forestry has been evaluated through the lens of the theory of planned behavior. Previous research indicated that although the intensity of the destruction of the world's forests has decreased from −0.19 to −0.12% between 1990 and 2020, their area has decreased from 32.5% to 30.8% of the world land during this period. Despite the deterioration of Iranian oak in the forests of the west of the country, various studies have proposed ways to counter this dilemma (Mozafari et al., 2019; Parnian Kalayeh et al., 2020). The first report on oak decay in the Zagros forests dates back to the 1380s, and the first signs of decay were observed in the forests of Ilam in 1385 (Mozafari et al., 2019). Research indicates that in recent years, the direction of forest ecosystem functions via procedures like command and control has been unsuccessful. One of the most important reasons is that current policies and laws for managing natural resources are insufficient and are often adjusted without the local community's consultation such as farmers (Abdulkarim et al., 2017) and various protection and restoration measures (National Forest Restoration Plans, etc.) has been done by the competent authorities without achieving the desired results (Medjahdi et al., 2018). In this regard, environmental psychology and the theories of this field of science have a special place as a suitable tool for understanding people's behavior, and researchers have been searching for variables that have the biggest impact on behavior for decades (Strydom, 2018). Despite the capability of the mentioned behavioral theories in explaining the environmental behavior of humans, there are criticisms on it. For example, these theories have included few moral and value variables in their analysis. Therefore, they are not suitable for examining behaviors that are somehow affected by values and ethics (such as environmental behaviors). Therefore, in order to respond to this need, efforts should be made to provide appropriate behavioral theories according to the conditions and needs in order to respond to environmental behaviors (Menatizadeh and Karimi, 2016). Izadi et al. (2022) aimed at investigating several factors predicting the behavior of rural households in the protection of Zagros forests using the theory of planned behavior through the moral norm and with the structural equation modeling approach showed that the variables of moral norm, intention and behavioral control of understanding has a direct, positive and considerable effect and the variables of moral norm, attitude and perceived behavioral control have an indirect and significant effect on the behavior variable. Finally, the theory of planned behavior through the variable of moral norm can predict 52 and 38 percent of the changes in the variables of intention and behavior of rural households regarding forest protection, respectively. Moghim et al. (2021) investigated the mediating role of intention in the analysis of factors affecting the sustainable environmental behavior of agriculture. The results indicate that there is a positive and significant correlation between the variables of subjective norm, perceived behavior control and environmental attitude with the dependent variable of sustainable environmental behavior in agriculture. According to the results of the mediator structural model, it was determined that the environmental intention variable has a mediating role in the correlation between independent variables with sustainable environmental behavior in agriculture, and these variables explain 39% of the changes in the dependent variable. Bagheri et al. (2019) investigated the intention and application of pesticide labels and pictograms among the studied farmers by using the theory of planned behavior. According to the findings, attitude variables, subjective norms and perceived behavioral control showed a positive and significant effect on intention to use. Perceived behavioral control had a positive and considerable effect on the use behavior, but the effect of the intention to use on the behavior was not significant. Finally, the factors of attitude, subjective norms and behavioral control were able to explain 58% of the changes in the intention to use labels and pictograms, and the factors of behavioral control and intention to use explained 63% of the changes in the behavior of using labels and pictograms. Empidi and Emang (2021) examined the public's intent to involve in preservation efforts for forested watersheds in Malaysia utilizing the theory of planned behavior. The authors reported that attitude considerably influences people's behavioral intention. In this regard, Popa et al. (2019) demonstrated that the intention to partake in forest law enforcement is influenced by attitude, subjective norm, and perceived behavioral control. Wang et al. (2019) studied the environment-friendly behavior of Chinese rural people based on the theory of planned behavior and found that attitude, subjective norm, and perceived behavioral control have a positive and significant effect on their environmental intention. Yanakittkul and Aungvaravong (2019) in their research entitled the theoretical framework presented to study the behavior of organic farmers using the model of planned behavior change concluded that attitude and behavioral control factors in changing the behavior of farmers from conventional to organic farming It is effective. Issa and Hamm (2017) considered the acceptance of organic farming of fruits and vegetables as an opportunity in Syrian farmers, while using the theory of planned behavior and structural equation modeling, concluded that attitude and behavioral control have a significant effect on intention and behavior. Overall, the available literature has a rich source of information on ways to analyze forest deterioration and preservation. However, finding the gaps in these sources is an ingoing challenge for researchers and policy-makers.

3. Research method

This research is considered a quantitative study in terms of methodology, and the necessary data was collected through fieldwork and questionnaire distribution. The present study is also considered to be of a nature that includes correlation and variance-covariance matrix analysis.

In this study, a positivist research philosophy was adopted, emphasizing the use of scientific methods to investigate the environmental behavior of rural people in Ilam province, Iran. The theory of planned behavior was used as a theoretical framework to analyze the data, considering the importance of intention and perceived behavioral control in predicting environmental behaviors. The findings had important implications for promoting sustainable development and conservation of natural resources. The study demonstrated the value of using scientific methods to study environmental behavior, providing valuable insights into how to effectively address environmental problems. The study highlighted the importance of considering behavioral factors alongside technological changes to solve environmental problems. The findings showed the value of using scientific methods to study complex social and environmental issues and provided a basis for future research in this field (see Fig. 1).

