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Predicting pro-environmental behavior for managing farmer-wildlife conflicts in northern Iran

Mojgan Asadollahi[a], Faraham Ahmadzadeh[*a], Hossein Mahmoudi[a]

[a] Department of Biodiversity and Ecosystem Management, Environmental Sciences Research Institute, Shahid Beheshti University, Tehran, Iran

ABSTRACT

Effectively managing and mitigating "human-wildlife conflict" (HWC) by adjusting the use of cultivated land to realize the coexistence of humans and wildlife plays an important role in protecting biodiversity, ensuring food security, improving cultivated land use efficiency, and improving the livelihoods of community residents in nature reserves. Moreover, conservation biologists are paying growing attention to HWC, which is a significant global environmental problem. To achieve a sustainable solution and mitigate such conflict, it is necessary to focus on the conflict's human dimensions and direct and indirect economic and social effects. Human behaviors are affected by values, attitudes, norms, and economic factors. Thus, identifying those factors might be of use to predict human reactions toward wildlife. The framework of this study is a combination of Planned Behavior Theory (TPB) and Wildlife Value Orientations (WVOs) that can identify and predict the behavior of farmers and ranchers in dealing with wildlife by creating a value-attitude-behavior cognitive hierarchy. The study was designed as a stratified random sample of 200 interviewees in Mazandaran province. We used the results (individual characteristics, questions related to conflicts, WVOs, and TPB variables) to analyze and predict the pro-environmental behavior of interviewees in conflict conditions. The results demonstrated that WVOs in total could predict 32% of TPB variables. The attitude and perceived behavior control variables had significant effects on behavioral intention (Respectively, ($\beta = 0.49$, $p < 0.001$) and ($\beta = 0.21$, $p < 0.05$), and in total, these variables can predict 22% of the pro-environmental behavioral, whereas subjective norms had none. Most notably, combining two theories significantly enhanced the predictive power and comprehensiveness of the ultimate framework for predicting farmers' and ranchers' pro-environmental behavior. The findings provide a clearer perception of factors driving the non-environmental behavior toward wildlife in conflict situations. So, the TPB and WVOs can be effective tools for investigating and reducing HWC. Also, they can be a basis for developing human-based conflict research in Iran.

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*Corresponding author
E-mail address:
f_ahmadzade@sbu.ac.ir
(F. Ahmadzadeh)

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1. Introduction

Human-wildlife conflict (HWC) is rising globally, which represents a major challenge for conservation managers. In addition, HWC occurs under the constraints of limited natural resources, and it affects the livelihoods of millions of people worldwide (Gross et al., 2021). Although the key factors causing these conflicts are well known, limited effective solutions have been proposed to reduce them (Lozano et al., 2019).

In addition to imposing direct and indirect economic and social costs, conflict may threaten well-being and even people's lives (Anthony, 2021). For instance, Tilson and Seal (1987) reported that 100 people are killed annually by tiger attacks in India and Bangladesh. In addition, wildlife may be in a state of crisis and destruction due to injury to the protection of people's property and life (Siege and Baldus, 1998).

