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Influencing Factors on the Ecological Protection Behaviors of Entrepreneurial Farmers in Chinese Forest Zones

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Abstract: Following the collective forest tenure reforms in China, many households pursued entrepreneurial activities creating substantial pressure on the environment. This study examines data collected from 462 informants in 10 provinces in Southern China to understand how changes in attitudes toward ecological protection behavior occur. The internal mechanisms of ecological attitudes were explored using structural equation modeling to obtain a function path. Ecological emotion has a direct effect on ecological protection behavior by acting as an intermediary between ecological knowledge and ecological protection. Perceived ecological severity mediates between ecological knowledge and emotion influencing entrepreneurial farmers' ecological protection behavior. The perception of individual effect is mediated by perceptions of ecological severity and ecological emotion, eventually affecting ecological protection behavior. A model of cognition–emotion–practice is proposed based on the findings.

Keywords: Chinese forest zone; entrepreneurial farmers; ecological protection; structural equation; ecological attitude

1. Introduction

The collective forest rights system in China has undergone a series of institutional reforms since 2005. By 2012, the first round of reforms, which aimed to distribute forest lands to farmers, had achieved significant results [1]. These reforms provide the basis and opportunity for local farmers to conduct entrepreneurial activities that expand the current scale of production or carry out new production activities. Depending on their family structure, farmers may expand production and invest additional capital, which contributes to the intensification of forest resource exploitation. Meanwhile, due to the small highly scattered scale of operations, farmers in the forest zone face significant challenges related to ecological protection. In addition, because of the enforcement of environmental regulations in urban centers, many high-polluting industries began transferring operations to rural areas, including forest zones. If this trend continue, the entrepreneurship reform initiatives will contribute to the destruction of rural ecology.

Existing research demonstrates that ecological attitudes directly affect ecological protection behavior [2]. Ecological attitudes can be subdivided into the individual effects of perceptions influenced by ecological knowledge, ecological severity, and ecological emotion [3]. This is particularly true of forest farmer entrepreneurs [4]. Currently, farmers face the key stage of development following the reform of collective forest rights, in which both entrepreneurship and the forest should operate

for mutual benefit in terms of reciprocity; thus, ecological protection is significant for both parties. Farming entrepreneurship will directly affect the forest's ecological balance. It is therefore imperative to explore the factors influencing the ecological protection behavior of entrepreneurial farmers in forest areas.

Although entrepreneurial farmers are generally concerned about ecological protection, there is a significant gap between their cognition and behavior [5]. Some farmers undertake ecological programs after social and ecological rationales have been explained [6]. Other farmers undertake the process of selecting which forest products to harvest and process through business motives, without due regard for the destruction of the forest environment. Ecological consequences include forest loss, deforestation, and gradual ecosystem diversity loss, all of which have a long-term impact on public welfare and health [7]. Therefore, clarifying the main factors influencing entrepreneurial farmers' ecological protection behaviors and their paths is instrumental in promoting the ecological protection of forests.

The next important question is: which factors influence the ecological protection behaviors of entrepreneurial farmers in the Chinese forest zone? One established approach is to examine the direct effects of ecological attitudes on ecological behavior [8]. In this view, ecological attitudes are created by ecological cognition, supported by perceptions of ecological severity, ecological emotion, and other intermediary factors [9]. Therefore, understanding how attitudes affect ecological behavior warrants further investigation. Those factors influencing entrepreneurial farmers' ecological protection behaviors cannot be measured simply with a single index. Such factors have a combined effect, indicating that the behavioral mechanism warrants a comprehensive analysis. Most existing research studies are limited to qualitative analyses consisting of conceptual descriptions that have not tested and quantified the interactive relationships between factors based on actual data [10]. We obtained relevant data through a questionnaire in order to construct a framework of ecological attitudes and assess the effect of farmers' protection behaviors. Based on the structural equation model (SEM), results indicate a path coefficient that shows the interrelations and interaction mechanism between the internal factors of ecological attitude to provide a reference for improving the ecologically protective behaviors of forest farmers' ventures.