The research area under investigation includes the oak forests of the South Zagros region, which are located within the protected area of Ilam province. Ilam province is situated in the west and southwest of Iran, bordered by Kermanshah province to the north, Lorestan province and part of Khuzestan province to the east, Khuzestan province and Iraq to the south, and Iraq to the west, with a shared border of approximately 425 km. A significant portion of Ilam province is mountainous due to its location within the Zagros mountain range (Fig. 2). The province covers an area of approximately 6,200,794 ha, which is approximately 2.1% of the total area of the country, and is comprised of 10 cities, including Islam, Ivan, Chardavol, Badreh, Darrehshahr, Abadan, Sirvan, Mehran, Malekshahi, and Dehloran, with a total of 27 towns.

The statistical population of the research includes all the rural people of Ilam province living in the South Zagros area (N = 5512). The sample size was calculated using the table of Bartlett et al. (2001), 416 people were determined and stratified random method with proportional assignment (according to the city of activity) was used for sampling. In this research, a questionnaire included two parts. The first part was related to the personal and professional characteristics of the studied rural people and the second part was based on the objectives of the research. Also, the objectives of the research consist of 7 subscales of attitude (13 questions), subjective norms (10 questions), perceived behavioral control (14 questions), intention (7 questions), environmental behavior (17 questions), time perspective (14 questions) And the place attachment (7 questions) of the rural people of Ilam Province was towards the protection of the oak forests of South Zagros.

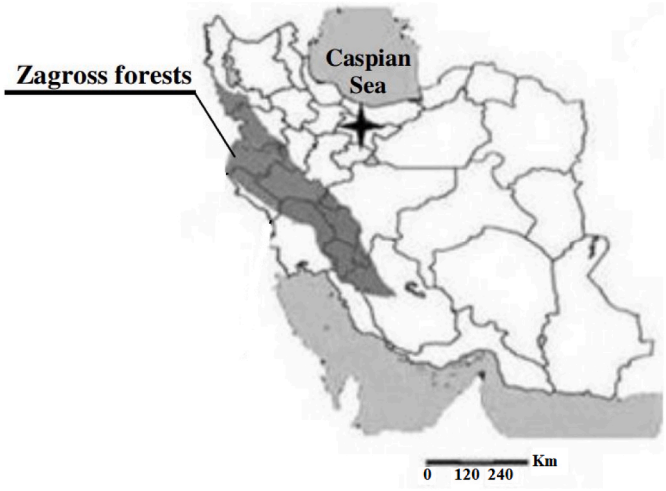

Fig. 2. The Zagros forests in Iran.

To measure this section, a 5-part spectrum from very low (1) to very high (5) was used. The rating scale was used to determine its validity using content validity and factor validity.

After completing the questionnaires, the obtained information was analyzed using SPSS V22 and Smart PLS_3 statistical software in the form of descriptive and inferential statistics, which will be explained below.

4. Results

The research findings indicate that the age range of the participants in this study was between 46 and 55 years. The studied rural people were mostly male (78.13 percent), married (87.26 percent) and had a diploma (45.43 percent). Also, they had an average of 13.43 years of experience in agriculture and animal husbandry.

In order to calculate the reliability of the questionnaire, Cronbach's alpha and composite reliability method (CR) were used, and values above 0.7 indicate the intensity of control of measurement errors in the structural equation model. In the conducted study, the range of AVE values between 0.738 and 0.867 suggested a high degree of correlation

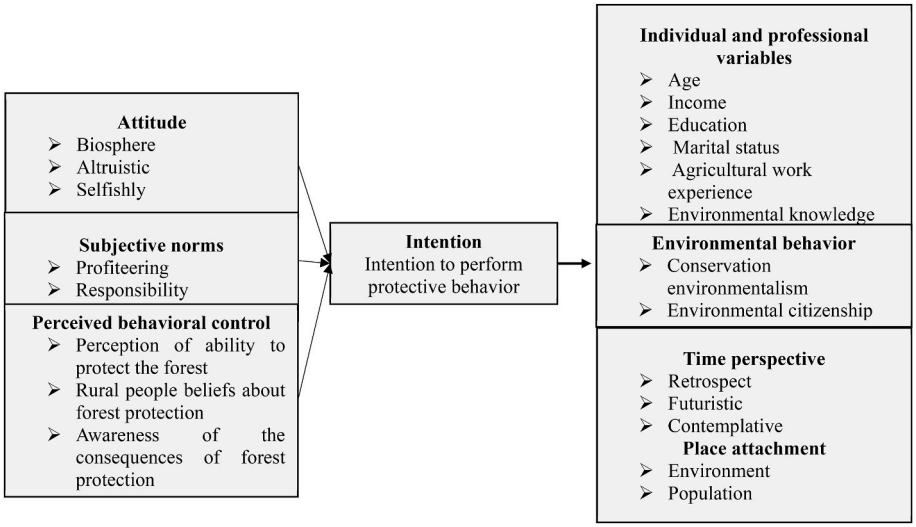

Fig. 1. Conceptual model of research based on the theory of planned behavior by Ajzen (1991).

among the items in the questionnaire, indicating strong convergent validity. These findings suggested that the questionnaire was a reliable and valid measure of the construct under investigation, and that the items in the questionnaire consistently tapped into the same underlying construct (see Table 1).