Annually, 50-120 elephants are killed by shooting in Kenya. Arlet and Molleman (2010) reported that 43% of cocoa fields in Cameroon are destroyed annually by large and small mammals. The people who experience the most conflict with wildlife seem to be farmers and ranchers whose crops and livestock are destroyed by wildlife. In the 2005–2012 period, compensation expenditures for wildlife damage in Europe amounted to USD 41.38 million/per year (Bautista et al., 2019). In October 2020, nearly 8000 farmers in northeastern Nigeria were displaced by the destruction of crops by a herd of approximately 250 elephants (Yan et al., 2022). Therefore, handling the relationship and building a harmonious relationship of coexistence between humans and wildlife have become the primary tasks of global biodiversity conservation (Inskip et al., 2016). Farmers often show self-adjustment behaviors after experiencing HWCs. Nyhus (2016) showed that to reduce HWC-related losses to their families, farmers will independently adjust their living and production methods. Such adjustments include independently setting up protective facilities and adjusting the planting structure. They expand the planting area of economic crops that are not easily damaged and even directly abandon the cultivation of seriously damaged land. Although the self-regulation behavior of farmers has alleviated HWCs to a certain extent (Yan et al., 2022), it is limited by wildlife protection, land use control, and the strong dependence of farmers on natural resources. Farmers' voluntary adjustment of cultivated land use behavior cannot effectively alleviate HWCs, and it is not sustainable because the livelihood results of farmers are damaged (Woolaston et al., 2021). It seems that more advanced approaches that deal with human dimensions (Wallen and Daut, 2018), should be used to control HWC. Despite the variety of species and situations that cause HWC, a particular concept is always the same: ultimately, human thoughts and behaviors determine the solution for these conflicts. Human behavior reflects a variety of factors (Cinner, 2018). Models and theories of behavior give us a framework to develop research and understand the underlying HWCs (Kansky and Knight, 2014). Theoretical frameworks such as the theory of planned behavior (TPB) (Ajzen, 1985; Fazio, 1986), can provide a useful structure for predicting human behavior by exploring the attitudes of individuals and the factors influencing their decision-making in conflict situations (Manfredo et al., 2009). Iran is a vast semi-arid country in southwest Asia with significant biodiversity due to its four seasons and topographic diversity (Dehshiri, 2018). It also has a variety of landscapes due to having four biogeographical regions (the Euro-Siberian, the Irano-Touranian, the Nubo-Sindian, and the Sahara-Arabian regions) (Zohary, 1963). Although only 15 percent of the country is agricultural land and 25% is pasture (www.iranicaonline.org/agriculture in Iran, 2020), reports indicate that conflicts between farmers and ranchers with wildlife are currently the most important problem in Iran, particularly the northern part of the country. Increasing agricultural lands and, the proximity of wildlife habitats to human settlements in northern Iran is one of the causes of these conflicts. Since there are many protected areas in northern Iran, this can lead to further problems. In Mazandaran province, livestock and agriculture are a vital part of a farmer's livelihood and income. Therefore, the destruction of these products and livestock (Such as rice, fruit trees, vegetables, beehives, sheep, cattle, and poultry) can overshadow their well-being. Therefore, it is necessary to identify the farmer's perception of the HWC in Mazandaran province. The studies that have been done on this subject in Iran have been very few and limited and species based. For example, the findings of Qashqaei et al. (2014) showed that on average of two *Ursus arctos* are killed annually in Iran to defend agricultural lands and crops. Also, Babrgir et al. (2017) examined the conflict between humans and leopards in northern Iran. Their results showed that socio-economic factors such as cattle predation caused 80 of the interviewees to consider leopards as pests and 45% of those to seek permission to hunt them. Meinecke et al. (2018) surveyed 162 households in northern of Iran to understand species-specific patterns of human-wildlife conflicts and people's reactions to these conflicts, and to suggest appropriate conflict mitigation measures. Wild boar (*Sus scrofa*) and grey wolf (*Canis lupus*) were found to be the primary conflict species regarding reported levels of severity and crop loss by wild boars was reported by 97% of households. Nematpour and Habibzadeh (2019) investigated the attitudes of the villagers of Horand County, East-Azerbaijan about wildlife species with the focus on eight species and to determine the main causes of their conflict with the gray wolf. The

results showed that the people were negative in their views toward hyaena and jackal than gray wolf and bear. The intensity of human-wolf conflict was positively influenced by an increase in respondents' number of income sources, as well as by livestock disease-related losses. TPB predicts a particular behavior that a person intends to do and includes the internal control component (an individual's belief about their own capacity to carry out a given behavior) and the external control component (an individual's belief about the availability of the necessary resources in the external environment to carry out a given behavior). Behavior is influenced by three factors: 1) Attitude (internal control) or to what extent the intended behavior is desirable, pleasant, useful, or enjoyable to the individual, and depends on the individual's judgment of the effects and consequences of the behavior; 2) subjective norm (internal control) or the amount of social pressure perceived by the individual to behave; and 3) the perceived behavior control (external control), or degree of the individual's belief that refers to the behavior in question is under his/ her voluntary control and often assessed by the ease or difficulty of the behavior. In general, factors affecting behavior in addition to TPB factors are also beliefs and values, and social and economic factors (Ajzen, 1985; Fazio, 1986; Ajzen, 1991). Social groups have their attitudes, beliefs, values, and norms, and a clear understanding of their individual attitudes is crucial for investigating human-wildlife issues (Ajzen and Driver, 1992). Acuna-Marrero et al. (2018) studied human attitudes toward sharks in the Galapagos Marine Reserve. They identified some of the most influential socio-economic factors, emotions, and beliefs that shape those attitudes (as one of the main components of TPB). They also showed that behavioral responses such as tolerance and support for shark conservation could be predicted using their attitudes, so there is a strong correlation between them. The other factor determining behavior is values, which are based on the cognitive hierarchy of each person that represents the learned component of human response to wildlife. They are usually formed in the first years of life under the influence of family and community education (Fazio, 1986), guide people in interpreting events, and are always present (Manning and Serpell, 2002). The wildlife value orientation (WVO) concept is to predict human responses to wildlife conflict (e.g., attack, disease transmission, and wildlife damage) that, using basic beliefs and values, can show the pattern and direction of attitude and intention toward wildlife (Seoraj-Pillai and Pillay, 2016). Fulton et al. (1996) and Kerlinger et al., (2013) first used WVO surveys to measure human–wildlife relationships in North America. Subsequently, two key WVO affecting wildlife relationships were identified (Teel and Manfredo, 2010). These two key WVO are supremacy (prioritizing human well-being over wildlife and treating wildlife as resources used for human benefit) and mutualism (seeing wildlife as part of the social community and deserving of the same rights as humans). Four WVO types have been derived from these two key WVO: traditionalist (high domination, low mutualism), mutualist (high mutualism, low domination), distanced (low mutualism, low domination), and pluralist (high mutualism, high domination). Traditionalists believe that wildlife should be exploited and managed primarily for human benefit. Animals are viewed by mutualists as belonging to an "extended family," capable of developing trusting connections with people and deserving of protection and rights. Pluralists relate domination and mutualism, and their influence is situational; expressed inclination is determined by the specific circumstances of a given topic. Pluralists may respond as traditionalists or mutualists, making it impossible to predict their actions. The distanced group has no domination or mutualism WVO and is uninterested in wildlife and wildlife-related issues (Keener-Eck et al., 2020). The current research looked at the human-based perspective and developed a framework based on the TPB and combined it with Wildlife Value Orientations (WVO) (Figure 1). This final structure organizes the individual's perspective into a cognitive hierarchy consisting of values, wildlife value orientations, attitude/subjective norm/ perceived behavior control, intentions, and behaviors. All these elements of the pyramid are placed on top of each other (Homer and Kahle, 1988), and can more accurately predict pro-environmental behavior in dealing with wildlife (a value-attitude-behavior cognitive hierarchy) (Manfredo and Dayer, 2004).

