

Pro-Environmental Behaviours among Agricultural Students: An Examination of the Value-Belief-Norm Theory

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ABSTRACT

The present study attempted to understand pro-environmental behaviours among university students in the developing country of Iran. The Value-Belief-Norm (VBN) theoretical framework was used in this study. Data were obtained from 295 agricultural students at Bu-Ali Sina University using a self-administered survey. The data were then analyzed using the Partial Least Squares approach. The structural equation modelling findings showed that the VBN theory model could effectively be applied for the prediction of pro-environmental behaviour among university students in non-Western and developing countries, which in turn affirmed the validity of this theory in intercultural settings. The variables' causal order in the VBN theory likewise was affirmed, i.e. each individual variable had a significant relationship with the next variable throughout the causal chain. Furthermore, as hypothesized, variables mediated relationships between their antecedent and outcome variables in the causal chain. These results suggest that the VBN theory is a useful framework for understanding pro-environmental behaviours in a non-Western developing country.

Keywords: Agricultural students, Causal chain, Intercultural settings, Iran.

INTRODUCTION

The world now faces several environmental challenges, such as global warming, pollution, depletion of natural resources, biodiversity loss and deforestation (Steg and Vlek, 2009). These challenges are worsening daily, and their negative effects are increasing. The outlook is not good as millions of people face scarcity of water, air pollution is a major cause of mortality worldwide, and floods and droughts are increasing as a result of climate change. All of these problems are forcing people to migrate (Moran, 2010).

Because many of these problems have been caused by human behaviour and their solutions depend on changing this behaviour; in other words, finding behavioural solutions (Steg *et al.*, 2014). Therefore, studying these environment-related behaviours, as well as the factors that

determine them, is a fundamental part of understanding the potential to foster sustainable development. Pro-environmental behaviours, which include those that favour maintaining the environment or, at least, harming it less, are affected by social and psychological factors (Thøgersen, 1996; De Leeuw *et al.*, 2015; Whitley *et al.*, 2018). To date, most of these studies have been conducted in households or social settings (Ture and Ganesh, 2014). Despite the significant impact that university students are likely to have on the future status of the environment, fewer academic studies are being dedicated to examining pro-environmental behaviours (Whitley *et al.*, 2018), specifically among university students in less developed and developing countries. University students, as young people bear the burden of past and current negligence towards the environment. In the meantime, they have the great potential of

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changing behaviours towards the environment, not only for their own part but for all citizens as a whole (De Leeuw *et al.*, 2015). They are not, of course, the only people who can access high levels of knowledge and top positions, but they are probably one of the main groups that acquire the technical and specialized knowledge necessary to carry out appropriate decisions and solutions for a more sustainable world (Vicente-Molina *et al.*, 2017). This is the case especially for agricultural students because they may be making decisions about agriculture and food systems (either individually as farmers or regionally/nationally as employees of agencies or policy makers) after they graduate. Perhaps that is the reason that suggests it is worthwhile to study this group. Such an understanding may be helpful in determining solutions to promote environmental behaviour through different means including education and thereby protecting the environment for the future generations (Zsóka *et al.*, 2013; Gifford and Nilsson, 2014; De Leeuw *et al.*, 2015).

Studies have highlighted that various psychosocial constructs including values, attitudes, and beliefs can help in predicting pro-environmental behaviour. Among numerous theories that have considered such constructs, the Value-Belief-Norm (VBN) theory is outstandingly efficient (Stern *et al.*, 1999; Stern, 2000) and popular among researchers for providing a powerful framework for examining and explaining the determinants of environmental behaviour (Liobikien and Juknys, 2016). Accordingly, this study aimed to adopt the VBN theory to investigate pro-environmental behaviour and its antecedents among Iranian university students.

Since fewer number of environmental behavior studies have been conducted in non-Western cultures and developing countries, especially with university students in agriculture as subjects, the present study was designed to examine whether the VBN theory, first introduced in developed countries, could also be employed for

explaining the pro-environmental behavior of university students in Iran, a developing country, and if VBN theory would ultimately lead to improved intercultural validation. Moreover, examining the mediating role of the VBN theory postulated causal chain was another objective of this research. Application of this theory may provide some insights about the promotion and encouragement of pro-environmental behavior among Iranian university students who study agriculture.

