



A Critical Review of Sustainable Pro-Environmental Behavior Theories

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Abstract

Agricultural production decision-making is becoming more complicated due to the inherent complexity of the interaction between natural and human processes as the heart of agricultural systems. Predicting the behavior of agricultural systems is critically important for sustainability issues. Since agriculture is a human activity that is dependent on its main actors, farmers' behavior needs to be investigated in terms of the extent to which their activities are consistent with sustainable agriculture initiatives. This study is based on the documentary research method conducted by a systematic literature review. The main goal was to review and analyze pro-environmental behavior theories in terms of their strengths and weaknesses during the time period of 1975-2016. The strengths and weaknesses of each theory were described after the introduction of each theory. On the other hand, a comparison of the theories based on seven indicators is presented too. About 14 theories were reviewed to reach agent-based theories of decision-making, in which feedback is provided on the system. Based on the results, the agent-based integrated theories are diagnosed to be the most suitable and comprehensive for the study and prediction of farmers' behaviors among the studied theories.

Keywords:
Decision-making; behavioural theories; critical review; documentary research; pro-environmental behaviour

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INTRODUCTION

Environmental psychology, looks at the range of complex interactions between humans and the environment. Over the last 30 years many psychologists and sociologists have explored the roots of direct and indirect environmental action (Allean & Ferrand, 2010).

According to studies, the incidence of poisoning by pesticides is increasing in developing countries, especially in South Asia (Gunnell & Eddleston, 2003), indicating that the behaviors of farmers in developing countries conflict with sustainability goals. In addition, many studies (Beedell & Rehman, 2000; Burton, 2004; Kings, 2014; Loloei et al., 2014; Willock et al., 1999) have reported that the complexities of the agricultural system are mostly related to the interaction between the farmer and his/her surroundings (social and ecological environment). Thus, it is both crucial and difficult to understand the behavior of farmers as the main actors of the agricultural system in issues related to sustainability and instability as it is influenced by various social and ecological variables. Given the above-mentioned issues, it should be stated that understanding the behavior of farmers is the core of the efforts to expand adaptation capacity and move towards sustainable agriculture. Actually, farmers are actors who assume sustainability policies and programs, so their behavior plays an important role in how successfully these programs will be implemented. Agricultural policy-makers and decision-makers require a tool to anticipate how to encourage farmers to implement agricultural policies. Therefore, it is important to understand the factors encouraging farmers' behavior. To achieve this and to fully understand the instability behavior of the farmers, it seems essential to select the best and most comprehensive understanding model of behavior, which is addressed in this study. Limited studies have compared and criticized the theories of environmental behavior. In this study, theories are introduced with an evolu-

tionary trend. Then they are compared based on indicators and finally, the strengths and weaknesses of each theory are explained. Introduction, comparison, and critique of theories make it possible to select a more complete theory for use in experimental studies.

Pro-environmental behavior theories

Theories related to behavior and its relationships with attitude and other psychological attributes were started before the 1960s, but none of them offered any relationship between behavior and attitude (Beedell & Rehman, 2000) while in the late 1960s, these models and theories were developed, indicating that such a weak causal link did exist (Wicker, 1969) and recalling attention to the behavior models. On the other hand, environmental problems and issues influenced by agricultural production have steadily increased in importance since the 1980s in public debates (Vogel, 1996). Looking at the historical evolution of environmental behavioral models, it may be argued that the starting point of the widespread use of these models goes back to 1975 by the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975). The next theory after TRA was the Norm Activation Theory (Shalom Schwartz, 1977), which uses normative considerations to predict pro-environmental behaviors rather than self-interest (van der Werff & Steg, 2015). At the same time, environmental decision-making was studied from the perspective of social psychology of behavior by the Theory of Interpersonal Behavior (Triandis, 1977). In this theory, social factors and emotions, especially habits, are highlighted and it can be said that it was a theoretical alternative to the TRA model (Moody & Sipoenen, 2013). Then, Fietkau and Kessel (1981) used sociological as well as psychological factors to explain pro-environmental behavior or the lack of it (Kollmuss & Agyeman, 2002). The Theory of Planned Behavior (TPB) was developed to predict people's intention/behavior (Ajzen, 1986) and was an extension of

TRA to predict people’s behavior (Han & Yoon, 2015). The other models related to pro-environmental behavior from 1985 to 2010 are shown in Figure 1.

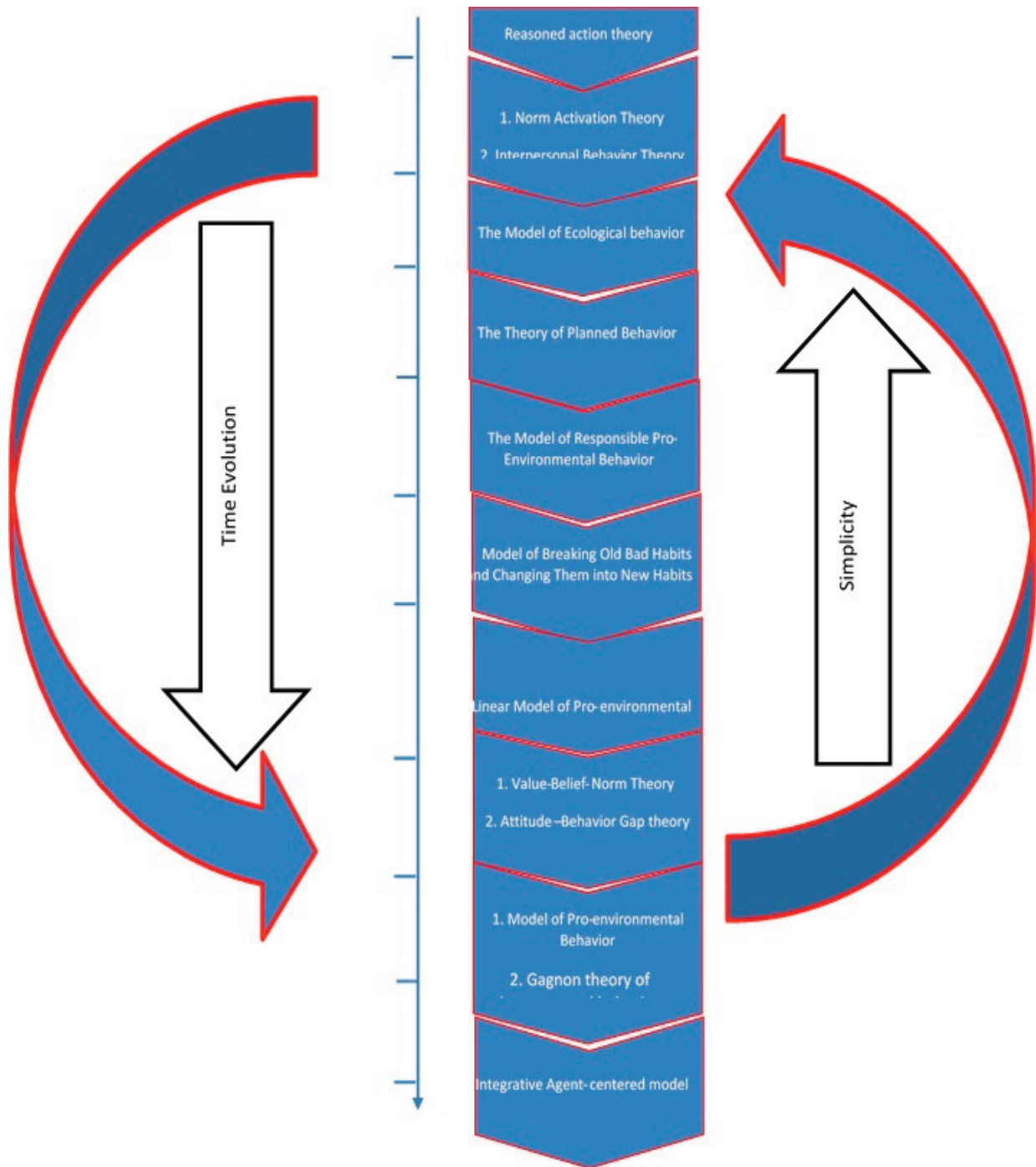


Figure 1. The review of sustainable pro-environmental behaviour models over time 1975-2010