In this regard, this study classified farmers and ranchers into two critical categories of WVO (mutualism and domination; as in some sources; (Teel and Manfredo, 2007), these two groups

are referred to as WVO), show better results and to better manage conflicts with a more comprehensive understanding in Mazandaran province.

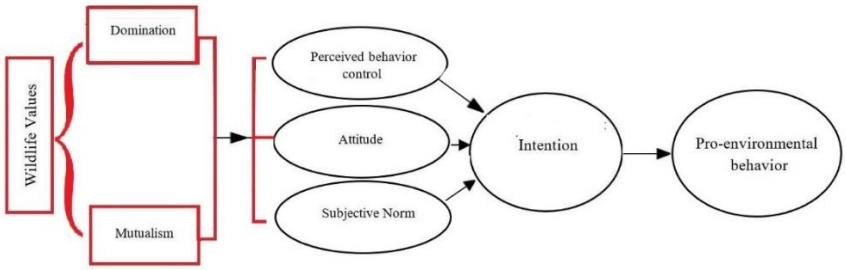

Fig. 1. The modified conceptual model is based on Ajzen's 1991. The original TPB model is in black line.

2. Material and Methods

2.1. Study Area

This survey was carried out in Mazandaran Province situated in the north of Iran (50°34′-54°10′ E, 35°47′-36°35′ N, 23842 km^2, 0-5670 m a. s. level) (Figure 2). The area, known as the Caspian district (Ziaie, 2009), has a temperate and wet climate, with an annual rainfall of 700 to 1000 mm and an annual temperature of -3 to 40 °C (DOEM, 2017). The Caspian district due to its geographical location, and ecological conditions (proximity to the sea and mountains), has a very diverse climate, which has led to very diverse and valuable fauna and flora composition (Amini and Zare, 2006). Hyrcanian forest as the main vegetation type of the area is covered by broad-leaved trees (Kheiri, 2010). The province harbors 18 protected areas (22% of the lands of Mazandaran province are protected) (DOEM, 2017) and its landscape is composed of rice fields, gardens, forests, mountainous habitats, and residential areas. In recent years, vast forestry regions have been destroyed due to livestock overgrazing, indiscriminate harvesting of timber, and land-use change. Economic activities in the region consist mainly of livestock rearing and agriculture. Livestock husbandry is a major source of income for local people in the province (Faham et al., 2008).