Pro-Environmental Behaviours

The dangers that threaten human life and the earth's environment are the results of human activities and abundant studies have been conducted in recent decades to find solutions for protecting the environment and mitigating the adverse effects of environmental harm (e.g., De Groot and Steg, 2008; Wynveen *et al.*, 2015; Whitley *et al.*, 2018; Hiratsuka *et al.*, 2018). As one of the approaches proposed by some scholars (Kollmuss and Agyeman, 2002) showed, fostering the pro-environmental behavior of human is expected to be helpful in ensuring the protection of the environment and, thereby, human life and the earth as a whole. This behavior comprises an expansive range of activities and actions that "protect the environment or minimize the negative impacts of human activity on the environment in either general daily practice or specific outdoor settings" (Miller *et al.*, 2015). It also has been referred to as "environmentally friendly behavior," "environmentally sensitive behavior," and "environmentally responsible behavior." This study analyzed the general pro-environmental behavior of Iranian university students including consumption of organic products, reducing water and electricity use, using public transportation, avoiding the use of plastic bags, reusing plastic containers and bottles, saving utilities and resources, and recycling waste material.

Value-Belief-Norm Theory

As mentioned above, Stern *et al.*'s (1995) VBN theory was used as a guide to examine pro-environmental behavior among university students. The VBN theory assumes a causal chain of five variables that affect the types of action taken (Stern, 2000; Stern *et al.*, 1995): values, New Ecological (or Environmental) Paradigm (NEP), Awareness of Consequences (AC), Ascription of Responsibility (AR) to self-beliefs, and Personal Norms (PN). Value orientation is defined as a guiding principle regarding desirable states or appropriate states or outcomes (Schwartz, 1992; Stern *et al.*, 1999). In respect to the purpose of this study, the "values" include the biospheric values (i.e., concern for non-human aspects of the environment), social altruistic values (i.e., focusing on people's welfare), and egoistic values (i.e., focusing on one's own welfare) (Stern, Dietz, and Kalof, 1993). These values are general and unchanging, and develop in the first years of one's life, and thus constitute the first ring of the causal chain and are assumed to have direct impact on an individual's ecological worldview (Stern *et al.*, 1995). Very often, altruistic- and biospheric-value-oriented individuals have positive beliefs and attitudes toward the environment because such beliefs and attitudes will result in the interests of others as well as the environment (De Groot and Steg, 2008).

The NEP is the first construct among the three constructs of beliefs. Since the environmental problems have turned out to be the key concern of all sectors of society, understanding of people's environmental worldviews is of utmost importance. The NEP is the commonly used environmental worldviews construct (Dunlap and Van Liere, 1978) reflecting the people views concerning the human capacity for upsetting the nature balance, the potential for limitation of growth of human society, and the right of human to govern the nature. Based on the VBN theory, the NEP can be affected by three types of values and, in turn, it can influence the AC of an individual as the outcome of his/her actions,

i.e., the third ring in the causal chain. The second construct of belief in the VBN model is the AC, referring to the question that whether an individual is aware of the negative impacts of his/her anti-social actions on others or other objects. The third (last) construct of belief in the VBN framework is AR, referring to the sense of responsibility for the negative impacts of not acting pro-socially. The VBN theory then incorporates the PN of the person, referring to a person's feeling of 'moral obligation to perform or refrain from specific actions' (Schwartz and Howard, 198).

Among the environmental psychology models, the VBN theory (Stern, 2000) has represented a dominant paradigm model for describing various environmental attitudes and behaviour. (Steg *et al.*, 2005; De Groot and Steg, 2008; Wynveen *et al.*, 2012; Chen, 2015; Han, 2015; Wynveen *et al.*, 2015). Despite this support, few studies have applied the VBN to environmental behaviour in non-Western cultural settings or developing countries. In one recent exception, Chen (2015) reported that the underlying causal structure of the VBN (values to beliefs to personal norms) was supported and that the VBN predicted general environmental behaviour among a student sample in Taiwan. More recently, Hiratsuka *et al.* (2018) tested the VBN theory in Japan. Their results supported the basic structure of the VBN and showed all variables predicted succeeding variables in the causal chain.

To completely examine the VBN theory model, this study assumes that any variable in the causal chain directly affects the next variable and indirectly affects variables farther down the chain. In sum, according to the above arguments, the following hypotheses have been developed:

H1: Biospheric value positively affects new ecological paradigm among university students.

H2: Altruistic value positively affects new ecological paradigm among university students.

H3: Egoistic value negatively affects new ecological paradigm among university students.



H4: New ecological paradigm positively affects awareness of consequences among university students.

H5: Awareness of consequences for valued objects positively affects ascription of responsibility among university students.

H6: Ascription of responsibility positively affects pro-environmental personal norm among university students.

H7: Pro-environmental personal norms positively affect pro-environmental behaviours among university students.

