ENVIRONMENTAL PERCEPTIONS AND BEHAVIORAL CHANGE OF HILLSIDE FARMERS: THE CASE OF HAITI

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Abstract

Land degradation is one of the most serious problems facing resource-poor tropical hillside farmers. Studies examining determinants of farmers' decisions to invest in land improvement technologies have focused on economic and financial factors, neglecting individuals' perceptions and awareness of the problems and how they affect land use and behavioral change that enhance environmental sustainability. This study examines Haitian peasants' environmental behavior structure using a structural equation modeling approach. Specifically, the study examines the effects of perceived susceptibility, seriousness, benefits, and barriers to change on attitude, and the causal effect of attitude on behavior. The influence of the level of resources extracted from the land per capita on perceptions, attitude, and behavior is examined. Results show that Haitian peasants' attitudes toward the environment are significantly affected by their perceived susceptibility and severity of land degradation. The path coefficients linking perceived susceptibility, severity, and benefits to attitude are 0.49 (t=5.43) and 0.21 (t=3.78), respectively. A positive attitude toward the environment seems to cause a greater inclination to behavioral change. The coefficient from attitude to behavior is 0.21 (t=3.81). The results indicate that agricultural productivity significantly shapes hillside farmers' perceptions of susceptibility to and severity of land degradation. Per capita resource extraction significantly affects people's perceptions of the benefits of good environmental quality and the barriers to behavioral change.

Keywords: Farmers, environment, perception, behaviour and degradation, agricultural productivity

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INTRODUCTION

The Republic of Haiti is one of the developing countries in the tropics that has been undergoing rapid environmental alteration that raises serious concerns among policy makers and development agencies. Land degradation is an important ecological and economic issue in Haiti because of Haitians' high dependence on agriculture for their survival. What happens in agriculture has direct consequences for food security and economic development in Haiti (Lundahl 1996).

Haitians are dependent on agriculture for food, firewood, and export revenue. Haiti is a hilly country with approximately 75 percent of the land area on high elevation (Weil *et al*. 1973). Approximately 63 percent of the land in Haiti is too steep for sustainable agricultural production (Blémur 1987). Demographic, economic, and market pressure, however, push Haitian farmers to cultivate the most fragile lands. It is believed that 60 percent of all lands have been converted from forest to agricultural use (Unites States Agency for International Development/Haiti 1996).

The widespread cultivation of steep slopes on the hills has caused severe soil losses due to erosion. In 1994, it was estimated that soil loss approximated 37 million tons in Haiti (United Nations Development Program 1996). Hence, land is a scarce resource that is rapidly deteriorating. Recent estimations suggest that arable land represents approximately 21 percent of the total land in the country (Economic Commission for Latin America and the Caribbean 2000). Therefore, it is imperative to find the necessary means to expand agricultural production while protecting the land resources. In essence, Haitian farmers must use soil management practices that increase agricultural productivity while limiting environmental degradation.

Developing and maintaining sustainable agricultural systems require participation of all stakeholders involved in agriculture. In this regard, farmers are the prime targets for developing and implementing measures aimed at reducing land degradation. Most attempts to limit land degradation problems have relied on soil management techniques, such as tree planting, agro-forestry, and mechanical structures. Unfortunately, farmers have been reluctant to adopt those conservation measures in order to control land degradation problems. Several studies (Bayard 2000; Bannister 2001; White and Quinn 1992) point out a number of socio-economic factors that are likely to influence Haitian farmers' attitudes toward adoption of soil conservation practices. However, those studies lack the framework to analyze

the complex decision-making process of hillside farmers. Before farmers can engage in land improvement programs, they need to be aware of the phenomenon and its impacts on their wellbeing, perceive the seriousness of the problem, and develop a positive attitude towards it. Therefore, it is important to consider individuals' socio-economic characteristics as well as their perceptions and attitudes in examining their environmental behaviors.

The purpose of this study is to investigate the perceptions held by Haitian hillside farmers about land degradation and its influence on their attitude and behavior. The study also examines how household pressure on land resource extraction affects their perceptions, attitudes, and behaviors.