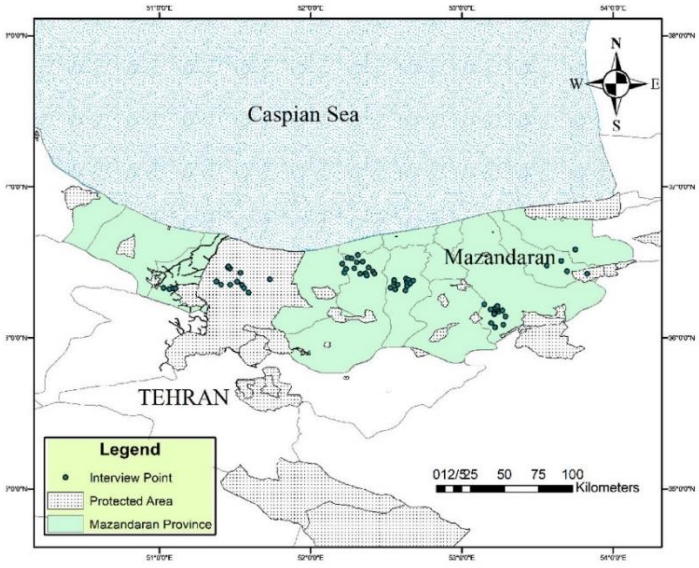

Fig. 2. The geographical location of the Study area

2.2. Methods

The statistical population of this study is farmers and ranchers, whose number is estimated at 350 thousand people (Statistical Center of Iran, 2014). 200 people were determined using the Morgan table (Krejcie and Morgan, 1970). We employed a multi-stage stratified sampling method of random clusters for selecting sample members, tailored to the statistical population's size. Stations were chosen based on the highest reports of conflict

and complaints from the local community to the General Department of Environmental Protection in Mazandaran Province. This encompassed issues like wildlife-related destruction of agricultural and livestock products, hunting risks, and wildlife endangerment due to discontent. We conducted surveys in a total of seven stations, including Kojour, Dodange, Hezar jarib, Chahar bagh, Amol, Babol, and Tonekabon, which covered 65 villages, during the period from January to May 2017. Some of these stations were located within protected areas. The questionnaire design was based on previous studies and the combination of different questionnaires was appropriate to our research objectives; for example, Fishbein and Ajzen (2012); Marchini and Macdonald (2012); McCleery (2009); Zinn and Shen (2007). The validity of the content and structure of the questionnaire was assessed using experts' opinions. Finally, in a pilot survey of 15 farmers and ranchers, the structure of the final questionnaire was determined. The final questionnaire consisted of three main parts: 1) individual and professional characteristics including age, sex, occupation, agricultural work experience, level of education, place of residence and duration of residence, farm area, type of cultivation, village location, type, and the number of livestock, 2) open and closed questions related to the description and identification of conflicts (report on the experience of damage to livestock and agricultural products, annual wildlife damage, time of wildlife attack, population fluctuation and wildlife damage in recent years, human casualties, methods of damage prevention, insurance status and hunting), and 3) TPB and WVOs variables. This section comprised questions from seven variables, including attitude, subjective norms, perceived behavior control, intention, past behavior frequency (including Pro-environmental behavior), mutualistic value, and domination value (Table 1). In total, this section intends to measure all these factors within TPB and WVOs with 30 questions. Interviewees rated their level of agreement with the questions by choosing one of five answer options (five-point Likert). It includes "strongly disagree", "disagree", " Neutral", "agree", and "strongly agree" which were measured as responses (1 = not at all, to 5 = very high). The pilot collected data was imported into SPSS v24 and the reliability of the instrument was calculated using Cronbach's alpha coefficient. The output of the Cronbach's alpha for the components of the questionnaire (see also Table 1) determined the questionnaire's reliability for the research and evaluated the internal consistency of the scales (George and Mallery, 2019). Chi-Square ($\chi 2$) test, Pearson correlation coefficient, and logistic regression analysis were used for data analyses. The general method of the interview was one-on-one. Since some of the interviewees were illiterate, all the questions were read to them, and they were given explanations for better understanding. Then, the interviewer recorded their answers.

Table 1. Factors examined and questions used to evaluate them, and related Cronbach's alpha values.

Variable	Number of items	Cronbach's alpha coefficient
Attitude		
– Hunting nonhuman animals and wildlife is not always the best way to prevent farm damage.	5	81
– To prevent wildlife damage, I prefer methods that do less damage to wildlife.		
– I have the right to hunt wildlife that enters my farm and damages my crops and livestock.		
– In my opinion, wildlife is a pest that must be eradicated.		
– I feel compassionate and kind to wildlife.		
Subjective Norm		
– My family and important people in my life recommend the non-lethal method to solve the problem with wildlife.	3	78
– My neighbors and colleagues encourage the killing of nonhuman animals (wildlife) entering the farm.		
– My family believes that wildlife hunting on our farm is immoral.		
Perceived behavior control		
– The hunt is the better choice.	2	71
– It is difficult to find a non-lethal way for wildlife to enter farms		
Intention		
– I plan to deal with the wildlife that enters my farm in the future for food, in a non-lethal way.	2	83
– I decided to find and use a wildlife-friendly mead.		