Furthermore, in line with the VBN theory, we hypothesize that every presumed intervening variable in the causal chain mediates the relationship between the distal variable and the outcome variable. To put it more clearly, we hypothesize that PN mediates the relationship between AR beliefs and behaviour, AR beliefs mediate the relationship between AC beliefs and PN, AC beliefs mediate the relationship between NEP and AR beliefs, and NEP mediates the relationship between values and AC beliefs. (Figure1).

MATERIALS AND METHODS

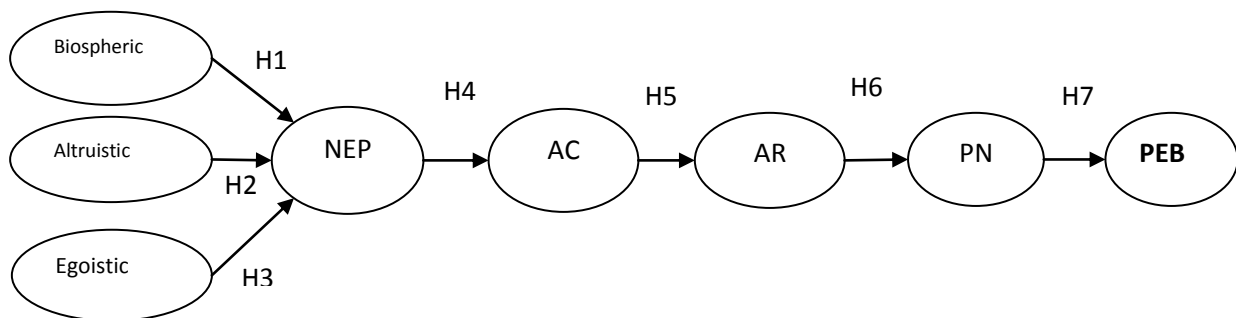
Measurement Instruments

We adopted the measurement items of this study from previously validated researches in a variety of contexts (e.g., Stern *et al.*,

1999; Stern, 2000; Groot and Steg, 2008; Markowitz *et al.*, 2012; Han, 2015). The study variables were measured using multiple items (see Appendix). The survey questionnaire was first developed in English and translated to Persian through a translation-and-back-translation method. A pilot study was conducted with 20 agricultural university students to test the reliability of the questionnaire. Reliability of the constructs was calculated using the Cronbach's alpha. As can be seen in Table 1, the reliability value for each construct was above 0.70, which meets acceptable limits, indicating that the measurement scales of the constructs were stable and consistent (Hair *et al.*, 2014).

Values

The value scales were adopted from previous studies (see e.g. Dietz *et al.*, 2005; De Groot and Steg, 2008). For the values scales, the respondents were asked to rate the importance of each value item as "a guiding principle" in their lives on a 5-point scale ranging from "extremely important" (5) to "not at all important" (1). These scales included 12 items, four to measure biospheric value, four to measure altruistic value, and four to measure egoistic value.



Note: NEP: New Ecological Paradigm; AC: Awareness of Consequences; AR: Ascription of Responsibility; PN: Personal Norm; PEB: Pro-Environmental Behavior.

Figure 1. The conceptual framework.

Beliefs

Typically, the “new environmental paradigm” scale (Dunlap and Van Liere, 1978) and its revised versions such as the “New Ecological Paradigm” (NEP) scale (Dunlap *et al.*, 2000) have been used with various samples as measures of respondents’ ecological beliefs. Measurement of the respondents’ NEP was performed using a simplified measure consisting of five items in accordance with Kotchen and Moore (2007) method.

This study used the measurement of ‘Awareness of Consequences’ and ‘Ascription of Responsibility’ from the past undertaken studies from the literature (Stern *et al.*, 1999; Steg *et al.*, 2005; Zhang *et al.*, 2014; Han, 2015; Wynveen *et al.*, 2015). Six items were used for the measurement of ‘Awareness of Consequences’; six items were also used for the measurement of ‘Ascription of Responsibility’.

Norms

The present study used seven items adapted from previous studies (e.g., Steg *et al.*, 2005) to measure the personal norm to take pro-environmental actions.

Behaviours

Self-reported environmental behaviours were measured using 20 items. These items were based on numerous studies (e.g., Markowitz *et al.*, 2012; De Leeuw *et al.*, 15; Jagers *et al.*, 2016; Miao and Wei, 2016; Whitley *et al.*, 2018). The respondents were asked to rate all of the five-point Likert scale items to describe the frequency with which they practiced different pro-environmental behaviours (e.g., behaviours related to energy use, waste prevention, transportation choices, and recycling) with 1 indicating ‘never’ and 5 indicating ‘always.’