PERCEPTION-ATTITUDE-BEHAVIOR RELATIONSHIPS

A number of social scientists, including psychologists and economists, have devoted considerable amounts of energy understanding the relationship between attitudes and behaviors. Research developed along this line has established the role of attitudes, values, and beliefs as predictors of behavior (Zimmer *et al*. 1994). It is largely believed that direct relationships exist between attitude and behavior. Those who hold such beliefs claim that a change in attitudes will have a direct impact on behaviors. For a relatively long period of time, studies on attitudes and behaviors were concentrated within the domain of psychological sciences (Kilbourne and Beckmann 1998). Such constructs have recently been of interest among economists and other social scientists. Individuals' environmental attitudes, for instance, have been studied in various fields including marketing, consumer behavior, social psychology, and economics.

Studies have examined the underlying structure motivating environmental attitude and the behavioral manifestations it engenders in both consumption and production (Balderjahn 1988; Scherbon 1993). Investigations on the attitude-behavior relationship for various environmental issues suggest that attitude can be a significant precursor of behavior. Results of studies in marketing and consumer behavior suggest that consumers are concerned about environmental issues (Scherhon 1993; Zimmer *et al*. 1994). Their behaviors are generally reflected by their attitudes toward the environment (Kilbourne *et al*. 2002; Balderjahn 1988; McCarty and Shrum 1994). Although the attitude-behavior relationship may be weak, the study by Balderjahn (1988) depicts a positive and significant effect of attitudes on specific behaviors such as use of non-polluting products. Attitudes also mediate the effect of socio-economic and demographic characteristics on behavior.

At the farm level, researchers have explored the attitude-behavior relationships for various environmental issues. Studies by Lynne and Rola (1988), and Lynne *et al*. (1988) suggest attitude alone, or with interaction with income, has a significant positive effect on conservation behavior. They argued that stronger positive attitudes towards conservation increase the level of efforts. Income and attitudes moderate the effect of each other on behaviors. Their findings also suggest that farmers with higher income tend to develop a weaker positive attitude toward conservation behavior. Luzar and Diagne's findings (1999) revealed that higher environmental attitude is significantly and positively related to participation in environmental programs.

Some researchers (Willock *et al*. 1999a, 1999b; Vogel 1996; Pouta and Rekola 2001; Bourke and Luloff 1994) reported significant relationships between farmers' attitudes and their environmental behaviors. Their results show significant positive correlations between environmentally oriented behaviors and attitudes. Duff *et al*. (1991) observed that most farmers in Canada who show greater concern for land degradation had adopted conservation measures on their farms. However, a substantial number of farmers had to overcome obstacles, such as the costs of the technology, technical difficulties, and lack of information, before they actually used a conservation practice.

Other studies (Carr and Tait 1991; Hines *et al*. 1990; Kantola *et al*. 1982) exhibit significant correlations between attitude and behavior. In one study, Kantola *et al*. (1982) found a positive effect of attitude on intentions to conserve water. Attitudes influence behavior to the extent to which they are accessible (Fazio *et al*. 1989), and only when both are measured at similar levels of specificity (Shetzer *et al*. 1991).

Many factors interact to form an individual's attitude toward a particular object. Fishbein and Ajzen (1975) and Ajzen and Madden (1986) argue that attitudes are derived from beliefs about the nature of the object and the consequences of the action. In this sense, some researchers (Ervin and Ervin 1982; Rogers 1995) suggest that perceptions are precursors of attitudes and actions. Analyzing farmers' attitudes toward adoption of soil conservation practices, Ervin and Ervin (1982) stated that farmers perceive erosion problem before they decide whether to adopt or not to adopt a conservation practice. By the same token, a number of researchers (Gould *et al*. 1989; Traoré *et al*. 1998; Bultena and Hoiberg 1983) found that farmers' perceptions of erosion problems and their impacts motivate erosion control efforts. In situations where farmers perceive the seriousness of land degradation, they are more likely to

increase the number of soil conservation practices implemented on their farms.

A study by Napier and Brown (1993) showed that perceived threat to family health has a significant influence on land operators in becoming more concerned about groundwater pollution problems, and in taking actions to prevent contamination of groundwater resources. However, there may exist a trade-off between protecting the environment and the socio-economic viability of the rural household. Although farmers may be aware of environmental problems related to agricultural production, they are less likely to change their production practices to protect the environment if adoption of new practices threatens the economic viability of the farm enterprise (Napier and Brown 1993).