The article proceeds as follows: The next section reviews the literature and discusses whether ecological knowledge, the perception of individual effect, perceived ecological severity, and ecological emotion affect entrepreneurial farmers' ecological protective behaviors in the Chinese forest zone and states the hypotheses. The methodology section describes the measurements, sample, and data, while the following section presents the statistical results. Finally, the closing section discusses the results, makes some managerial recommendations, and suggests directions for future research.

2. Literature Review and Proposed Hypotheses

Many scholars divide ecological attitudes into different dimensions or components. Importantly, the relationship between ecological attitudes and environmental protection behavior was verified by Ramkissoon et al. [11], Rees, Klug, and Bamberg [12], and others who demonstrated that ecological emotion and ecological attitudes were significantly related to actual ecological protection. The research on ecological attitudes by Fraj and Martinez [13] and others, that investigate attitudes in terms of elements, divide ecological attitudes into three dimensions: cognition, emotion, and intention. Bijani et al. [14] expand the concept of "knowledge" to include "cognition and ideas", incorporating perceptions and knowledge about resources and the environment, as well as the idea of personal consumption as a third dimension. "Faith" is also included in "emotion and consciousness", combining with the three dimensions of affection for environmental resources, perceived individual effects, and social responsibility consciousness. In this paper, ecological attitudes will be divided into two broad dimensions of cognition and emotion. Cognition includes ecological knowledge and the effect of individual perception, while emotion refers to the ecological sense of perception—ecological emotion and ecological perceived severity. A conceptual model is proposed as shown in Figure 1,

in which emotion refers to perceptions of ecological severity and an understanding of the human body through conscious activities, which facilitates the psychological process of understanding an individual's effect on ecology. On the other hand, emotion refers to an individual's emotional response to the environment and their perception of the degree of ecological severity (i.e., how they assess what is good and bad for the ecology, by making positive and negative emotional judgments).

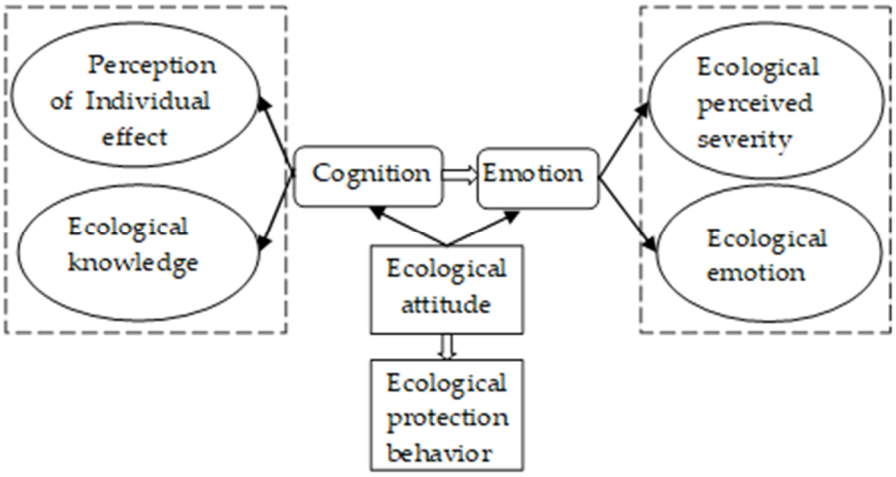

Figure 1. Conceptual model of this study.