The discriminant validity of the measurement model was assessed using the Heterotrait-Monotrait (HTMT) ratio (Table 2). The HTMT ratios for all pairs of latent variables were less than 0.9, indicating good discriminant validity. Specifically, the HTMT ratios ranged from 0.596 to 0.698, with the highest value observed for the relationship between Behavior (B) and Time perspective (TP). These results suggest that the measurement model has good discriminant validity and that the latent variables are distinct constructs. Overall, the HTMT table provides evidence for the validity and reliability of the measurement model in this study, supporting the use of partial least squares (PLS) structural equation modeling to analyze the data.

In the survey of the attitude of the rural people of Ilam province towards the protection of the South Zagros's oak forests, 3 dimensions of selfishness, biosphere and altruism were examined.

As can be seen in Table 3, based on the total average (4.5 out of 5), it can be concluded that the attitude of the rural people of Ilam province towards the protection of the oak forests of South Zagros is evaluated at a favorable level. Based on the results, the selfish factor with the highest average has the first priority, and the biosphere and altruistic factors have been assigned the second and third priorities, respectively, of the attitude of the rural people.

In this research, the constituent dimensions of the subjective norms of the rural people consisting of 2 factors of self-interest and responsibility were ranked based on the coefficient of changes (Table 3). According to the results of the data, the total average of 4.2 for these two factors shows that the condition of the subjective norms of the rural people of the province regarding the protection of forests is evaluated at a favorable level. Also, the results showed that the dimension of profit seeking with a higher average is the first priority and the dimension of responsibility is the second priority of the subjective norms of the rural people.

The factors constituting the perceived behavioral control of the rural people of Ilam Province regarding the protection of the oak forests of South Zagros, consisting of 3 factors of the perception of the ability to protect the forest, the beliefs of the rural people regarding the protection of the forest and the knowledge of the consequences of forest protection, were ranked.

Table 2
Discriminant validity with Heterotrait-Monotrait (HTMT) ratio.

Variable	AT	SN	PBC	I	TP	PA	B
Attitude (AT)							
Subjective norms (SN)	0.596						
Perceived behavioral control (PBC)	0.603	0.625					
Intention (I)	0.644	0.647	0.649				
Time perspective (TP)	0.680	0.660	0.690	0.610			
Place attachment (PA)	0.665	0.674	0.669	0.626	0.601		
Behavior (B)	0.698	0.618	0.645	0.615	0.696	0.659	

The total average of 3.8 out of 5 showed that there is an average level for the perceived behavioral control status of the rural people of Ilam province regarding the protection of the oak forests of South Zagros. The factor of perception of the ability to protect the forest with the highest average (value 4), the first priority and the rural people' beliefs about forest protection and awareness of the consequences of forest protection have assigned themselves as the second and third priorities of perceived behavioral control status of the rural people regarding forest protection, respectively.

Based on the coefficient of variation, two factors of the intention to perform protective behavior and the desire to perform protective behavior were ranked in the status of environmental intention of rural people. The results indicates that the average level of environmental intention of the rural people was more than 4, which indicates a favorable level for this situation. Also, the factor of carrying out protective behavior with a higher mean was more important than the factor of wanting to carry out protective behavior.

Three institutional factors, consumption and recycling were ranked based on the coefficient of changes as the factors that make up the environmental behavior of rural people. Also, the results showed that the state of environmental behavior is at an average level.

Among the 3 mentioned factors, the institutional factor of environmental behavior with a higher average was more important than the other two factors including consumption and recycling factors.

In this research, the status of the time views of the rural people of Ilam province and their environmental behavior towards the protection

Table 1
Validity and reliability of questionnaire sections.

Research variables / Factors Dimensions		Average Variance Extracted (AVE)	Composite Reliability Coefficient (CR)	Cronbach's alpha reliability coefficient
Attitude	Selfishly	0.763	0.968	0.92
	Biosphere	0.758	0.973	0.94
	Altruistic	0.739	0.945	0.90
Subjective norms	Profiteering	0.783	0.957	0.88
	Responsibility	0.786	0.949	0.93
Perceived behavioral control	Perception of the Ability to protect the forest	0.803	0.944	0.92
	Rural people' beliefs about forest protection	0.798	0.928	0.91
	Awareness of the consequences of forest protection	0.779	0.956	0.93
Intention	Intention to perform protective behavior	0.832	0.938	0.92
	Willingness to engage in protective behavior	0.819	0.953	0.93
Behavior	Institutional	0.756	0.945	0.90
	Consumption	0.774	0.967	0.91
	Recycle	0.785	0.974	0.93
Time perspective	Retrospect	0.867	0.957	0.90
	Futuristic	0.843	0.973	0.97
	Contemplative	0.816	0.94	0.938
Place attachment	Environment	0.774	0.96	0.952
	Population	0.738	0.985	0.95

Table 3
The ranking of the dimensions that make up the attitude of the rural people of Ilam province towards the protection of oak forests.