Other behavioral studies point out the effects of beliefs on attitudes and behaviors. Dabbs and Leventhal (1966) and Leventhal *et al*. (1965) indicated that attitudinal change increases with greater fear and greater perceived seriousness of the threat. Dabbs and Leventhal (1966) also suggest that increased feelings of susceptibility are positively related to greater attitude change. In short, various factors including economic, perceptual, and attitudinal variables may contribute to understanding individuals' environmental behaviors.

CONCEPTUAL MODEL AND HYPOTHESIS DEVELOPMENT

Farm level studies investigating attitude-behavior relationships used various estimation techniques. Those statistical tools include logit, tobit (Lynne and Rola 1988), probit (Luzar and Diagne 1999), Pearson correlations (Willock *et a*l. 1999a, 1999b), and path analysis (Vogel 1996). The present study uses a structural equation modeling approach to examine the perception-attitude-behavior relationships among Haitian hillside farmers. The conceptual model builds upon the popular Ajzen and Fishbein's theory of reasoned action (1977, 1980), and empirical studies that suggest a direct relationship between attitudes and behaviors. Ajzen and Fishbein's theory posits that individuals form intentions before they actually engage in a given behavior. Behavioral intentions are determined by attitudes toward the behavior and subjective norms. According to theory, attitude is determined by a set of beliefs that performing the behavior leads to a desired outcome. Figure 1 sketches the hypothesized model of farmers' environmental behavior structure.

The model first examines the influence of household's resource extraction per capita on farmers'

perceptions of land degradation, and attitudes and behaviors toward the problem. It is assumed that the economic and cultural attachment to the land may have significant influence on the way peasants perceive the environment, and their inclination to take actions to control the situation. In this study, resource extraction per capita is obtained by dividing income from agricultural production by the size of the farm and by the number of people living in the household. We formulate the following hypothesis:

Hypothesis 1: Greater resource extraction per capita will cause greater susceptibility to land degradation, greater perceived severity, less barrier, and greater benefits for behavioral changes. Greater resource extraction per capita will also engender a more positive attitude toward land degradation and stimulate behavioral changes.

The empirical studies reviewed above suggest that perceptions of a particular problem may influence individuals' attitudes. In this study, we borrow four psychological concepts from the Health Belief Model (HBM) - susceptibility, severity, benefits, and barriers - to examine their influence on farmers' environmental attitudes. Perceived susceptibility refers to the beliefs in one's likelihood of being affected by land degradation. Perceived severity is the perception of the seriousness of land degradation and its adverse effects. Perceived barriers comprise of social, economic, financial, and physical obstacles that may influence an individual effort. Perceived benefits are concerned with the beliefs that an improvement of the environment will be beneficial to individual farmers and the whole community. With respect to the effects of perceptions on attitude, the following hypothesis was postulated:

Hypothesis 2: Greater perceived susceptibility, severity, and benefits will cause a more positive attitude toward the environment, whereas greater perceived barriers will have a negative influence on environmental attitude.

An important issue raised in the study is the influence of hillside farmers' attitudes on their environmental behaviors. Attitude can be defined as a positive or negative evaluation of the object of behavior (Fishbein and Ajzen 1975). As indicated in previous research, attitude may be a significant precursor of behavior. These findings lead us to the following hypothesis:

Hypothesis 3: A more positive attitude toward the environment will cause a positive behavioral change among hillside farmers in Haiti.

METHOD

Research Areas

The study was carried out in five villages located in southern and southeastern Haiti. These villages were selected because of the observed levels of land degradation and of farmers' exposures to soil and water conservation measures that are likely to raise their awareness of the problems. In the south, a field survey was conducted in Gaita and Bannate within the community of Camp-Perrin, whereas interviews in the southeastern region were held in Cap-Rouge, Cayes-Jacmel, and Marigot.

The annually cultivated plots in the areas of the southern region are on elevations of 100 to 300 meters above sea level. The average annual rainfall is usually between 1,500 and 2,000 millimeters. The research site in the southeastern region varies in elevation from 200 to 500 meters. The average annual rainfall in this region varies from 1,000 to 1,500 millimeters. In both regions, subsistence crops, especially sorghum, corn, beans, and cassava, have occupied steeply sloping lands that are classified as more appropriate for forest uses. Some production of vegetable crops is observed in the southeastern area. The slopes of cultivated plots in the regions can reach over 60 percent. Hillside farming in these regions is especially intensive. Both regions suffer severe soil erosion problems due to the agro-climatic conditions on one hand, and the lack of soil protection on the other. Coupled with a short fallow period of one to two years, the degradation of the soil causes the decline of the fertility level, and consequently reduces crop yields.