Data Collection

Data collection was done at Faculty of Agriculture (N= 1,850), Bu-Ali Sina University, a large university in the west of Iran. This is a convenient sample as frequently used in environmental behaviour research (Han and Hyun, 2012; Jakovcevic and Steg, 2013; Yadav and Pathak, 2016). Sample size was decided based on Hair *et al.*’s (2014) rule of thumb i.e. one to five ratio. The measurement tool consisted of 58 items (questions), requiring the collection of at least 280 (56×5) questionnaire. Because of low response rate and to ensure collection of at least 290 usable questionnaires, 360 self-administered questionnaires were distributed among university students during a class session. The data collection period spanned approximately two weeks, from November 5 to 20, 2016. The respondents were given 30 minutes to fill the questionnaire and were assured that their responses would remain anonymous and confidential. In total, 310 questionnaires were collected indicating a response rate of 86%. Data were screened for missing data and outliers (Hair *et al.*, 2010), and after this validation process, 295 useful responses were obtained.

Sample Profile

The sample consisted of 251 BSc. (85%) and 44 MSc. students (15%). The sample consisted of 120 male (41%) and 175 female students (59%). The majority of the respondents were between 20-22 years of age (60%) and their average age was 21.83 years. Just over 20 percent of the respondents participated in environmental associations and groups. Television and radio were the main source of environmental information for the respondents (61%), followed by Internet (55%), family and friends (14.5%), university books and courses (12.5%), newspaper (12%), pro-environmental groups (9.3%), and environmental experts (8%),



Data Analysis Method

The main purpose of this study was to evaluate the hypothesized theoretical model in order to understand the complicated relationships existing between the study variables. A Structural Equation Modelling (SEM) is deemed to be an adequate solution for the achievement of this objective, thus used in the present study. This study used the Partial Least Squares (PLS) technique to perform the SEM analysis using the statistical program, *SmartPLS* 3.0 (Ringle *et al.*, 2005).

Measurement-Model Evaluation

The evaluation of measurement model was based on the reliability and validity of model (Hair *et al.*, 2014). To assess the reliability of the model, the factor loading and composite reliability were used (Chin, 2010). The results showed that all factor loadings and composite reliability were higher than the recommended values of 0.50 and 0.70, respectively (Henseler *et al.*, 2009). As shown in Table 1, the composite reliability values of the constructs ranged from 0.80 to 0.90, exceeding the recommended minimum of 0.70. In addition, the values of Cronbach's alpha for the study constructs were all above the minimum threshold of 0.70, ranging from 0.72 to 0.87. Subsequently, convergent and discriminant validity was assessed. Evaluation of the convergent validity of constructs was carried out by the Average Variance Extracted (AVE). The results indicated the calculated AVE values ranging from 0.43 to 0.69 were all above or close to the minimum level of 0.50 (Table 1). Moreover, the square root of the AVE values (diagonal values) were greater than the correlations among constructs (off-diagonals values) in the corresponding rows and columns; each construct shares larger variance with its own measure than with other measures, suggesting satisfactory discriminant validity

RESULTS

Descriptive Statistics

Participants reported having behaved "regularly" to "often" in a pro-environmental manner (M= 2.98, S= 0.85). They reported moderately high NEP (M= 3.83, SD= 0.77), AC (M= 4.03, SD= 0.71), AR (M= 3.83, SD= 0.72), and moderately high PN (M= 3.91, SD= 0.81). Participants stated that they felt better represented by biospheric and altruistic values than by egoistic values. Their biospheric (M= 4.26, SD= 0.78) and altruistic values (M= 4.36, SD= 0.75) were quite high (Table 1).

Table 1. Evaluation of the measurement model.

	1	2	3	4	5	6	7	8	AVE
1- Biospheric value	(0.83)								.69
2- Altruistic value	0.73**	(0.81)							.65
3- Egoistic value	0.23**	0.23**	(0.78)						.61
4- New ecological paradigm	0.57**	0.53**	0.11*	(0.67)					.45
5- Awareness of consequences	0.59**	0.52**	0.05	0.59**	(0.72)				.52
6- Ascription of responsibility	0.50**	0.45**	0.06	0.52**	0.52**	(0.76)			.57
7- Personal norm	0.63**	0.49**	0.12*	0.63**	0.59**	0.57**	(0.76)		.57
8-Environmental Behaviour	0.32**	0.26**	0.02	0.38**	0.33**	0.39**	0.45**	(0.66)	.43
Mean	4.26	4.36	3.72	3.83	4.03	3.83	3.91	2.98	
SD	0.78	0.75	0.79	0.77	0.81	0.72	0.81	0.85	
Cronbach's Alpha	0.85	0.73	0.72	0.80	0.77	0.74	0.87	0.76	
Composite Reliability	0.90	0.85	0.80	0.85	0.85	0.83	0.90	0.82	

* $p < .05$. ** $p < .01$.