Past behavior frequency (including Pro-environmental behavior)		
– I have hunted wildlife that has entered my farm or attacked my livestock in the past years.		
– I have revived wildlife that has entered my farm or attacked my livestock in the past years.	5	72
– For managing the conflict, I usually use Fencing.		
– For managing the conflict, I usually use Night Guarding		
– For managing the conflict, I usually use Make noise and light		
Mutualist value		
– I like helping nonhuman animals more than helping people.		
– Hunting is a cruel act on a nonhuman animal.		
– In my opinion, the world should be a place where humans and wildlife can live together without fear.	5	84
– Nonhuman animals must have the same rights as humans.		
– I don't like harassing the nonhuman animal.		
Domination value		
– If I feel my property and assets are endangered by wildlife, I will kill them.		
– If I feel endangered by wildlife, I will kill them.		
– I like wildlife so much that I can easily hunt them.		
– People who want to hunt should be allowed to do so.	7	79
– From the beginning of time, wildlife was on the planet for human use.		
– Human needs must take precedence over the protection of wildlife.		
– Humans must reduce wildlife populations for their benefit		

*Cronbach Alpha: $0.90 \leq \alpha$: Perfect; $0.80 \leq \alpha < 0.90$: Good; $0.70 \leq \alpha < 0.80$ (Source: George and Mallery, 2019)

2.3. Analysis

The statistical analysis contains two steps, a measurement level, and a structural level. The measurement level using CFA techniques was estimated in Amos v22. CFA helps to determine the factor structure and factor loadings of measured variables, and to assess the fit between the data of theoretical model. The following goodness-of-fit indices were selected: chi-square ($\chi 2$), Root-Mean-Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Incremental Fit Index (IFI), and Tucker Lewis Index (TLI). A nonsignificant chi-square and values above 0.95 for the CFI and TLI are considered to reflect a good model fit, and above 0.90 indicate adequate fit. RMSEA value less than 0.05 suggest good fit and up to 0.08 indicate reasonable errors. Structural Equation Modeling (SEM) was used for the structural level, to investigate the quantification and statistical testing of theoretical constructs. The modified TPB model was estimated in Amos v22. Path analysis (PA) is a data analytic method for SEM. Its technique demonstrates the associations among observed variables in a path diagram, that it allows the direct, indirect, and total effect of one observed variable on another to be obtained. Therefore, SEM estimating the structural and measurement elements of analysis, simultaneously. In the current research, the structural part of the analysis determines the causal relationship between the variables of the research's conceptual framework such as TPB variables, and WVOs. For our purpose, the modified version of Ajzen's TPB model (1991) consists of seven variables: domination, mutualism, attitudes, subjective norms, perceived behavioral control, intention, and pro- environmental behavior. The high degree of correlation between the variables indicates their greater impact on intention and, of course, on actual behavior (pro-environmental behavior).

Our primary hypotheses in this study were as follows:

H1: Farmers with mutualistic values towards wildlife have a direct positive relationship with three factors of behavior prediction (perceived behavior control, attitude, and subjective norm).

H2: Farmers with domination values towards wildlife have a direct negative effect on the mentioned factors of behavioral prediction.

H3: Three factors including attitude, subjective norm, and perceived behavior control have a direct positive effect on behavioral intentions.

3. Results and discussion

Some of the most important results are summarized as follows: 90.5% of the interviewees experienced conflicts with wildlife. The main occupation of 67% of the interviewees was nonhuman animal husbandry and agriculture activities. There were 36.6% reports of human fatalities and injuries by wildlife. In addition, 36% (76 people) of the interviewees stated that wildlife is a life-threatening danger to them and causes the transmission of disease to livestock (43%). Therefore, they (68.7%) considered themselves

victims of wildlife under these conditions; 58% reported increases in the wildlife population and, consequently, in their attacks and damage (49.5%) in recent years. Of the attacks and damage, 68.1% occurred during the night. However, only 20.5% (41 people) admitted to hunting, trapping, and capturing wildlife. However, 30% of them believed that the best way to protect livestock and agricultural products was to hunt and eliminate wildlife. Findings showed that 68 people (34%) insured their products and livestock, but only 29 (42%) of them were compensated (For more information see table S1). Table 2 reports the fit indices for the modified version of Ajzen's TPB model. Based on the results obtained, a four-factor model representing was demonstrated to possess good model fit (RMSEA= .048; CFI= .92; IFI= .99; TLI= .99). The chi-squares value was large relative to the degrees of freedom (χ 2= 260.91) (Table 2). The research's Theoretical Framework encompasses a cognitive hierarchy of domination and mutualistic values, attitudes, subjective norms, perceived behavioral control, behavioral intention, and pro-environmental behavior. Integrating these values into the Theory of Planned Behavior (TPB) enhances our comprehension of their role in shaping behavior. The study's results, illustrated in Figure 3 and Table 3, reveal important relationships. The domination value directly and negatively influences perceived behavioral control (β = -0.69, $p < 0.01$), while the mutualistic value directly and positively impacts perceived behavioral control ($\beta = 0.34$, $p < 0.05$). These variables jointly account for 32% of perceived behavioral control variations. Furthermore, the domination value has a direct, negative, and significant effect (β = -0.71, $p < 0.01$) and the mutualistic value has a direct, positive, and significant impact ($\beta = 0.40$, $p < 0.01$) on attitudes. This combined model explains 51% of the variations in attitudes. The research also uncovers that the domination value directly and negatively affects subjective norms (β = -0.18, $p < 0.01$), while the mutualistic value directly and positively influences subjective norms ($\beta = 0.54$, $p < 0.01$). These variables, in concert, predict 32% of the variations in subjective norms.