Data Collection

The sample for this study was randomly selected from individuals directly involved in agriculture in both regions. The sample includes 240 farm operators from the southern areas, and 360 from the southeastern region. Male farmers accounted for 85 percent of the sample whereas female respondents represented 15 percent. Individuals in the sample averaged 48 years of age. Sixty-three percent of the farmers had some primary school level of education, and 32 percent had no formal education.

Farmers included in the analysis cultivate on average 5.23 plots totaling 1.48 hectares (ha) of land. The numerous plots composing a typical Haitian farm are cultivated under various land tenure arrangements including purchase, crop share, cash rent, and temporary use of family plots. Agriculture is the primary source of income for the individuals in the sample. Annual per capita income for a survey household was estimated at an average of 1,871 gourdes (1 gourdes = U. S. $0.05 at the time of the survey).

Interviews with farmers in both regions were carried out in two successive phases. In the first phase, personal interviews were conducted with the selected farmers between July and August 2000. A questionnaire consisting of seven sections was developed for the purpose of these interviews. A section of the questionnaire gathered information on demographic characteristics (age, marital status, education), farm family situation (composition and occupation of household members, membership in organized groups), farm situation (size, land ownership, income), animal production and non-agricultural activities that generate earnings to the household. Other sections of the questionnaire dealt with farmers' awareness of land degradation, their perceived susceptibility and seriousness of environmental degradation, their attitude toward the problem, the perceived benefits of conservation, and their perceived barriers to change.

In the second phase of the interviews, the same farmers were revisited between January and March 2002 to collect information on their goals in farming, perceived capacity to behavioral change, stated behaviors, and opinions on policy formation. Six interviews were discarded for incomplete information upon completion of the two sets of interviews.

Variable Measurements

The items of measurement included components of attitude, behavior, perceived susceptibility, severity, barriers, and benefits. Since those variables are not observed, multiple items were used to measure each one of them. Each item represented by a survey question was measured on a five-point scale response ranging from "strongly agree" to "strongly disagree."

Analysis

The constructs representing attitude, perceived susceptibility, seriousness, benefits, and barriers, were recorded by asking farmers to scale a set of questions that expressed their beliefs about ecological, social, and economic problems related to environmental degradation in Haiti. Behavior was recorded by asking farmers a set of questions that indicate actions they have taken or intend to take. Each set of items was subjected to a factor analysis using the scree test and an orthogonal varimax rotation. Confirmatory factor analysis assessed the scale's dimensional structure of each construct. A reliability assessment estimate (coefficient alpha) was determined for each of the final constructs using the SAS software system (Hatcher 1994). Table 1 provides a summary of the items for each construct retained for the analysis.

Structural equation modeling was performed to test the hypothesized structural paths in Figure 1. The models measure the direct effects of perceived susceptibility, severity, barriers, and benefits on environmental attitude. The mediating role of attitude between the perceptual constructs and behavior was also examined. In addition, the influence of agricultural productivity per capita on perceptions, attitudes, and behaviors was analyzed. Estimation was carried out using maximum likelihood procedures in Lisrel (Jöreskog and Sörbom 2001; du Toit and du Toit 2001). Model goodness-of-fit was assessed using the Normed Fit Index (NFI), the Goodness of Fit Index (GFI), and the Comparative Fit Index (CFI). A value of at least 0.90 for NFI, GFI, and CFI is considered reasonable fit (Jöreskog and Sörbom 2001; Byrne 1998; Bentler 1990).

RESULTS

Items measuring farmers' perceptions, attitudes, and behaviors are reported in Table 1. The results show that all measurement items load positively and significantly on the subjective constructs at the 0.05 level. Cronbach's alpha estimates were in the acceptable range, suggesting a relatively good convergent validity of the data. Three items measured farmers' susceptibility to land degradation. The items described their feelings of being affected by land degradation because they have taken (or failed to take) conservation measures to control the problem.

Perceived severity of land degradation was also measured by three items that reflect farmers' perceptions of the negative impact of land degradation. The analysis suggests that perceptions of the benefits of and barriers to environmental improvement were defined by three items each. Perceived benefits reflect respondents' decisions to develop a sustainable farming attitude because it results in positive outcomes. The items measuring perceived barriers dealt with issues such as social and physical obstacles that impair behavioral changes.