According to this evolution pathway, as we move towards new models, a shift happens from limited components and interactions towards more factors and interactions in order to predict environmental behaviors. Also, behavior simulation and feedback are added to new models of predicting environmental behaviors. In the next section, attempts are made to discuss each of these models briefly and to extract their constraints and advantages within the [Table 1](#).

1.1. The theory of reasoned action (Martin Fishbein & Icek Ajzen, 1975)

It represents social behavior and argues that human behavior is the result of beliefs that underlie this behavior ([Figure 2](#)). From the viewpoint of the developers of this theory, two factors of attitude and subjective norms affect an individual's behavior. People behave based on their beliefs about the outcomes of behavior and the value of these outcomes. People's beliefs and evaluations of the result of their behavior lead to attitudes about the behavior. The subjective norms of an individual imply that the belief of those who are important to an individual is more important than his or her own belief towards his or her behavior. This model has been used to understand different behaviors, such as diet, women's occupation, family planning, and choice of transport ([Ajzen, 1991](#)) and to predict consumer buying behavior ([Ajzen & Fishbein, 1980](#)). However, this theory has some constraints ([Table 1](#)).

1.2. The norm activation theory (Shalom Schwartz, 1977)

One of the models of pro-environmental behavior ethics is the norm activation theory. The main motive of this theory is to provide a framework for understanding altruistic and pro-social behaviors and has been widely used to understand and anticipate pro-environmental behavior. In this theory, contrary to TRA that people's behavior is represented based on their beliefs about their behavioral outcomes and the value of these outcomes,

pro-social behavior is only affected by personal norms. These norms derive from two direct psychological phenomena: awareness of behavioral outcomes and acceptance of personal responsibility, which affect one another directly, in addition to their direct effect on behaviors ([Figure 3](#)). The theory has been used by [Stern et al. \(1999\)](#) to examine pro-environmental behaviors, [Hopper and Nielsen \(1991\)](#) and [Vining and Ebrov \(1990 and 1992\)](#) to review recycling behaviors to explain house energy compatibility, and to examine alternative car use. However, this model is not a suitable option for identifying behavior due to its limitations ([Table 1](#)). The study showed that this theory is a moral-social theory. People are aware of the consequences. It has external and internal components but no feedback has been received from it.

1.3. The theory of interpersonal behavior (Triandis, 1977)

[Triandis \(1977\)](#) argues that in any situation, behavior is influenced by intention and largely by habitual responses and ultimately by situational pressures and conditions. From his point of view, intentions are influenced by social, emotional, and intellectual considerations. In this model, the person behaves neither completely consciously nor completely unconsciously, neither completely independently nor completely influenced by the community. Indeed, Triandis emphasizes the unconscious part of the behavior in addition to the conscious part. In his view, a habit that is based on the past behavior of individuals leads to automatic behavior in certain situations so that when a person is in a particular situation, he behaves in accordance with the habit. In addition, in his view, facilitating conditions as a structural factor facilitate specific behaviors in the environment ([Figure 4](#) and [Table 1](#)).

Table 1
Comparison of Pro-environmental Behaviour Models in Terms of Pros and Cons

Pro-environmental behaviour models	Pros	Cons
The theory of reasoned action (Fishbein & Ajzen, 1975)	It can be used by modifications in different themes.	The effects of environmental changes on the type of reaction and the occurrence of behaviour have not been investigated. This model is belief-based and does not involve the effect of external factors (personality, cultural factors, demographic variables, political orientation, performance, environmental awareness, and religious beliefs). There is no explanation for the change in behaviour. It is applicable in a situation where there is a significant voluntary control over behaviour, and when the amount of voluntary control decreases on one's behaviour, this model is no longer applicable.
The norm activation theory (Schwartz, 1977)	The effect of variables on each other is considered.	It emphasizes only altruistic values. The influence of the internal factor of attitude on behaviour is neglected, while this internal factor can greatly affect behaviour. In this model, the effect of habit on behaviour is ignored. It does not specify external components (such as social, economic, cultural, and demographic factors) effective on behaviour well. The effect of habit on the occurrence of behaviour is ignored.
The theory of interpersonal behaviour (Triandis, 1977)	In addition to the conscious part of behaviour, it emphasized the unconscious part as well.	The impact of unpredictable factors and internal and external factors has been ignored. The level of personal skills and experiences, the level of literacy, resources available resources are also known to change attitudes and affect behaviours that have not been addressed in this model. The existence of social components and behavioural habits are considered to not affect attitude, while these two factors can affect the creation of positive or negative attitudes. The rules laid down in relation to each subject are also among social components. In this model, its influence on decision and behaviour has not been considered.
The theory of planned behaviour (Ajzen & Madden, 1985)		In this model, the impact of social norms, roles, and values on subjective norms has not been investigated. The tendency to do something does not always lead to its occurrence. Existence of unanticipated internal and external factors and some personal and social issues may lead to behaviour contrary to the person's desire.
The value-belief-norm theory (Stern et al., 1999)	In addition to altruistic values, it includes biological values and selfishness.	This model is almost linear and for new behaviours it is necessary to go through all these steps. Awareness of the consequences of the action occurs after the adoption of the new environmental model, while in some societies, especially rural communities, as long as the outcomes and benefits of the new model are not known to their previous model, they will not accept it. The influence of components on each other is ignored. Three biological, altruistic, and selfishness values are considered to be effective in adopting a new environmental model, while cultural factors, especially in rural communities, will not have any effect on traditional values. Values and beliefs only affect personal norms, while these two factors may also affect social, political, and cultural norms. A personal norm is the only norm that is known to affect behaviour, while social, cultural, political and economic norms will not be ineffective.
The revised interpersonal behaviour model (Gagnon et al., 2010)	The effect of habit on behaviour is explored.	The effect of the advantages and disadvantages of the components on attitude and behaviour has not been determined. The impact of individual, social and attitude beliefs on each other is ignored.
The revised interpersonal behaviour model (Moody & Siponen, 2013)	Advantages and disadvantages of belief about outcomes and evaluation thereof on attitude are explored.	In this model, the influence of social components and habit on attitude is not investigated. The effects of internal, external, and unpredictable factors have not been investigated. Only advantages and disadvantages of two factors that affect attitude are explored and the advantages and disadvantages of factors affecting social components, outcomes, and habits have been ignored.