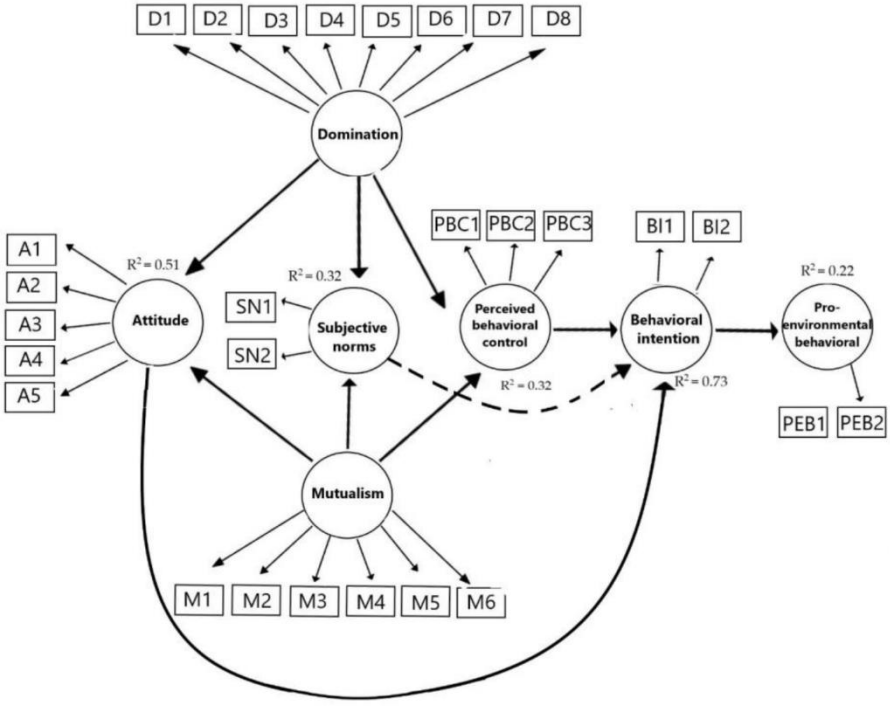

Fig. 3. Structural Equation Modeling and path analysis coefficients are the variables of the conceptual framework of this research.

* $p < .05$, ** $p < .01$, *** $p < .001$ -----> = non-significant path

According to the results, perceived behavioral control had a direct, positive, and significant effect ($\beta = 0.21$, $p < 0.05$), and the attitude had a direct, positive, and significant effect (β = 0.49, $p < 0.001$) on the behavioral intention. On the other hand, mutualistic and domination values had an indirect influence on behavioral intention. In sum, the perceived behavioral control, attitude, and mutualistic and domination values predicted 73% of the