Environmental attitudes and behaviors were measured by four and three items, respectively. Items dealing with environmental attitude reflect farmers' evaluations of the global effects of land degradation in the country. With respect to environmental behavior, the items stressed farmers' efforts to retard environmental degradation.

The maximum likelihood estimation results of the hypothesized model are reported in Table 2. The chi-square statistics often used to assess model fit was significant, suggesting a possible lack of overall fit. However, sample sizes tend to inflate this statistic (Vaske and Kobrin 2001; Byrne 1998). As indicated by Long (1983), for large samples any model with positive

degrees of freedom is likely to be rejected for lack of fit. Consequently, we used multiple fit indices as suggested by many authors (Jöreskog and Sörbom 2001; Byrne 1998; Tanaka 1993; Bentler 1990). Hence, fit indices such as the Normed Fit Index (NFI), the Goodness of Fit Index (GFI), and the Comparative Fit Index (CFI) were used to assess the fit of the model.

The multiple fit indices indicate that the model exhibits a good fit of the data. The values for NFI, GFI, and CFI were 0.95, 0.94, and 0.97, respectively. Results of the hypotheses regarding the effects of perceptions on environmental attitude are mixed. The results support the hypotheses that perceived susceptibility and perceived severity influence farmers' attitudes toward the environment. The standardized coefficient for the susceptibility factor was 0.49 (t = 5.43), indicating a positive and significant influence on environmental attitude. The results suggest that greater feeling of susceptible to land degradation leads to a more positive attitude towards the environment.

Perceived severity of environmental degradation was positively related to the attitude variable. The standardized path estimate for perceived severity factor was 0.21 (t = 3.78). Increasing perception of the severity of land degradation seems to lead to a positive attitude of Haitian farmers toward the environment.

The results support the influence of attitude on environmental behavior. The standardized coefficient of attitude on behavior is 0.21 (t = 3.81). The results indicate that attitude toward the environment is the antecedent of behavioral change. A positive attitude toward the environment leads farmers to adopt measures that are likely to reduce the problem. Hence, attitude plays a mediating role between perceptions of susceptibility and severity of land degradation and environmental behavior.

Hypothesis 1 examines the effects of land resource extraction per capita on the perceptual and attitudinal variables and behavior. The results indicate that the per capita resource extraction has an effect only on the perceptual variables. Resource extraction per capita significantly affects perceptions of susceptibility and seriousness of land degradation, barriers to, and benefits of environmental improvement. The standardized coefficients of resource extraction on susceptibility, severity, benefit, and barriers were 0.14 (t = 3.07), 0.25 (t= 5.48), 0.11 (t= 4.87), and -0.11 (t= -2.34), respectively. Thus, greater resource extraction per capita will cause greater susceptibility to land degradation, greater perceived severity of the problem, less barrier to environmental improvement, and greater benefits to behavioral change.

DISCUSSIONS

This study focuses on Haitian hillside farmers' environmental behavior structure. Empirical test of hypothesized relationships revealed that perceived susceptibility to land degradation and perception of the severity of the problems greatly affect farmers' environmental attitudes. These results suggest that the more farmers feel susceptible to the degradation of the environment, the more they are aware of the extensiveness of the problem, and the more they will develop a positive attitude toward environmental improvement. These results are in line with other findings (Dabbs and Leventhal 1966; Leventhal *et al*. 1965; Napier and Brown 1993; Gould *et al*. 1989; Traoré *et al*. 1998) indicating that attitude change increases with greater fear and greater perception of the seriousness of a threat. Immediate threats of land degradation to a household well-being will engender a more positive attitude toward the environment. These findings suggest that policies addressing soil management practices in Haiti need to attract people's attention on the seriousness of erosion and its short and long term consequences on their lives if the problem is not solved.

An important finding of the study is that positive attitudes toward the environment significantly enhance farmers' environmental behaviors. As in previous studies (Luzar and Diagne 1999; Vogel 1996; Willock *et al*. 1999a), the results indicate that more positive attitudes toward the environment may cause farmers to change their behaviors. Assuming that positive attitudes stimulate behavioral changes, *ceteris paribus*, the findings suggest that individuals with more positive attitudes should be given particular attention in order to encourage environmental efforts among hillside farmers. Attitudes will be reinforced by developing educational programs that stress the seriousness of environmental degradation and the danger it represents today and in the future.