Factor	Dimensions	Average*	Standard deviation	Coefficient of changes	Rank
Attitude	Selfishly	4.6	0.82	0.18	1
	Biosphere	4.5	0.84	0.18	2
	Altruistic	4.3	0.92	0.22	3
	Total	4.5	0.86	–	–
Subjective norms	Profiteering	4.4	0.94	0.21	1
	Responsibility	4.1	0.89	0.22	2
	Total	4.2	0.91	–	–
Perceived behavioral control	Perception of the ability to protect the forest	4.0	0.84	0.22	1
	Rural people' beliefs about forest protection	3.8	0.93	0.24	2
	Awareness of the consequences of forest protection	3.6	0.94	0.26	3
	Total	3.8	0.90	–	–
Environmental intention	Intention to perform protective behavior	4.35	0.92	0.21	1
	Willingness to engage in protective behavior	3.66	0.98	0.27	2
	Total	4.05	0.94	–	–
Environmental behavior	Institutional	3.7	0.93	0.25	1
	Consumption	3.6	0.92	0.26	2
	Recycle	3.2	0.92	0.27	3
	Total	3.5	0.93	–	–
Time perspective	Retrospect	3.8	0.93	0.24	1
	Futuristic	3.6	0.95	0.26	2
	Contemplative	3.1	0.93	0.29	3
	Total	3.5	0.94	–	–
Place attachment	Environment	4.5	0.95	0.21	1
	Population	4.2	0.93	0.22	2
	Total	4.3	0.95	–	–

Scale*: very little = 1 very much = 5.

of the oak forests of South Zagros were investigated. The results indicated that the three retrospective, futuristic and contemplative factors are the factors that form the time views of the rural people of the province. It was also found that the status of time perspective is at a medium level (3.5) as well as the status of environmental behavior.

Also, retrospect, futuristic, and Contemplative factors were of higher importance and priority comparing to each other. According to the results, the current factor had one of the lowest averages among all the factors of different situations.

In the ranking of rural people' spatial attachment to forest protection, it was found that the two factors of the environment and the population are in this state. It was also found that the environmental factor is more important than the population factor. This situation was also evaluated at an average level.

In order to validate the research conceptual model and its assumptions, structural equation modeling was used using Smart PLS_3 statistical software. The fit of the structural model was checked using R^2, Q^2 and GOF criteria. The higher value of R^2, the better the fit of the model. Q^2 criterion also determines the predictive power of the model. The higher the calculated value of Q^2 is greater than 0.2, the higher the prediction power of the model will be (Seifollahi, 2023). Based on the results of both criteria, R^2 and Q^2 have acceptable and appropriate values (Table 4). The model also was evaluated using several fit indices, including the Normed Fit Index (NFI), Standardized Root Mean Square Residual (SRMR), and Root Mean Square Theta (RMS Theta) (Table 4). These results also indicated that the model had excellent fit, with an NFI value of 0.97, indicating a good fit relative to the null model. The SRMR value of 0.06 indicated a good fit of the model to the data, as values less than 0.08 are generally considered an acceptable fit. The RMS Theta value of 0.09 indicated a good fit of the model, with values less than 0.12 considered indicative of a good fit. These findings suggest that the SEM model was a suitable representation of the data and that the latent constructs were well-defined and properly measured.

In order to check the overall fit of the model, the GOF criterion was used (Tenenhaus et al., 2004). According to the results, the value of GOF was calculated as 0.875, which was more than 0.5 and confirmed the appropriate and very good fit of the research model.

After validating the research model, confirmatory factor analysis was used for the state of the factor structures to check the measurement of the hidden variables of the model. In this way, if the factor load of any indicator with its factor has a t value higher than 1.96, then this indicator has the necessary accuracy to measure that factor or characteristic. According to the results of Table 5, it can be seen that the indicators of each factor have the necessary importance for measurement.

In Table 6, the path coefficient and the corresponding values of the t statistic at the 99% confidence level are presented. Based on the results of Table 6, all the variables had positive and significant regression effect coefficients and the research measurement model has the necessary efficiency.

This indicates the high explanation of the environmental behavior model of the rural people of Ilam province in the protection of the oak forests of the South Zagros area by the selected agents. Also, based on model fit indices and general judgment about model fit with t-value statistics, research hypotheses were tested. Based on the results of the t-value statistic, all research hypotheses were confirmed.

The final approved model is given in the format of Fig. 3. The results of Fig. 3 and Table 6 indicate that the states of attitude ($\beta = 0.745$), subjective norms ($\beta = 0.638$) and perceived behavioral control of the

Table 4
R^2, Q^2, NFI, SRMR, RMS Theta, and GOF criteria for fitting the structural model.