Table 1
Continued

Pro-environmental behaviour models	Pros	Cons
The sociological model for analyzing pro-environmental behaviour (Fietkau & Kessel, 1981)		In this model, the impact of variables on each other is not investigated. Knowledge does not have a direct impact on environmental behaviours, but indirectly affects environmental behaviours through influencing individual values and attitudes. The impact of facilities on the motivation for action has not been investigated. It is single-dimensional and applicable only in the environmental field. Lifestyle, variables of sense of responsibility, social ethics, education, and traditional and religious values are also effective in protecting the environment and choosing environmental behaviours, but are not considered in this model. In this model, the effect of factors of economic and social pressures on selection of behaviour and factors affecting environmental knowledge and motivation for action is not specified.
The model of responsible pro-environmental behaviour (Hins et al., 1986)		In this model, the reasons for the difference between attitude and behaviour are not specified. It investigates only individual components and does not pay attention to social components. The effect of knowledge on personal components is ignored.
The model of breaking old bad habits and changing them into new habits (Dahlstrand & Biel, 1997)		This model is linear and for new behaviours, all these steps should go through.
The linear model of pro-environmental behaviour (Burgess et al., 1998)		The most important factor in shaping the attitudes of individuals is their knowledge, while various internal factors (such as social environment and social learning) can affect an individual's attitude. Media or education creates attitudes in the individual that may not show true beliefs or behaviours. According to this model, if there is false information or lack of information, making informed choices about environmental behaviours will be difficult. Although environmental knowledge should be considered as a necessity, it is not a sufficient condition for decision-making.
The model of attitude-behaviour gap (Blake, 1999)	It addresses the gap between attitude and behaviour.	This model specifies the sphere of constraints, but does not address and identify the constraints of each sphere and.
The model of pro-environmental behaviour (Kollmuss & Agyeman, 2002)	It evaluates internal and external components and limitations and barriers affecting environmental behaviours have been identified.	This model evaluates the components but do not review feedback and behavioural implications.
The integrative agent-centered model (IAC) (Feola & Binder, 2010)	The influence of several factors such as tendency, habit, physiological excitation and internal and external factors as factors influencing decision and behaviour, perceived and unperceived, desired or unintended effects, and feedback are measured. This model measures both internal and external factors affecting behaviour and identifies the outcomes. It can be used in various research projects to study behaviour in agricultural, social, and environmental systems. It is rooted in the action-theoretic approach of social research, and is a comprehensive model with more than one individual. Hence, the behavioural assessment is carried out collectively. It is developed for a group of farmers; it can be generalized to a part of the community.	This is more of a psychological model that has not paid attention to social and economic issues that have a great impact on behaviour. It has specified the underlying factors as generally related to both internal and external factors, but it has not specified the details of each factor.

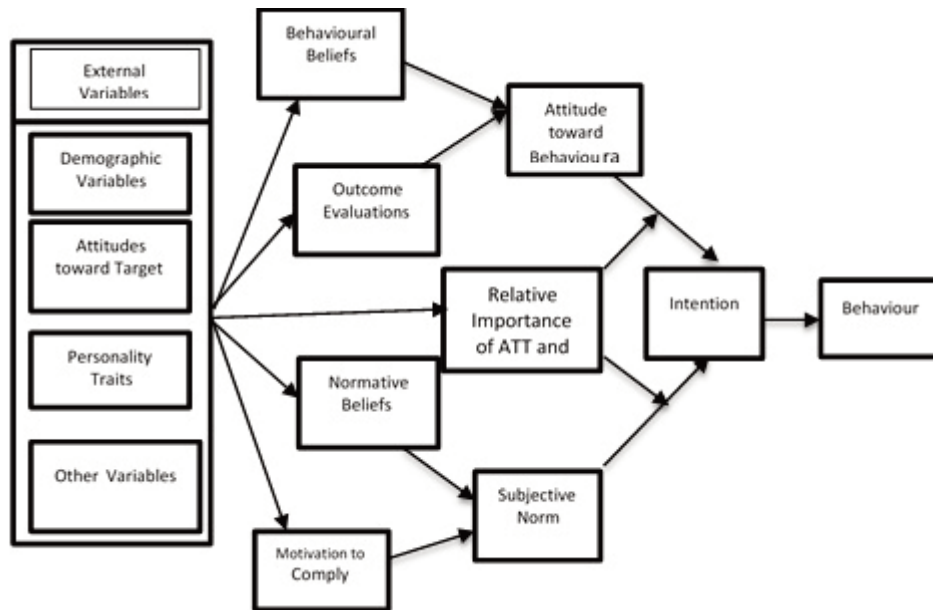


Figure 2. The theory of reasoned action (Martin Fishbein & Icek Ajzen, 1975)

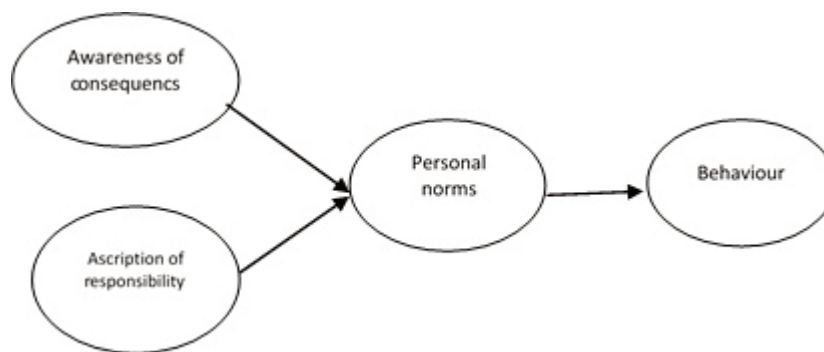


Figure 3. The norm activation theory (Shalom Schwartz, 1977)

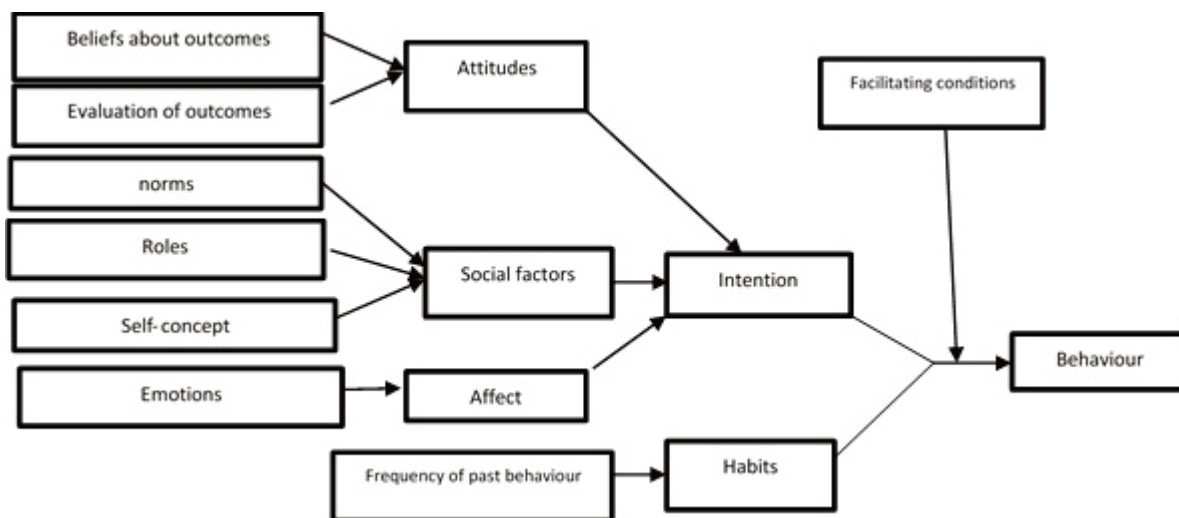


Figure 4. The theory of interpersonal behaviour (Triandis, 1977)

This theory has four factors affecting behavior and activity in the social sphere. In this theory, there are two indirect and two direct components. Research shows that this theory has no feedback and therefore it does not assess consequences. Also, this theory has no support theory.