A critical finding of this research is the influence of resource extraction per capita on the perceived severity, susceptibility, benefits, and barriers. Higher extraction of resource per capita leads farmers to feel more susceptible to land degradation and to better evaluate the seriousness of the problem. The level of resources extracted from the land also enhances the perceptions of the benefits of behavioral changes, and creates less barriers to seek assistance that would stimulate that adoption of more sustainable farming practices. These results suggest that while techniques are developed to improve agricultural production, decisions should be made to increase farmers' perceptions of the benefits of environmental quality and to help them

overcome the obstacles that would impair their actions.

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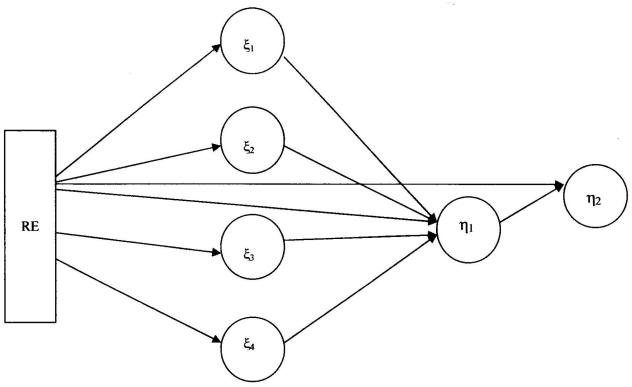

FIGURE 1
CONCEPTUAL MODEL OF ENVIRONMENTAL BEHAVIOR

RE= Resource extraction per capita, $?_1$= susceptibility, $?_2$= severity, $?_3$=barrier, $?_4$=benefit, $?_1$=attitude, $?_2$ = behavior.

Table 1. Items measuring perceptions of land degradation, attitudes, and behaviors

Item	Standardized factor correlation	Standard error	Cronbach's alpha
Perceived susceptibility of land degradation			0.84
I use soil conservation techniques in my plots to limit erosion	0.83a	----	
I maintain soil conservation structures to prevent erosion	0.83*	0.046	
I plant trees to prevent erosion	0.69*	0.048	
Perceived seriousness of land degradation			0.76
Erosion can cause damage on my plots	0.81a	----	
Erosion can reduce soil nutrients	0.82*	0.062	
Erosion can cause famine in Haiti	0.55*	0.055	
Perceived barriers to land improvement			0.87
I don't look for aid because other people would think I am poor	0.79a	----	
I don't look for aid because I don't like the technicians in the projects	0.83*	0.065	
I don't search for aid to protect my lands because project intervention is far from my zone	0.69*	0.057	
Perceived benefits of behavioral changes			0.85
I monitor my plot to detect erosion problems	0.83a	----	
I always install erosion barriers on my plots	0.90*	0.042	
I take some conservation measure while planting	0.78*	0.044	
Attitude toward land degradation			0.69
The environment in Haiti is in danger because the soil is washing away	0.74a	----	
The soil in Haiti is eroded because of forest destruction	0.61*	0.066	
Uphill agricultural practices affect downhill areas	0.52*	0.065	
Erosion causes water shortage in the country	0.49*	0.065	
Environmental behavior			0.73
It is my responsibility to encourage my neighbors to adopt soil conservation techniques	0.75a	----	
I have made major efforts to adopt conservation practices last year	0.61*	0.07	
I have encouraged my neighbors to adopt conservation practices in the past year	0.72*	0.08	

Table 2. Predictors of perceptions, attitude, and behavior

	Attitude		Behavior		Susceptibility		Severity		Barriers		Benefits	
	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
Susceptibility	0.49*	5.43	----	----	----	----	----	----	----	----	----	----
Severity	0.21*	3.78	----	----	----	----	----	----	----	----	----	----
Barriers	-0.04	-1.06	----	----	----	----	----	----	----	----	----	----
Benefits	0.16	1.74	----	----	----	----	----	----	----	----	----	----
Attitude	---	---	0.21*	3.81	----	----	----	----	----	----	----	----
Resource extraction	0.04	0.94	-0.08	-1.64	0.14*	3.07	0.25*	5.48	-0.11*	-2.34	0.21*	4.96

$\chi2 = 403.76$
df = 157 p<0.0001
NFI: 0.95
CFI: 0.97
GFI: 0.94
RMSEA: 0.051

*significant at 5% level