(Fornell and Larcker, 1981).

Structural-Model Evaluation and Hypotheses Testing

After confirmation of the reliability and validity of the construct measures, the structural model results were evaluated. We first considered the structural model for Goodness-of-Fit (GoF) before interpreting the path coefficients (Tenenhaus *et al.*, 2005). The GoF of the model was found to be 'large' (0.40), considering the categorization of small (0.10), medium (0.25) and large (0.36) effect size proposed by Schepers *et al.* (2005), showing the suitability of our measures for the subsequent evaluation of the study causal model and hypothesis.

The significant level of path coefficients and the amount of explained variance (R^2) in the endogenous constructs are used to specify the predictive power of the inner model (Hair *et al.*, 2014). In order to generate the path coefficients and their corresponding *t*-values for specifying whether or not these paths are significant (Hair *et al.*, 2014), the PLS algorithm and bootstrapping procedure with 5,000 resamples were used (Table 2). The R^2 values are considered as weak, medium, and strong for the constructs in the structural model are 0.19, 0.33 and 0.67 (Chin, 1998). In terms of R^2 value, three constructs demonstrate moderate R^2 values (> 0.33) and

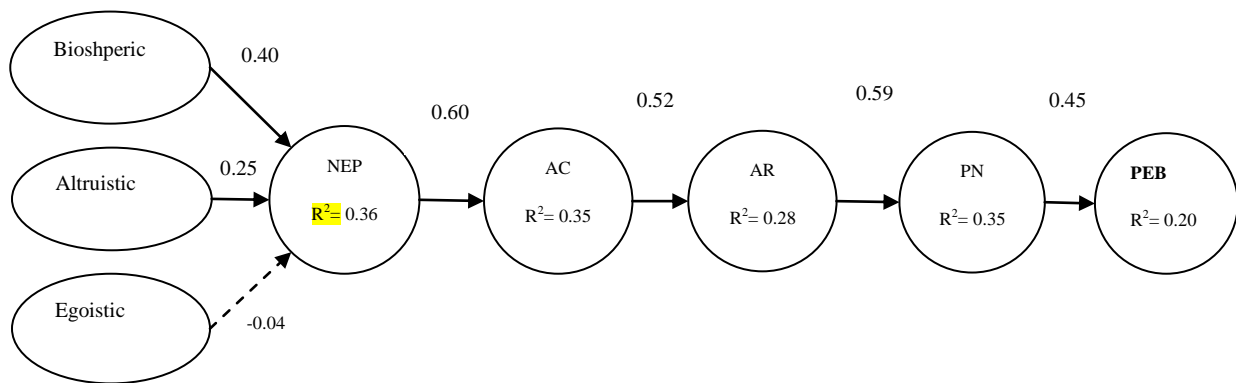
two constructs demonstrates weak R^2 values (> 0.19), suggesting that a moderate amount of variance is explained by the hypothesized model.

Subsequently, the hypotheses 1-7 were tested and, as expected, the findings showed that biospheric value and altruistic value were positively related to New ecological paradigm ($\beta = 0.40$, $P < 0.01$; $\beta = 0.25$, $P < 0.01$, respectively), explaining 36% of the variance, thus supporting H1 and H2. The respondents who were caring and conscious about other people's wellbeing and the entire environment had more positive attitudes regarding the environment. Moreover, new ecological worldview was positively associated with awareness of consequences ($\beta = 0.60$, $P < 0.01$), explaining 35.4% of the variance, and supporting H4. The more the students had positive attitude regarding the environment, the more they were aware of the adverse consequences of not acting pro-environmentally. Awareness of consequences in turn was positively related to ascribed responsibility ($\beta = 0.52$, $P < 0.01$), explaining 27.5% of the variance, thus supporting H5. The more the respondents were aware of the adverse consequences of not acting pro-environmentally, the more they felt responsible for the negative consequences. It was found that ascription of responsibility had a positive significant relationship with personal norm ($\beta = 0.59$, $P < 0.01$), accounting for about 35.1% of the total

Table 2. Evaluation of structural model.