1.4. The model of ecological behavior (Fietkau & Kessel, 1981)

Many researchers have stated that behavior models lack sociological and psychological variables, so Fietkau and Kessel (1981) proposed a model based on the sociology of five variables influencing environmental behavior (Figure 5), but they did not determine the effect of variables on each other (Table 1).

This theory has four internal components and one external component. The model contains five factors affecting behavior.

1.5. The theory of planned behavior (Ajzen & Madden, 1986)

Ajzen and Madden (1985) developed the

theory to eliminate the lack of the use of TRA when the amount of intentional control decreases on one's behavior, and, in addition to the other two components (attitude and norm), they added the component of control of objective behaviors (Figure 6). The ability of this third component decreases when the intention to behave is sufficient or that intentional control over behavior is high. Relative weights of these three constructs vary in different societies and behaviors. In this model, it is stated that the behavior is related to two factors: motivation (behavioral intention) and ability (behavioral control). The theory of planned behavior has widely been used to understand behaviors. This model is also used in the literature on environmental conservation behaviors, often referred to as "environment-friendly behavior" (Stern, 2000). A number of studies have shown that there is a strong relationship between pro-environmental goals and pro-environmental behaviors (Boldero, 1995). This model also has some limitations (Table 1). In this theory,

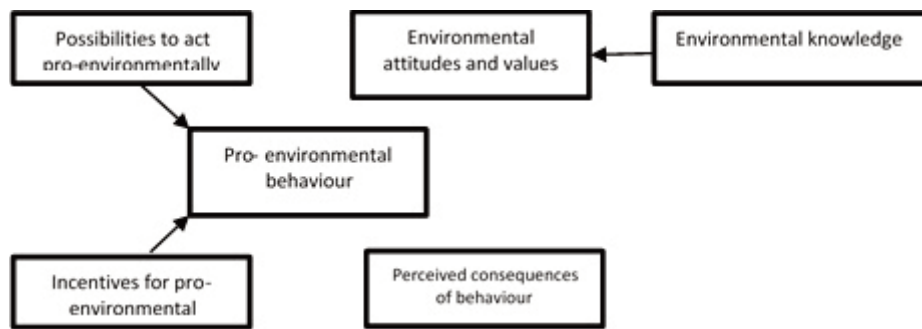


Figure 5. The model of ecological behavior (Fietkau & Kessel, 1981)

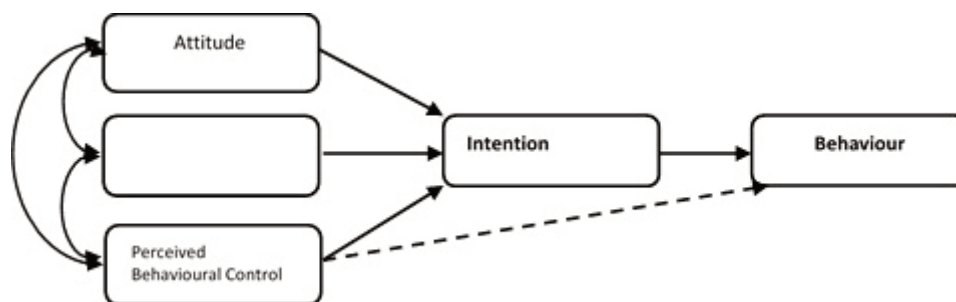


Figure 6. Theory of planned behavior (Ajzen & Madden, 1986)

there is no feedback and assessment of consequences. Theories supporting this theory are reasoned action and internal components.

1.6. The model of responsible pro-environmental behavior (Hins et al., 1986)

This behavior model is based on the theory of planned behavior by Ajzen and Fishbein. They reviewed 128 studies on pro-environ-

mental behavior and extracted variables influencing environmental behavior (Figure 7). The model reviewed with the components by Hins et al. (1986) failed to explain a significant portion of behaviors. Hence, situational factors were also added to the model. Situational components reflect economic restrictions, social pressures, and choosing different measures. In addition to the defects, this model also has limitations (Table 1).

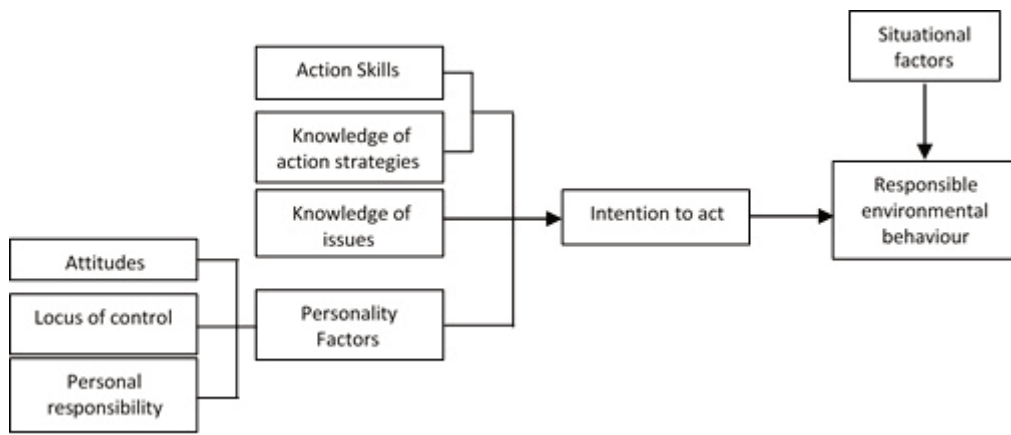


Figure 7. The model of responsible pro-environmental behavior (Hins et al., 1986)

1.7. The model of breaking old bad habits and changing them into new habits (Dahlstrand & Biel, 1997)

The theory suggests that to achieve a new habit, the individual needs to feel the need and be aware of it, then consider an alternative option for the past behavior habits and

assessment of the outcomes of that behavior and new habits are formed (Figure 8). This model is linear and it is necessary to go through these steps for these new behaviors (Table 1). There are two factors affecting behavior in this theory.