Research variables		AVE	R^2	Q^2	NFI	SRMR	RMS Theta	GOF
Environmental behavior of rural people in Ilam province	Environmental attitude	0.777	0.874	0.657	0.97	0.06	0.09	0.875
	Subjective norms	0.791						
	Perceived behavioral control	0.788						
	Intention	0.817						
	Time perspective	0.760						
	Place attachment	0.777						

Table 5
Examining factor loadings and significant coefficients of research variables.

Factor	Symbol	Dimensions	Factor load	t-value
Environmental attitude	X1	Selfishly	0.678	39.345
	X2	Biosphere	0.765	46.412
	X3	Altruistic	0.823	52.860
Subjective norms	X4	Profiteering	0.832	49.554
	X5	Responsibility	0.876	35.467
Perceived behavioral control	X6	Perception of the ability to protect the forest	0.865	53.465
	X7	Rural people' beliefs about forest protection	0.876	48.702
	X8	Awareness of the consequences of forest protection	0.889	49.678
Intention	X9	Intention to perform protective behavior	0.845	34.256
	X10	Willingness to engage in protective behavior	0.789	74.754
Time perspective	X11	Retrospect	0.834	56.657
	X12	Futuristic	0.845	47.654
	X13	Contemplative	0.869	48.765
Place attachment	X14	Environment	0.893	54.766
	X15	Population	0.877	41.835
Behavior	X16	Institutional	0.884	44.545
	X17	Consumption	0.897	53.629
	X18	Recycle	0.874	55.642

rural people of Ilam province towards the protection of the oak forests of South Zagros (β = 0.589), has a considerable and positive effect on their intention to perform the environmental behavior of protecting the mentioned forests.

Also, according to the results, perceived behavioral control (β = 0.602), intention (β = 0.711), time perspective (β = 0.653) and spatial attachment of the rural people of Ilam province towards the protection of oak forests of South Zagros (β = 0.473), has a considerable and positive effect on their environmental behavior in protecting the mentioned forests.

According to the results of this research, 52% of the changes in the dependent variable mediating the intention of the rural people of Ilam province to carry out the environmental behavior of oak forest protection have been explained by the independent variables of attitude, subjective norms and perceived behavioral control. Also, 61% of the changes in the final dependent variable of rural people' environmental behavior in the protection of said forests are explained by the independent variables of intention, time perspective, place attachment and perceived behavioral control of said rural people.

5. Discussion and conclusion

Similar to our results, Ramkissoon et al. (2013) and Bayard and Jolly (2007) highlighted the value of using structural equation modeling to understand the complex relationships between variables that influence pro-environmental behavior. While the specific findings may vary across studies due to differences in research questions, sample characteristics, and measurement instruments, the use of structural equation modeling provides a powerful tool for analyzing and interpreting these relationships.

Zagros forests are one of the centers of life in Iran, and the protection

Table 6
The results of researching the study's hypotheses.

Hypotheses		Path coefficient	t-Value	R^2	Sig	Test result
Environmental attitude	Intention to perform environmental behavior	0.745	34.265	0.437	**	Approved
Subjective norms		0.638	19.788	0.378	**	Approved
Perceived behavioral control		0.589	16.790	0.346	**	Approved
Perceived behavioral control	Environmental behavior	0.602	11.673	0.276	**	Approved
Intention to perform environmental behavior		0.711	9.576	0.524	**	Approved
Time perspective		0. ***653	7.343	0.482	**	Approved
Place attachment		0.473	5.980	0.259	**	Approved