Hypothesis	Relationship ^a	Path coefficient	SD	<i>t</i> -Value	R^2 value	Decision
H1	Biospheric value \rightarrow NEP	0.40	0.071	5.62	0.360	Supported
H2	Altruistic value \rightarrow NEP	0.25	0.075	3.34		Supported
H3	Egoistic value \rightarrow NEP	-0.04	0.069	0.62		Not supported
H4	NEP \rightarrow AC	0.60	0.042	14.14	0.354	Supported
H5	AC \rightarrow AR	0.52	0.050	10.53	0.275	Supported
H6	AR \rightarrow PN	0.59	0.045	13.28	0.351	Supported
H7	PN \rightarrow PEB	0.45	0.052	8.76	0.203	Supported

^a NEP: New Ecological Paradigm; AC: Awareness of Consequences; AR: Ascription of Responsibility; PN: Personal Norm; PEB: Pro-Environmental Behaviour.



Note: NEP: New ecological paradigm; AC: Awareness of consequences; AR: Ascription of responsibility; PN: Personal Norm; PEB: Pro-environmental Behavior

Figure 2. Result of the structural equation modeling.

variance in personal norm, thus supporting H6. The more one feels responsible for the negative consequences of not acting pro-environmentally, the more one feels a moral obligation to take pro-environmental actions. Finally, personal norm was positively associated with pro-environmental behaviours ($\beta = 0.45, P < 0.01$), explaining about 20.3% of the variance, thus supporting H7. The more one feels a moral obligation to take pro-environmental actions, the more one behaves pro-environmentally. In this study, egoistic value ($\beta = -0.04, P > 0.05$) was not significantly related to new ecological paradigm; therefore, H3 was not supported. Next, the indirect impacts of study variables were examined (Figure2).

Mediation Effects

The bootstrapped estimates for the indirect

effects are displayed in Table 3, showing the significance of the tested indirect (mediated) effects in all cases, as the 95% confidence intervals did not include zero. Therefore, our predictions for mediation were supported for the NEP, AR, AC and PN. In other words, the NEP indeed mediated the relationships between Biospheric and Altruistic and the AC, because the relationship between Biospheric and Altruistic and AC was significantly weaker when the NEP was controlled. In addition, the AR mediated the relationship between the AC and the PN as we expected, because the relationship between the AC and PN was significantly weaker when AR was controlled. Moreover, the PN, mediated the relationship between the AR and the PEB, as the relationship between the AR and the PEB was significantly weaker when the PN was controlled. The size of indirect effect was assessed using the variance accounted for (VAF), representing the ratio of indirect effect

Table 3. Bootstrap analysis and statistical significance of indirect effects.

Relationship ^a	Indirect effect	SE	95% Confidence level	VAF
Biospheric → NEP → AC	.21	.043	.118-.290*	.36
Altruistic → NEP → AC	.23	.037	.154-.327*	.43
NEP → AC → AR	.20	.041	.103-.3.3*	.32
AC → AR → PN	.21	.034	.148-.292*	.35
AR → PN → PEB	.18	.034	.114-.259*	.69

^a NEP: New Ecological Paradigm; AC: Awareness of Consequences; AR: Ascription of Responsibility; PN: Personal Norm; PEB: Pro-Environmental Behavior. * The 95% confidence interval excludes zero and therefore is significant at $P < 0.05$.

to the total effect (Hair *et al.*, 2017). According to Hair *et al.* (2017), partial mediation is represented when the *VAF* is above the 0.2 threshold level and that full mediation is represented when it is above 0.8. In Table 3, the values of *VAF* indicate that there exists partial mediation, as the *VAF* values are within the 20-80% interval. The *VAF* values for the NEP, AC, AR, and PN are 0.43, 0.32, 0.35, and 0.69, respectively. Therefore, we can confirm that all mediating variables partially mediate the relationships between the distal variables and the outcome variables in the causal chain.

DISCUSSION

To our knowledge, this is the first study designed and conducted to test the VBN theory in the environmental context of Iranian agricultural students. Most importantly, the results of this study confirmed the applicability of the VBN theory as a framework for understanding university students' pro-environmental behaviour in a non-Western culture and developing country, which helps validate the model's intercultural application. The results also demonstrated the linkage in the chain effects, including the direct effects of the causal chain VBN theory postulates, and the indirect effects of the individual values of the NEP, AC, and AR on pro-environmental behaviour.