Figure 8. The model of breaking old bad habits (Dahlstrand & Biel, 1997)

1.8. The linear model of pro-environmental behavior (Burgess et al., 1998)

It is a simple and primary model in the field of pro-environmental behaviors. According to this model, the pro-environmental behavior of individuals is caused by their attitude and the most important factor in the attitude of people is their knowledge (Figure 9) while different internal factors can affect people's attitudes. Boldero (1995), argue that the so-

cial context or the social environment and social learning also lead the person in a particular direction. Studies show that in most cases, greater knowledge and awareness do not lead to pro-environmental behaviors (Haghighatian et al., 2005). Media or education creates attitudes in people where they might not show their true ideas or behaviors (Karimi, 2013). The pros and cons of this model are mentioned in Table 1.



Figure 9. The linear model of pro-environmental behaviors (Burgess et al., 1998)

1.9. The value-belief-norm theory (Stern et al., 1999)

The theory suggests that environmental altruistic behavior appears when help norms activate the three personal values, feeling of threat to values, and one's belief in his ability to reduce the threats. The difference between the theory and the norm activation theory is that the latter only emphasizes altruistic values, while the former involves other values as well (Figure 10). The presumption of the value-belief-norm theory is that the moral norms of individuals are activated when they become aware of the adverse consequences

of particular environmental conditions that threaten the values (awareness of the consequences). This is where the person feels responsible for reducing bad consequences. Stern et al. (1999) evaluated the triple behaviors (environmental citizenship rights, support for politics, and private sphere behaviors) in a normative value-belief-norm model with three environmental value models, which showed that this model describes individuals' behaviors more consistently than other patterns do. However, this model also has limitations (Table 1).

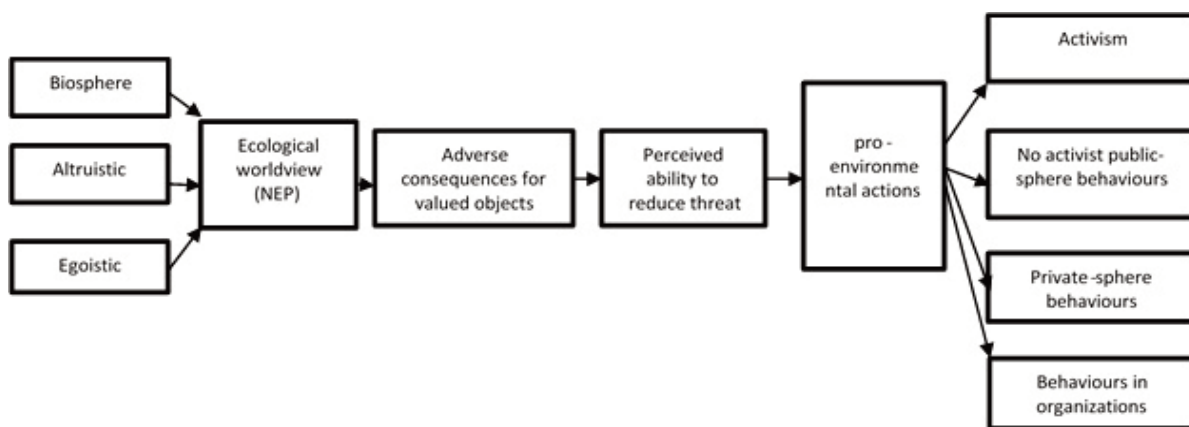


Figure 10. The value-belief-norm theory (Stern et al., 1999)

1.10. The model of attitude-behavior gap (Blake, 1999)

Blake (1999) proposed a model that has an advantage over other models. In this model, the gap between attitude and behavior is examined (Figure 11), while previous models could not explain the reasons for the gap existing between attitude and behavior. In other words, people with pro-environmental attitudes perform actions contrary to their attitudes. He argues that a rational person does not perform an activity contrary to his attitude, and the reason for these conflicting behaviors is the existing constraints. He stated that the constraints are in three general categories: (1) individual constraints; (2) social constraints; and (3) institutional constraints that affect pro-environmental behaviors. In addition, the source of constraints is in both personal and social spheres. Hence, Blake’s model of the attitude-behavior gap was presented. This model is also known as the value–action gap model. This model specifies the sphere of constraints but does not consider and identify the constraints of each sphere.

1.11. The model of pro-environmental behavior

This model evaluates internal and external factors and limitations and obstacles influ-

encing pro-environmental behaviors (Figure 12). The developers of this model believe that one’s attitude towards the stage of implementation undergoes many changes due to his constraints, which contradicts his initial attitude in the field of the environment. For example, farmers are eager to preserve the environment and always put it as their main goal, but in reality, external factors such as economic conditions, social and structural pressures on one hand and the absence of intrinsic incentives and awareness of sustainable behaviors on the other hand, as well as the habit component, which is considered to be a specialty of the individual, make the farmer implement unsustainable components. Blake examines the components in both personal and social spheres, while the leading model divides constraints into two parts of internal and external constraints. This model evaluates the components but does not review the feedback and behavioral consequences (Table 1).

1.12. The revised interpersonal behavior model (Gagnon et al., 2010)

The theory of interpersonal behavior presented by Triandis has always been used by various scholars, one of the most important of which is Gagnon et al. (2010). As can be seen in Figure 13, one of the most important differ-

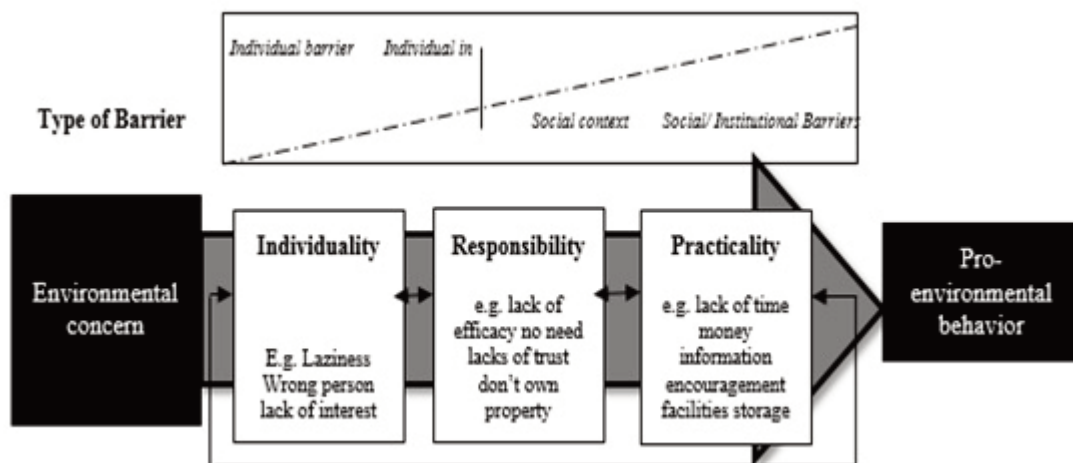


Figure 11. The attitude-behaviour gap model (Blake, 1999)

ences between this model and the initial theory of interpersonal behavior is the effect of the component of habit on the attitude of individuals. In other words, they believe that past repetitive behaviors have an effect on people's attitudes after a long period of time. However, this model has limitations (Table 1).

1.13. The revised interpersonal behavior model (Moody & Siponen, 2013)

Moody and Siponen revised the theory of interpersonal behavior. In the revised model (Figure 14), the attitude of individuals is obtained by the advantages and disadvantages of their beliefs and evaluation. In other words, this model does not suggest a direct

effect of beliefs on attitudes, and its effect is determined by factors such as advantages and disadvantages (Table 1).