**Significant at 1% level.

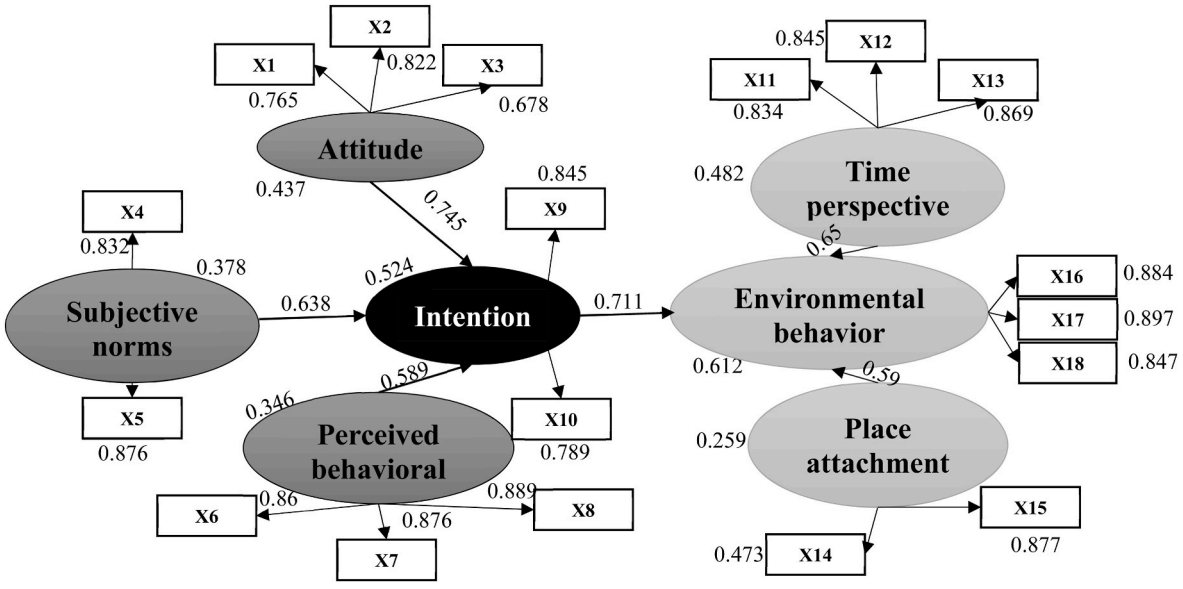

Fig. 3. The t-value statistics for each of the relationships between the factors and variables of the environmental behavior model of the rural people of Ilam province in the protection of the oak forests of the South Zagros region.

of these forests, which plays a considerable role in the life of the region and future generations, should be the concern and duty of all governing bodies and people. Considering the great importance and undeniable vital values of forest areas and their central and fundamental role in the continuity of human life, the protection and revival of these living and beautiful creatures is very important (Izadi et al., 2022).

On the other hand, since based on the surveys, unprincipled exploitation of forest dwellers and rural people is one of the most important factors of forest destruction and increasing the rate of deforestation (Ghorbani et al., 2020; Salmani et al., 2021), therefore, finding solutions to reduce such pressures on forests and natural resource areas can have an effect on reducing forest destruction. For this purpose, the present research was conducted with the aim of investigating the factors predicting the environmental behavior of the rural people of Ilam province in the protection of the oak forests of the South Zagros basin using the theory of planned behavior.

According to the results, the attitude of the rural people of Ilam province has a considerable and positive effect on their intention to protect Zagros oak forests as an effective mediating variable on their environmental behavior in protecting the said forests. In this regard, previous studies by Trihadmojo et al. (2020; Empidi and Emang (2021); Holt et al. (2021); Ullah et al. (2021) also showed that attitude is important in indirectly determining forest protection behavior, and its effect is mediated by behavioral intention.

For effective forest resources management, it is important to understand the characteristics of village people who have a close interaction with forests, as well as the local people's perspectives, suggestions, and ideas concerning forests (Atakan et al., 2010). reported that rural people were more likely to protect forest resources through a collaborative approach with the state forestry organization, rather than protecting, benefiting from, or managing forests on their own. The most influential factors on the rural people' forest management attitude were the ecological, recreational, and production values of the forest. (Nordlund and Westin, 2010). Castilho et al. (2018) reported that to bring about a change in the conservation behaviors of residents in areas of northeastern Atlantic Forest, Brazil, management actions should take into account people's attitudes and norms, as well as the combination of background factors that influence these variables. A growing body of research suggests that restrictions on the use of resources tend to generate negative attitudes among local residents. (Larson et al., 2016). By examining the attitudes of local residents, decision-makers can gain a better understanding of the potential influences on behavior and the effectiveness of conservation measures. (Hartter, 2009).

Therefore, considering that attitude is an important variable in predicting forest protection behavior, policies aimed at protecting more oak forests will not be successful unless there is a proper and positive attitude towards forest protection methods. This should come into the minds of all rural households, since people's attitudes are more influenced by the host society. Therefore, the communication of rural households and their interactions with family members, neighbors, friends and acquaintances, experienced people and organizations such as the Natural Resources Organization and Agricultural Jihad can influence the decision-making attitude and behavior of rural households to protect oak forests. Also, the means of mass communication, especially radio and television, are among the important factors that are effective in changing the attitude of rural households and can change their attitude towards the protection of resources, especially oak forests, by stimulating people's minds and creating an atmosphere of empathy. Some studies have suggested that attitudes can be reliable indicators of behavior, when taken in the context of social, cultural, and economic factors (Hafer and Ran, 2022; Zhao and An, 2021), whereas other authors have argued that attitudes do not always translate into pro-conservation behaviors (Nilsson et al., 2020). However, attitudes are only one factor that can influence behavioral intention, and specificity is necessary to more accurately (Liu et al., 2020).

According to the results of present study, the selfish dimension with the highest average has the first priority of the attitude of the rural people of Ilam province towards the protection of the oak forests of South Zagros. At the same time, the aspects of biosphere and altruism are the second and third priorities, respectively, of the attitude of the rural people of Ilam province towards the protection of the oak forests of South Zagros. Mahdavi et al. (2019). Studied the environmental attitudes and behavior of nomadic communities after the implementation of participatory management plan for forest and rangeland in Chahar Mahal and Bakhtiari province, Iran. The authors reported that the average of selfishness factor among the nomadic communities was 3.5, which is lower than the value of selfishness factor in the present study. It seems that nomadic communities are more care about the preservation of forests in compare with the village people or the participatory management plan for forest and rangeland was affective to improve the role of nomadic communities in conservation of their forests. However, the selfish factor in native communities for the forests and pastures in Iran is decreasing (Hajizadeh et al., 2021).