Each individual variable in the VBN model was related significantly to the next variable in the causal chain; this confirmed that individuals shift from relatively stable personal values to more general beliefs about human-environment relations and, thereafter, to more specific beliefs and norms that encourage pro-environmental behaviour. The results we obtained were consistent with those of previous studies (e.g., Stern *et al.*, 1999; Stern, 2000; Steg *et al.*, 2005; van Riper and Kyle, 2014; Chen, 2015; Kiatkawsin and Han, 2017; Whitley *et al.*, 2018). This confirmed that the VBN model is robust in predicting pro-

environmental behaviour and implies that the PN (the sense of moral obligation to take action) is its ultimate predictor. This personal norm is considered a function of a chain that consists of three beliefs: the AR, AC, and NEP, which are determined by environment-relevant values. Moreover, this study verified that each intervening variable in the VBN theory's causal chain mediates the relationship between the distal and outcome variables. Given that this study was conducted in the context of Iranian university students, the NEP, AC, and AR beliefs and PN demonstrated a partial mediating relationship among their antecedents and the outcome variables in the causal chain. These findings also were consistent with previous pro-environmental studies that have employed the theory (e.g., Stern *et al.*, 1999; Stern, 2000; Nordlund and Garvill, 2003; Jakovcevic and Steg, 2013; Chen, 2015; Han, 2015; Van Riper and Kyle, 2014; Kiatkawsin and Han, 2017).

The above findings provided additional evidence for the generalizability and applicability of the VBN for the prediction and understanding of pro-environmental behaviours within a non-Western and developing country context. Comparing the results of the present study with those of the USA study (Whitley *et al.*, 2018), the European study (Steg *et al.*, 2005; De Groot *et al.*, 2008), and the Asian study (Chen, 2015), the relationships between values, beliefs, norms, and behaviours are very similar and all of the expected mediation effects were observed; while contrary to the previous studies conducted in Western societies (Steg *et al.*, 2005; De Groot and Steg, 2008; Lind *et al.*, 2015), no significant relationship between egoistic value and NEP was found. This finding was, however, consistent with the findings made by previous researchers in non-Western countries (Kiatkawsin and Han, 2017, in South Korea; Nordfjærn and Fallah Zavareh, 2017, in China). They reported that egoistic values did not predict environmental worldview in their samples. One explanation for this finding may lie in the cultural



contexts of Iran versus Western countries like the USA and the Netherlands. In his famous IBM Study, Hofstede (2001) found that Iran scored high on collectivism. From the VBN perspective, a higher collectivism, in which people focus more on the benefits, well-beings, and needs of the collectives rather than those of individuals, could result in particularly altruistic and biospheric values, predicting positively pro-environmental beliefs, norms, and behaviour. Another possible explanation could be that young Iranians do not place a high emphasis on social dominance, wealth, influencing power over others, and authoritative power. Some scholars suggest including hedonic values in the VBN theory because these values may be a stronger predictor of NEP than egoistic values (Steg *et al.*, 2014). A potential reason is that environmental worldview has stronger hedonic implications (e.g. requires increased effort and a somewhat reduced individual comfort for the benefit of the collective) (Nordfjærn and Fallah Zavareh, 2017). This suggestion could be taken into account in future studies of environmental behaviour in Iran.

From the PLS analyses, the variances in pro-environmental behaviour explained by VBN theory were moderate (0.20). Hence, in this study, the VBN theory was as predictive of pro-environmental behaviour as in previous studies using the same variables in the USA (22%; van Riper and Kyle, 2014), in the Netherlands (32%; Steg *et al.*, 2005), in Argentina (22%; Jakovcevic and Steg, 2013), and in Taiwan (31%; Chen, 2015).

The theoretical findings have important practical implications for the promotion of environmental behaviours among university students. Higher education institutions could attempt to use our findings for planning interventions that could consider different value types to promote the potential for pro-environmental behaviour.

Based on these findings, variables such as personal norms appear to explain an important part of pro-environmental

behavior. It is therefore crucial that environmental education policies should be designed to create non-monetary incentives favoring proper behaviors, thus highlighting the importance of individual responsibility. Although adherence to norms that are accompanied by the aforesaid behaviours was a consistent predictor in our study as well, the theory affirms that norms are ultimately built upon one's values. Accordingly, these study findings propose that higher education plans capable of strengthening the students' biospheric and altruistic values -meanwhile highlighting the negative aspects of the human conduct on the environmental resources- can be effective in provoking the sense of responsibility and moral norms in them, thereby empowering their pro-environmental behaviour. Such educational programs are required to reflect the recipients' values to be effective (Schultz and Zelezny, 2003), meanwhile providing corrective information on those behavioural changes they can undertake for environmental protection purposes. In other words, the educational authority shall equip the target groups (university students) with the why, what, and how of the behaviour in question to initiate the desired behavioural change (Kaplowitz *et al.*, 2009; Yeboah and Kaplowitz, 2016). Therefore, if a higher education institute seeks changing of the students' current norms, it must first focus on empowering their positively pro-environmental values and beliefs. Although the mere focus on norms may seem more convenient, but because the norms emanate from the beliefs and values, it will be hard to change the norms (and behaviour) without changing the values first. Finally, on the basis of the VBN theory model and findings of the present study, we propose that in order to effectively and successfully change the university students' behaviour in respect with the environment, the higher education authorities must provide programs for internalizing the interconnection of this behaviour with the students' beliefs and values' frameworks (Whitley *et al.*, 2018).