1.14. The integrative agent-centered model (IAC) (Feola & Binder, 2010)

The IAC model provides a conceptual framework for farmers' action and perceived understanding based on their own structural field (Feola & Binder, 2010). Thus, the framework is important in the study of the behavior of farmers based on two important theories of Actor-centered Structuration Theory (ST) by Giddens (1984) and the Theory of Interpersonal Behavior (TIB) by Triandis (1977) (Raksanam et al., 2012). This model

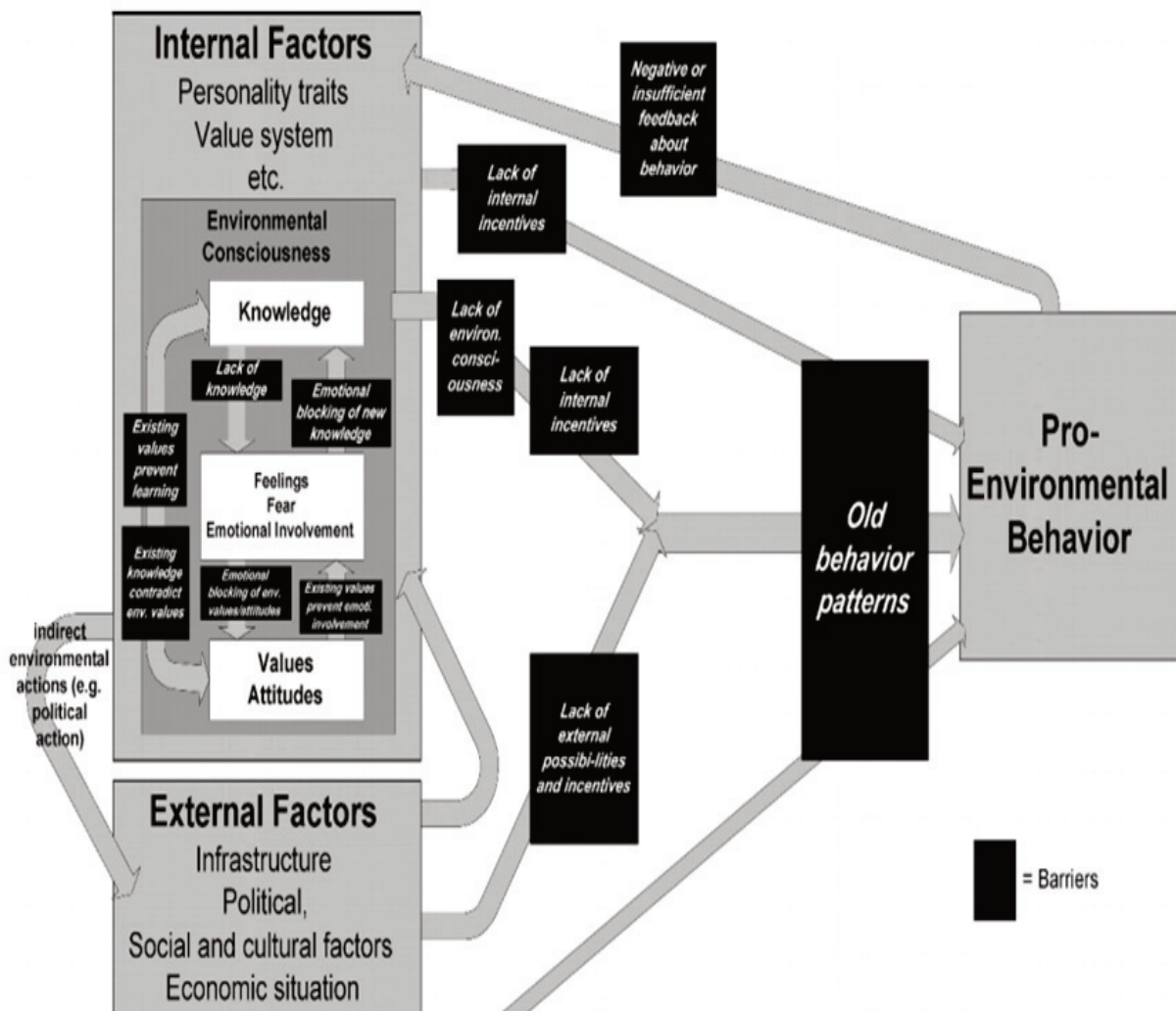


Figure 12. The model of pro-environment behaviour (Kollmuss & Agyeman, 2002)

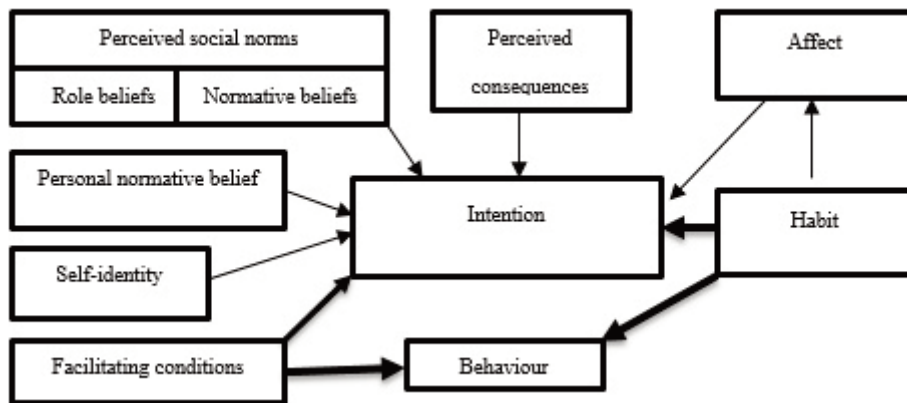


Figure 13. The revised theory of interpersonal behaviour (Gagnon et al., 2003)