Therefore, on this basis, it can be useful to identify the roots and causes of the negative attitudes and behaviors of the rural people in the region in future researches. Because when the roots and reasons of these selfish and negative attitudes among the rural people are identified, it is possible through institutions such as agricultural promotion that work in the field of behavior change, to develop the correct and logical attitudes that are related to the protection of natural resources such as The oak forests of the Zagros in the farmers.

Also, due to the fact that the results of the research indicated that the subjective norms of the rural people of Ilam province had a considerable and positive effect on their intention as an effective mediating variable on their environmental behavior in protecting the aforementioned forests, which is consistent with the results of previous studies (Bagheri et al., 2019; Trihadmojo et al., 2020). Ofoegbu and Ifejika Speranza (2017) reported that subjective norms or beliefs about the approval or disapproval of sustainable forest management practices by relevant others were found to have a strong influence on the intention to adopt such practices. Meijer et al. (2016) found that subjective norms had a positive effect on attitudes by decreasing intentions to cut down forest trees. However, subjective norms had no significant effect on intentions or attitudes towards taking part in forest management (Tesfaye et al., 2012). Ihemezie et al. (2021) investigated how human values affect attitudes and behaviours towards forest conservation. The authors proposed that, generally speaking, normative pressures are the leading influence on landowners' harvest intentions.

Similar to our results, Apipoonyanon et al. (2020) reported that attitude, subjective norms, perceived behavioral control, and self-efficacy are key predictors of local involvement in community forest management according to the theory of planned behavior.

The encouragement of the studied rural people by family members, friends, experienced farmers, agricultural jihad workers and service centers to protect oak forests can lead them to understand the sustainability of the environment in order to protect oak forests (Hassen et al., 2023; Javanmiri Pour, 2022).

Therefore, the more the rural people communicate with each other and with local organizations, it can have a greater impact on the behavior of protecting oak forests by them. Thus, in this regard, it is recommended to identify, encourage and support creative and courageous rural people to cooperate with each other and with government officials or local organizations to protect oak forests. Also, by identifying people who have a higher social status, such as teachers and elders of the village, as well as example farmers, they can be used as communication channels. In fact, by identifying and updating the information of this category of users, it provided the basis for spreading useful information to others.

According to the results, the perceived behavioral control of the rural people of Ilam province regarding the protection of the oak forests of South Zagros has a considerable and positive effect on their environmental behavior in the protection of said forests, which is consistent

with the results of other researchers (Sánchez et al., 2018; Strydom, 2018). Similar to the results of present study, the perceived behavioral control considerably influences local people's intention to participate in community forest development programs (Apipoonyanon et al., 2020). However, the perceived behavioral control can improve the person's beliefs together with attitude and subjective norms to predict the intention to participate in community forest development programs (Gruver et al., 2017).

Perceived behavioral control indicates that an individual's motivation is shaped by their assessment of the difficulty of behaviours and their likelihood of succeeding or failing in carrying out or avoiding a behavior. A person with a firm belief in the availability of facilitating factors for a behavior will have a strong perceived control over that behavior. On the contrary, if a person does not have strong control beliefs, he will have a low perception of control, which prevents the occurrence of behavior. This understanding can be related to past experiences, predictions of future events, and attitudes influenced by the norms of the surrounding environment. Therefore, in order to make rural households aware of the methods of protecting oak forests and especially the ease of carrying out actions, developing strategies and programs so that rural households can be assured of the ease of forest protection can be effective in creating moral commitment in them and performing appropriate protective behaviors by them. It is also suggested to provide the necessary facilities by the government and the trustees of this matter to make the protection activities easier. Also, since the rural people do not have enough information about the necessary awareness to preserve the environment in general and oak forests in particular and the understanding of environmental sustainability, therefore they do not consider themselves capable of performing appropriate behaviors and actions against the environment, and behaviors which they do in dealing with the mentioned resources, it actually destroys the environment. Therefore, in order to increase the awareness of the rural people regarding the sustainability of the environment and to believe that they have the ability to take the necessary measures to preserve the oak forests, it is possible to use the mass media and necessary brochures in this regard, as well as educational classes to increase the rural people' information.

Intentions are thought to encapsulate the motivational elements that impact behavior. It reflects the level of people's enthusiasm to try, as well as the level of effort they will put in to engage in the activity (Ajzen, 1991).

The results showed that the environmental intention of the rural people of Ilam province towards the protection of the oak forests of South Zagros had a positive and significant effect on their environmental behavior in the protection of said forests, which is consistent with the results of other researchers (Empidi and Emang, 2021; Holt et al., 2021; Ullah et al., 2021). Hickerson et al. (2017)found that subjective norms had a considerable and positive effect on people's intention to participate.

The intention to protect the oak forests actually refers to the individual's commitment to participate in environmental protection behaviors, especially the forest. Behavioral intention implies that the particular behavior will happen at some point in the future. Whereas actual behavior implies that the designated action will happen immediately or has taken place already. People are more likely to express their willingness to take part in an action that will take place in the future, and less inclined to perform an action that will take place without delay (Ajzen, 2020).