variations in behavioral intention. The behavioral intention variable had a direct, positive, and significant effect on the pro-environmental behavior ($\beta = 0.26$, $p < 0.05$). Accordingly, it can be concluded that perceived behavioral control, attitude, behavioral intention, and mutualistic and domination values significantly affect pro-environmental behavior. In total, these variables can predict 22% of the pro-environmental behavioral variations. Therefore, our findings support the value-attitude-behavior cognitive hierarchy. Subjective norms did not affect behavioral intention and pro-environmental behavior (see Table 3). The conflict between farmers/ranchers, and wildlife is currently one of the most challenging environmental issues. Human dimensions are the most important aspects of HWC management, which involves understanding the human's attitude and behavior toward wildlife. This study identified and predicted the intention and pro-environmental behavior of farmers and ranchers towards wildlife in Mazandaran province. This study combined the TPB and the WVO to create a value-attitude-behavior cognitive hierarchy as a potent and useful theoretical framework for understanding and predicting pro-environmental behaviors. In this study, attitude serves as a mediator between WVO, intentions, and behavior because there is no guarantee that TPB factors would result in an unambiguous prediction of an individual's behavior (Fulton et al., 1996). Ward (2013) showed that hunting behavior is controlled by attitudes, subjective norms, and perceived behavior control. Similarly, we showed that behavioral intention and pro-environmental behavior are influenced by attitudes and perceived behavior control which highly correlate with mutualistic and domination value orientations towards wildlife. The results showed that 90.5% of the interviewees experienced conflicts with wildlife in the studied areas and that conflicts have increased in the last five years (49.5%). Farmers and ranchers believed that the increase in conflict was due to the expansion of protected areas and wildlife protection by the government and the Environment Agency. Interviewees had a negative attitude and dissatisfaction with their actions. They believe the government and other responsible institutions attach more importance to wildlife than their lives. The domineering view of farmers and ranchers made them consider their lives and well-being superior to those of wildlife and expressed dissatisfaction. The domination value has affected their attitude, and this dissatisfaction allows some of them to act themselves and take steps to resolve the conflict. For example, in one of the stations, leopard attacks on livestock were more common, some ranchers had killed leopards by poisoning their prey. The results are in line with the findings of Hrubes et al. (2001). They showed that hunting intentions are strongly influenced by attitudes, subjective norms, and behavior control and these have a high correlation with the set of basic beliefs. We found that the hunting behavior of farmers and ranchers to wildlife was under the direct and indirect influence of behavioral intention, perceived behavioral control, attitudes, and WVO. 20.5 % of elderlies boasted in the interview about the number of wildlife hunts. In the past, wildlife hunting was considered a positive value, and the hunter was known as a powerful person in Mazandaran province. These values, which are rooted in indigenous culture, have influenced their attitudes, intentions and ultimately their behavior. The findings of this study showed that the rate of pro-environmental behavior is higher among young and educated farmers and ranchers. In the new generation, due to education, literacy levels, changing values as well as laws, the value of wildlife hunting has diminished. These new conditions have affected the perceived behavior control of the new generation, and as a result, they behave differently from the previous generation. Nilsson et al. (2020) demonstrated that TPB factors do not always lead to behavior prediction. The results of this study indicated that although most interviewees were mutualism-oriented, they ultimately acted as domination due to the inadequacy of damage reduction methods or massive financial loss caused by wildlife. In this regard, the TPB cannot fully predict the behavior of individuals. About 50% of interviewees reported more than 20 mRls (million Rials) damages annually which may be equal to their income for several months. Given that, more than 60% of the interviewees' main income was through nonhuman animal husbandry and agriculture activities. Therefore, the existence of conflict, financial losses, and lack of other income can affect their reaction to the conflict. We found that some farmers and ranchers, despite their environmental intentions, engaged in activities such as hunting or trapping (20.5%). In this

case, people may have environmental intentions, but inappropriate conditions do not lead to environmental behavior. Similarly, using this theory, Liu et al. (2011), examined people's attitudes toward bears. Their results indicated that economic incentives are far more substantial than attitudes towards illegal killing and trade in bear parts. As Marchini and Macdonald (2012) reported, other factors such as fear and internal and external barriers can affect the behavior of humans in association with killing jaguars. The results also showed that the rate of wildlife attacks on farms or even cages is higher at night (65%). Therefore, individuals had to adopt more preventative measures, which cost them more economically. Economic and psychological pressures, insomnia, stress, and anger from these conditions all affected their attitude and perceived behavior control. Some participants admitted that they felt helpless and disabled. Their view was that wildlife is uncontrollable at night. Some of them used tools such as traps, electric fences, or even hunting to prevent destruction. Also, 36% of interviewers reported feelings of fear and danger about wildlife and even 36 % reported experiencing injuries and damage from wildlife. Thus, feelings of fear can lead to non-environmental behavior despite different intentions. In the face of wildlife, which is referred to as evolutionary fear, it can change behavior even if one has a positive attitude or behavior toward pro-environmental behavior. Therefore, we can identify WVO and predict their behavior by using the emotional motivations (sadness, happiness, hatred, fear, pleasure, etc.) of farmers and ranchers in conflict situations. The results also showed that subjective norms did not affect intentions and behaviors. This means that there is no pressure from society and family (like encouragement and punishment) to live peacefully with wildlife. This indifference can be due to several reasons. First, friends and relatives are in the domination category and believe that humans are superior to wildlife. Therefore, it makes sense to hunt them both for the benefit and the relief. The following reason is that they may be mutualistic, but inappropriate circumstances have affected their intentions and behavior. As mentioned in several places in this article, economic factors play a decisive role, and because farmers and ranchers see their livelihoods endangered from wildlife, in many cases recommendations and social pressures will have an insignificant effect. In such cases, subjective norms will play a lesser role. According to the results, 67% consider themselves victims in conflict situations. The damage done by wildlife is quite understandable to them as well. Moreover, wildlife hunting is not a positive value or individual advantage in the present generation as it used to be. In this study, we had a mixture of all three reasons. As highlighted by Acuna-Marrero et al. (2018), attitudes toward sharks are influenced by socio-economic factors, emotions, and beliefs. Our study reinforces the impact of these factors on attitudes. Notably, we identified four species (wild boar, grey wolf, brown bear, and Persian leopard) responsible for significant harm to farms and livestock (tables S2 and S3). In Mazandaran province, wild boar (*Sus scrofa*) emerged as the primary destroyer of agricultural products, with mass attacks on gardens and farmlands prompting interviewees to advocate for population control due to extensive destruction. Additionally, our research unveiled that wolf (*Canis lupus*) and leopard (*Panthera pardus*) are the primary culprits in livestock attacks within Mazandaran province, aligning with Teixeira et al.'s findings in 2021. We further emphasize the impact of beliefs, emotions, and attitudes on landowners' tolerance of wildlife attacks on livestock. Significantly, this study sheds light on the persistence of old beliefs among Mazandaran natives, attributing human traits to wildlife, particularly wolves and leopards, which substantially affect the attitudes and behaviors of certain farmers and ranchers. In total, 34% of farmers and ranchers insure their products and livestock of which, 19.7 % claimed damages from wildlife from insurance companies. Most cited insurance laws as a reason for their reluctance to insure their products and livestock. Items such as non-payment of full compensation or presentation of livestock lost by wildlife, non-coverage of livestock grazing in the forest (only farmed cattle are insured), belong non-insurance damage to livestock attacked in the forest, non-compensation for damage to land or agricultural supplies (damage only applies to destroyed crops). As Acuna-Marrero et al. (2018) showed, economic and social issues can affect people's attitudes. The anger of farmers and ranchers, who see their only source of income at risk, and non-compensation could have affected their attitude and perceived behavioral control and behavior.