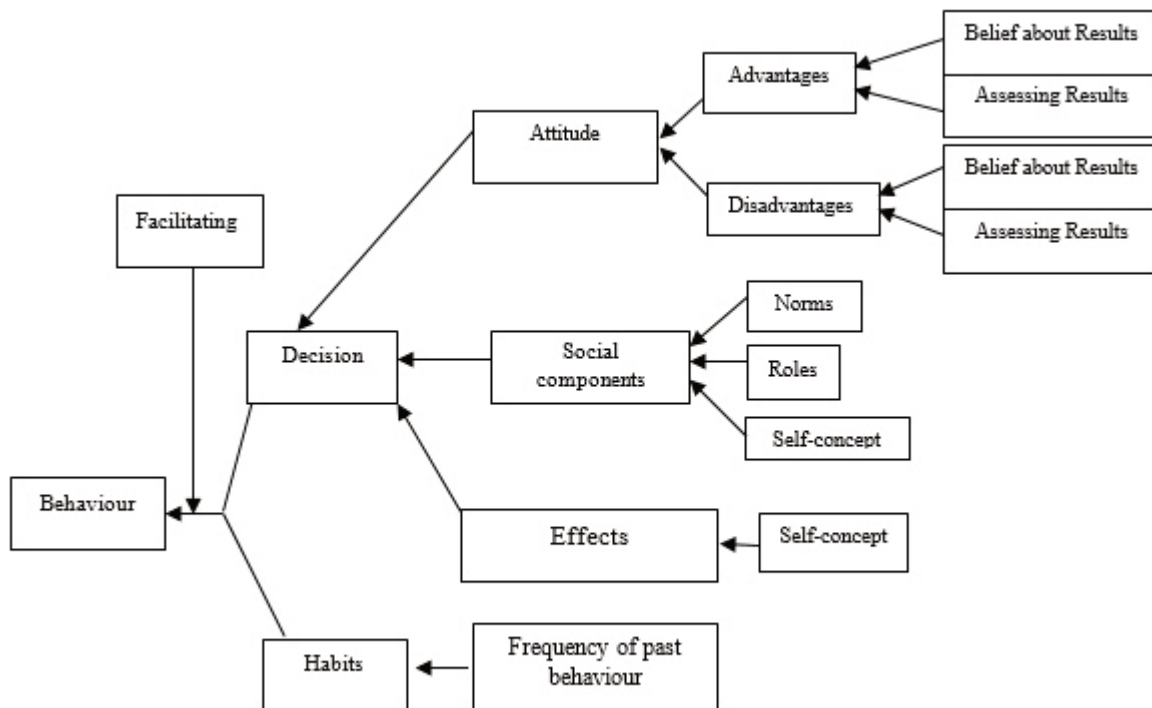


Figure 14. The revised interpersonal behaviour model (Moody & Siponen, 2013)

is rooted in the action-theoretic approach of social research and tries to fix criticism of the behavioral approaches that study the behavior of farmers separately and apart from the social environment. Within this approach, a social phenomenon should be viewed as a product of the actions of individuals who function in compliance with social status structure, i.e., the physical and symbolic context of macro-social actors within it should be analyzed (Boudon, 1985). Triandis (1977),

directly contribute to feedback from farmers through influencing tendency, affect, habit, and physiological excitation (Giddens, 1984). Feedback processes can strengthen or change the existing situation and can also happen at different levels of time. Customer interactions occur directly or indirectly. Direct interactions depend on the customer network (such as expansion, congestion, and heterogeneity). Indirect interactions occur through behavioral consequences that can be

condensed on the next higher hierarchy, perceived and reinterpreted by customers. For example, pests' resistance, prices of agricul-

tural products in the market, and social norms are all congested effects of individual actions (Feola & Binder, 2010).

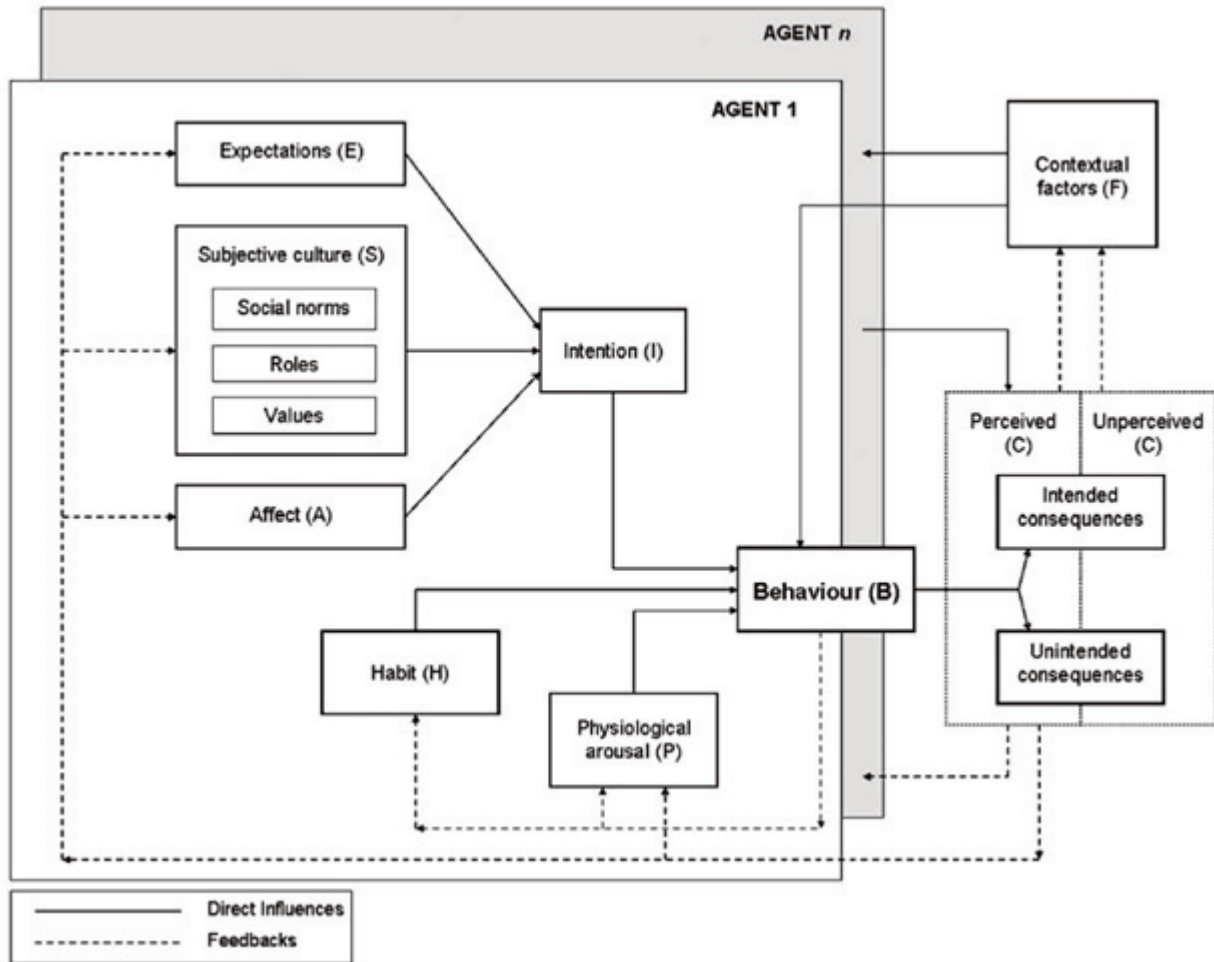


Figure 15. The integrative agent-centred model (Feola & Binder, 2010)