The results of the influence of the temporal views of the rural people of Ilam province and their environmental behavior towards the protection of the oak forests of South Zagros indicated that the retrospective, prospective and present time views are the priority of the effective time views on environmental behavior of the rural people of Ilam province towards the protection of oak forests of South Zagros. Based on this logic, it has been observed in this research that the intention of the rural people to protect the forests will occur in the future. However, considering that the forest protection behavior is imminent, the rural people may not want to change their lifestyle and postpone the protection behavior towards the oak forests of the region to the future. Also, some rural people may have avoidant beliefs and think that they can participate in forest protection activities in the future and have an effective role.

Juutinen et al. (2020) indicated that although forest owners in Finland still primarily rely on traditional even-aged forestry, they are gradually transitioning towards more uneven-aged forestry practices in the future.

Considering the variable influence of intention on the behavior of the rural people of Ilam province in the protection of the oak forests of South Zagros, it is suggested that by holding promotional educational programs as well as advertising, awareness and implementation of positive programs in line with the protection of the oak forests, to invite the rural people of the region to environmental activities and forest protection in order for everyone to benefit from this divine gift.

Cognitive processes that divide human experiences into three tenses: present, past, and future, are called temporal perspective. People's time perspective can be defined as the decision-making approach that people have in terms of time. Based on this, people may make their decisions based on past beliefs and experiences (retrospection), based on beliefs of current life (present perspective), or based on belief in planning and the future (future perspective). The results of the research showed that the temporal perspective has a positive and significant effect on the environmental behavior of rural people towards the protection of forests. Additionally, numerous studies have empirically validated the connection between time perspective and human consumption of the environment, as well as other behaviors (Li et al., 2023; Rabinovich et al., 2010; Valizadeh et al., 2018).

A positive and emotional connection between a person and a certain place is called place attachment (Gosling and Williams, 2010).

The results revealed that the location attachment of the rural people of Ilam province towards the protection of the oak forests of South Zagros has a considerable and positive effect on their environmental behavior in the protection of said forests. Previous researches also shows the positive and significant impact of place attachment to the environment (Valizadeh et al., 2020; Daryanto and Song 2021; Wan et al., 2021).

The current study aimed to investigate the attitudes and behaviors of rural residents in Ilam province towards protecting the southern Zagros oak forests. The results showed that rural residents prioritize their self-interest over protecting the environment. To address this issue, the study recommends several strategies to improve the attitudes and behaviors of rural residents towards protecting the environment. Education is necessary to increase awareness, promote environmental ethics, and encourage better environmental behavior. Developing strategies and programs to ensure that rural households have the means to protect forests can be effective in creating ethical commitments and encouraging appropriate conservation behaviors. Providing necessary facilities by the government and those responsible for this matter can make conservation activities easier. Encouraging creative and risk-taking behavior among rural residents, using individuals with higher social status as communication channels, and delegating authority to local communities can also increase the sense of responsibility towards protecting the environment. Participatory management plans and introducing successful rural models in environmental protection can increase public awareness and lead to a movement towards protecting the southern Zagros oak forests. The promotion and education department in the agricultural and environmental institutions of Ilam province can play an important role in capacity building and motivating rural residents to increase social participation in environmental and natural resource projects towards reviving the oak forests.

While the current study focused on the attitudes and behaviors of rural residents in Ilam province towards protecting the southern Zagros oak forests, its findings and recommendations can potentially be

generalized to other rural areas facing similar challenges in protecting their natural resources. However, it is important to note that the specific cultural, social, economic, and environmental contexts of each region can play a significant role in shaping the attitudes and behaviors of its residents towards environmental conservation. Thus, before generalizing the findings of this study to an international level, it is crucial to consider the unique context of each region and tailor the strategies and programs accordingly. Additionally, replication studies in other regions can help validate the effectiveness of the strategies and programs recommended by this study. Overall, while there may be possibilities for generalization, it is important to approach each region's environmental challenges with a customized and context-specific approach.

The study faced limitations related to data collection and access. Financial constraints were encountered due to the high costs associated with visiting a large number of stakeholders, and the statistical population of the study included all rural residents in the dispersed southern Zagros region of Ilam province, making it difficult to access. During the qualitative phase, the prevalence of COVID-19 and work commitments of managers and stakeholders made them difficult to access, which was considered a limitation for achieving the study's objectives. Despite these limitations, the study highlights the importance of considering and addressing challenges that can arise during research.

In conclusion, the study found that the intention and perceived behavior control were better predictors for responsible environmental behavior of rural people towards the protection of oak forests of South Zagros. Therefore, a set of educational and support measures by various institutions such as schools, universities, agricultural jihad organization, environmental organization, media and municipalities is necessary to fulfill in the best possible way people's participation in environmental management and Article 50 of the constitution and in some way environment-friendly mentalities lead to objective environmental responsible behaviors towards the protection of the oak forests of South Zagros. The institutional department of agricultural promotion and education in the Departments of Agricultural Jihad and Environment of Ilam Province can also play a very important role in building capacity, persuading and motivating rural people to increase social participation in the implementation of environmental and natural resources projects in the direction of revitalization of oak forests, which can be effective in improving the rural people' perception of the sustainability of oak forests and, consequently, environmental sustainability.

Disclosure of interest

The authors have no potential conflict of interest.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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