Therefore, using this method to better identify people and situations that affect their attitudes and intentions can effectively reduce conflicts in Mazandaran province. Also, more concrete solutions can be suggested by identifying situations that have affected inhabitants' attitudes. Training and financial support and compensation by the government and relevant institutions can be helpful.

Table 2. Fit indices for SEM model of the TPB

Items	Value
$\chi 2$	260.91
df	151
$\chi 2$ /*df*	1.78
RMSEA	.048
CFI	.92
IFI	.99
TLI	.99

RMSEA=Root-Mean-Square Error of Approximation.
CFI=Comparative Fit Index; IFI=incremental fit index.
TLI=Tucker Lewis Index

Table 3. Standardized and unstandardized factor

Items	β Measurement level	Structural level	
Domination value (DV)			
D1	0.65	**DV➔PBC**	-0.69**
D2	0.83		
D3	0.74		
D4	0.71	**DV➔AT**	-0.71**
D5	0.82		
D6	0.75		
D7	0.67	**DV➔ SN**	-0.18**
D8	0.77		
Mutualist value (MV)			
M1	0.72	**MV➔ PBC**	0.34
M2	0.68		
M3	0.69	**MV ➔ AT**	0.40**
M4	0.78		
M5	0.80	**MV➔ SN**	0.51
M6	0.58		
Perceived Behavior Control (PBC)		**PBC ➔ BI**	0.21*
PBC1	0.66		
PBC2	0.56	**R^2 (DV, MV)**	0.32
Attitude (AT)			
AT1	0.61	**AT ➔ BI**	0.49**
AT2	0.63		
AT3	0.61	**R^2 (DV, MV)**	0.51
AT4	0.57		
AT5	0.59		
Subjective Norm (SN)		**SN ➔ BI**	-
SN1	0.63		
SN2	0.78	**R^2 (DV, MV)**	0.32
SN3	0.82		
Behavioral Intention (BI)		**BI ➔ PEB**	0.26*
BI1	0.79		
BI2	0.77	**R^2**	0.73
Pro-environmental behavior (PEB)		**R^2**	0.22
PEB1	0.86		
PEB2	0.75		

* p < .05, ** p < .01, *** p < .001

4. Conclusion

This study aimed to predict farmers/ ranchers' pro-environmental behavior in the face of wildlife using TPB and WVOs in Mazandaran province. To reduce the HWC and ultimate success, legal oversight is needed at local, national, and global levels to change human behavior to mutualistic or friendly, obtained with psychological help. These results may assist in solving this critical issue among indigenous communities in Iran. Since Attitude in this study had a significant role in the tendency for pro-environmental behaviors of

conflict management of livestock/crops and wildlife. It is suggested with supportive tools such as insurance, awareness, and education about the importance of the role of biodiversity and wildlife on human life and, how to make money from biodiversity for local communities, positive attitude towards wildlife protection. Based on the findings of this study, for future research, we propose the focus be placed on species that are more in conflict with farmers and ranchers.

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