DISCUSSION

The study of the models showed that the early important models of behavior have only considered some factors in the occurrence of effective behaviors. For example, Fishbein and Ajzen's theory considered only two factors of attitudes and subjective norms of individuals, and Schwartz's theory only discussed consequences and their value as factors influencing behavior. These models have forgotten the impact of many factors affecting behavior. Although Triandis paid attention to the effect of the component of habit and its feedback and Fietkau considered the impact of sociological components on behavior, factors affecting be-

havior are not just confined to these two factors. The advantage of these models was that they were used in all areas of research. However, afterwards, models were presented that were used only in the environmental field. In pro-environmental models, the behavior of individuals has been taken as rooted in their attitude. In addition, knowledge is known as the most important factor in the formation of attitude, which indirectly affects pro-environmental behaviors by influencing individual values and attitudes. In the environmental field, models have also been developed that include behavioral habits, habits, and behavioral feedback, and influential components that

were added over time to the models. In addition to the above-mentioned issues, these models studied the effect of the subject knowledge components, individual control components, knowledge of action strategies, and action skills (Hins et al., 1986). In this regard, Blake has proposed a model that has an advantage over other models. This model has considered the gap between attitude and behavior, which was overlooked in any of the proposed models. Because people sometimes show behavior that contradicts their attitude, Blake expressed individual, social, and institutional constraints in both personal and social spheres, but did not seek to identify the constraints. Inspired by Blake's model, Kollmuss and Agyeman sought to identify constraints and evaluate the internal and external components. To overcome the shortcomings of these models, a model known as the agent-based integrated model was proposed by Feola and Binder. This model covers all the models proposed so far and includes elements of tendency, habit, and physiological excitation and of internal and external factors that influence decisions and behaviors, and the implied or unintended or perceived or unperceived consequences, and is rooted in the action-theoretic approach of social research. However, this model also has limitations that need to be discussed and resolved (Table 1). Behavioral models also differ in some structural features. The scope of the models in psychology, sociology, or the environment can be scattered. Although most of these models have benefited from psychosocial variables in model design, their activity sphere is more in the environment and the explanation of environmental behaviors. This difference is also observed in the number of explanatory factors of behavior and the way to explain behavior directly or indirectly. Some models emphasize more factors and seek to cover all the various dimensions affecting behavior, while others only use limited but more general factors with the most explanatory power. In addition, some models merely focus on internal factors, and others focus on internal and external factors. In par-

ticular, considering that the occurrence of behavior cannot occur only with respect to internal factors, and external factors are also involved, it seems that models that consider both internal and external factors are more useful for analyzing environmental behavior. On the other hand, by looking at behavioral models, it can be seen that models have evolved in a historic way, in which more advanced models are a developed form of previous models, and most of them are supported by previous theories. But, it is worth noting that fewer models have focused on the consequences of behavior and feedback. Most models only end in behavior, but how to change behaviors and improve them is forgotten. The Norm Activation Theory, Value-Belief-Norm Theory, the Model of Ecological Behavior and Integrated Agent-Centered Behavior Model are those that pay attention to the consequences of behavior and feedback (Table 2). Finally, it can be concluded that the models of environmental behavior are evolving. This evolution includes the number of factors explaining behavior, the interaction between factors, the coverage of internal and external factors, and ultimately the implications and consequences of behavior. It was the Theory of Reasoned Action (Fishbein & Ajzen, 1975), which showed that human behavior was predictable by the previous attitude. The later models used more internal and external factors for explaining behavior, and recent models even paid attention to the consequences of behaviors and feedback for improving behavior. Also, these models have come out of the field of activity and have spread to many other areas, such as agriculture, the environment, economics, management, and psychology, which reflects the importance of perception in these models. In the area of sustainable use of natural resources and the environment, these behavioral models have also been increasingly used so that the development of models for explaining responsible behavior in the field of the environment is due to the attention and understanding of the importance of sustainability. The present study challenges the no-

tion that environmental knowledge moderates the relationship between attitude and behavior. Instead, it argues that knowledge is acquired over time. There are two types of knowledge, namely pre-attitude knowledge and post-attitude knowledge. Pre-attitude knowledge leads to initial attitude formation while post-attitude knowledge changes attitude. Hence, the moderation effect could result from post-attitude knowledge. Theories of behavior change use attitude to explain pro-environmental consumer behaviors. The Norm Activation Theory argues that awareness of consequences of consumption behaviors and attribution of responsibility for behavioral outcomes are basic conditions for pro-environmental behavior. However, attribution of responsibility for the outcomes is an attitude-dependent process. Despite awareness of the consequences of consumption-related behaviors, people may not act in an environmentally-friendly manner if they have a negative attitude and more so when they feel others are responsible for the sustainability of the environment. Therefore, the Norm Activation Theory does not explain the denial of responsibility for the consequences of consumption behavior. In connection with the present study, which studied biophysical behaviors and models, it should be acknowledged that at the higher education level, students are national actors for the development of a sustainable environment in all aspects. Therefore, in addition to environmental awareness and attitude, it is necessary to pay attention to environmental performance here. Familiarizing students with the environment at various levels of study can strengthen their sense of adaptation and conservation of natural resources and increase their sense of responsibility. Selecting the appropriate teaching methods, along with access to up-to-date knowledge, as well as encouraging students to study and learn responsible environmental behaviors, can provide effective assistance in achieving management goals to protect and protect the environment. We will also be able to innovate on newer models

and behaviors in environmental management and achieve future growth performance.

CONCLUSION

The present study made a number of important contributions to our understanding of pro-environmental behaviour. Because in this study, during a historical trend, many models of pro-environmental behavior studied and the important components of these models introduced. Finally, by comparing the models, the strengths and weaknesses of each model were identified. In addition research findings suggest that, the officials of institutions and organizations such as Agriculture Organization which are interact with villagers, as a directly stakeholders of environmental resources, with a focus on issues related to pro-environmental behavior, can result in farmers' higher sensitivity and higher social pressures on environment. In other word, the current extension policies need to be reinforced to incorporate trends that recognize the critical role played by social environment of villagers and subjective norms in enlightenment and diffusion of information and manners including environment conservation activities. In addition, community participatory policies could be enhanced as an incentive for cooperation in articulatory action on management of environment.

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Table 2
Comparison of Pro-environmental Behaviour Models in Terms of Some Structural Features

Behaviour models	Activity sphere	Number of factors affecting behaviour	How components affect Behaviour	Type of components	Theories supporting the model	Assessing the consequences	Feedback
Reasoned action	Psychological - social	2	Indirect	Internal	-	-	-
Norm activation	Moral-social	2	Direct	Internal & External	-	Awareness of consequences	-
Interpersonal behaviour	Social	4	2 Indirect2 Direct	2 Internal2 Both Internal & External	-	-	-
Planned behaviour	Environmental	4	3 Indirect2 direct	Internal	Reasoned Action	-	-
Value-belief-norm	Socio-environmental	3	2 Indirect1 Direct	2 Internal1 Both Internal & External	The theory of ecological values and the norm activation	Awareness of the consequences	Creating a sense of responsibility toward reducing adverse consequences
The model of ecological behaviour	Environmental	5	Direct	4 Internal1 External	-	Perceived consequences	Perceptual feedback
Responsible pro-environmental behaviour	Environmental	5	Indirect	3 Internal2 Internal And External	Planned Behaviour	-	-
Breaking old bad habits and changing them into new habits	Environmental	2	Indirect	Internal	Triandis's Interpersonal Behaviour	-	-
Linear model of pro-environmental behaviour	Environmental	1	Direct	Internal	-	-	-
Attitude-behaviour gap	Environmental	2	Indirect	Internal & External	-	-	-
Pro-environmental behaviour	Environmental	3	Indirect	Internal & External	Blake's behaviour theory	-	-
Integrated agent-centered behaviour	Environmental	4, Each of which has its own subset of components	Direct	The underlying internal and exterior	Giddens agent-centered theory and triandis's theory of interpersonal behaviour	Implied or unintended or perceived outcomes	feedback

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