In addition, professional agricultural curricula and courses should be designed with sustainability in mind; environmental values and norms should be tailored to teach students that practicing sustainability not only assures societal development but also improves and secures their personal lives. In this way, agricultural colleges and universities will be able to educate and train the younger generation to secure the future of the global society. Academic freedom and autonomy enable universities to take a central role in developing both individual and social learning systems towards sustainable development (Chakraborty *et al.*, 2017).

Despite its positive outcomes, this study has certain limitations that should be considered when generalizing its findings. The main limitation is that the questionnaire was based only on subjective self-reporting of pro-environmental behaviour, and pro-environmental behaviour activities were not evaluated objectively in real settings. Despite assuring anonymity to survey participants, respondents may be overestimating their socially desirable behaviour when answering the questionnaire. Future studies must use a combination of methods (e.g., survey-based methods must be combined with more objective methods such as participant observation). The second limitation is that the study used a convenient sample of students. Although this is quite common in many such studies and the sample size and response rate were more than adequate, the findings of the study cannot necessarily be generalized to the population of agricultural students at Iranian universities. The third limitation is that the study used cross-sectional data. Similar to that in all cross-sectional studies, evidence of an association should be interpreted cautiously before the actual causality is confirmed. Because of the cross-sectional data, this study failed to track changes in people's perceptions of the components in the VBN theory model over time. Future studies should use a longitudinal methodology to track such

changes in perceptions. Accordingly, experimental and/or longitudinal methodologies must be used in future studies to investigate the ways by which academic settings can change the effects of values, beliefs, and norms on students' environmental behaviour over time. Finally, we suggest that future studies should examine the determinants of pro-environmental behaviour and integrate the required external or contextual factors into the VBN theory model to enhance its predictability for pro-environmental behaviour activities.

CONCLUSIONS

We tested the VBN theory in Iran and found empirical evidence that the theory can be useful in predicting students' pro-environmental behaviours in a non-Western, developing country. Overall, we found results in Iran to be similar to those of previous studies, with one main difference being that egoistic value was not significantly related to ecological worldview in the current study. This difference may lie in the cultural contexts of Iran versus Western countries. Based on the empirical evidence, we offered several suggestions for future research and interventions that may be effective in encouraging and promoting pro-environmental behaviour.

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رفتارهای دوست‌دار محیط زیست در بین دانشجویان کشاورزی: بررسی نظریه ارزش-باور-هنجار

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چکیده

هدف مطالعه حاضر بررسی و شناخت رفتارهای دوست‌دار محیط زیست دانشجویان در ایران است. در این مطالعه از چارچوب نظری ارزش-باور-هنجار استفاده شد. داده‌ها با استفاده یک پیمایش خود-اجرا از ۲۹۵ دانشجوی کشاورزی دانشگاه بوعلی سینا گردآوری و سپس با استفاده از رویکرد حداقل مربعات جزئی تجزیه و تحلیل شدند. نتایج مدل‌یابی معادلات ساختاری نشان داد که نظریه ارزش-باور-هنجار می‌تواند به طور موثری برای پیش‌بینی رفتار دوست‌دار محیط زیست در بین دانشجویان در یک کشور غیرغربی و در حال توسعه به کار برده شود که این امر بیانگر اعتبار این نظریه در محیط‌های بین‌فرهنگی می‌باشد. ترتیب علی متغیرها در نظریه مذکور هم تایید شد. به عبارت دیگر، در زنجیره علی نظریه هر متغیر با متغیر بعدی رابطه‌ی معنی‌دار داشت. به علاوه، همانطور که فرض شده بود، متغیرهای میانجی رابطه‌ی بین متغیرهای پیش و پس از خود را به طور معنی‌داری میانجی‌گری کردند. این نتایج بیانگر آن است که نظریه ارزش-باور-هنجار برای درک و شناخت رفتارهای دوست‌دار محیط زیست در کشورهای در حال توسعه و غیرغربی، چارچوب نظری مناسب و مفیدی می‌باشد.