2.1. Ecological Knowledge and Ecological Protection

Ecological knowledge, which comprises factors affecting ecological preferences or ecological consciousness, has been researched by many scholars. Hines et al. [15] first classified environmental knowledge. Since then, different scholars have analyzed the influence of three kinds of environmental knowledge on environmental behavior. Some empirical studies [16] indicate a direct effect of ecological knowledge on ecological behavior. Farmers' level of ecological knowledge within their households and the differences inherent in cognitive psychological processes influences the effect of emotion on ecology and leads to differences in farmers' ecological protection behaviors. Therefore, ecological emotion is one of the important conditions for the transfer of ecological knowledge to ecological protection behavior. Although farmers' ecological knowledge levels are high, research has shown that it is difficult to directly translate their knowledge into ecological protection behavior [17]. According to Williams et al. [18], increasing knowledge enhances positive attitudes toward ecology, while ecological emotion plays a crucial intermediary role. Gao et al. [19] found that the education of farmers had a significant positive influence on the intensity of their adoption of green control techniques. In research on ecotourism and environmentally protective behavior, Chiu et al. [20] and others confirmed that ecological attitudes such as ecological emotion play a significant mediating role in decisions that govern individual behavior. In addition, the severity of ecological perception is mainly related to climate change, ecological environment change, and environmental issues, as well as the factors that affect such perceptions. Therefore, the perception of the severity of ecological problems is closely related to farmers' ecological knowledge. When farmers have more knowledge of the environment, they understand more clearly the severity of environmental problems that influence and harm the present and future environments, thus developing positive ecological emotions and positive ecologically protective behaviors. Based on this, the following assumptions are proposed:

Hypotheses 1 (H1). *Ecological knowledge and ecological protection behavior have a positive correlation.*

Hypotheses 2 (H2). *Ecological emotion is the intermediary between ecological knowledge and ecological protection behavior.*

Hypotheses 3 (H3). *Ecological severity is the mediator between ecological knowledge and ecological emotion.*

2.2. Perception of Individual Effect and Ecological Protection Behavior

An individual's perceptions of the effects of ecological protection behavior depend on whether that individual believes his or her behavior can change the existing situation. Roberts [21] further indicates that an individual's perception of effects matters more than other psychological and demographic variables and represents the most significant variable influencing ecological protection behavior. Realistic ecological perceptions have a significant influence on an individual's perception of the effect of his or her behavior, which in turn affects individual judgments of ecological value. When the perceived ecological environment is very bad, an individual's perceptions of the effects of his or her behavior will be very small [22]. Ellen and Wiener [23] studied perceived effectiveness and found that an individual's perception of the effects of his or her behavior can predict some specific ecological behavior. If perceptions of the actual effects of certain behaviors are ecological improvement, it is possible to enhance the perception of ecological problems further. Moreover, Astridde et al. [24] assert that tourists' perceived effectiveness of environmental behavior has a significant positive effect, realized through the arousal of ecological emotion as an intermediary link. Based on this, the following assumptions are proposed:

Hypotheses 4 (H4). *The perception of individual effect and ecological protection has a positive correlation.*

Hypotheses 5 (H5). *The perception of individual effect and the seriousness of ecological severity have a positive correlation.*

Hypotheses 6 (H6). *Ecological emotion is the mediator between the perceptions of individual effect and ecological protection behavior.*

2.3. Ecological Perceived Severity and Ecological Protection Behavior

In research on the purchase of low pollution fuel, Kassarjian [25] found that consumer concern about the seriousness of environmental pollution is an important variable determining whether consumers are willing to pay more for green fuel options. The more consumers are aware of the dangers of air pollution, where the degree of air pollution is relatively serious, the more strongly ecological emotions are aroused through advertising, eventually increasing consumers' willingness to buy low-polluting gasoline. Noh [26] found that the perception of ecological problems has a positive effect on ecological attitudes. Lee [27] believed that ecological perceptions must be mediated by an ecological attitude or a specific emotion to be translated into a certain behavior. However, Laroche et al. [28] believed perceptions of ecological severity directly affect ecological protection behavior. Based on this, the following assumptions are proposed:

Hypotheses 7 (H7). *Ecological perceived severity and ecological emotion have a positive correlation.*

Hypotheses 8 (H8). *Ecological perceived severity and ecological protection behavior have a positive correlation.*

2.4. Ecological Emotion and Ecological Protection Behavior

Some scholars consider ecological emotion an important variable that affects ecological behavior. Vining and Ebreo's [29] environmental behavior-related research summarizes the importance of emotions as determinants of environmental behavior, indicating that emotion correlates attention, feelings, and behavior. In a study involving 758 people, Chung and Poon [30] investigated waste reduction in Guangzhou using the New Environmental Paradigm (NEP) and found that people with higher emotional connections to their environments demonstrate proactive waste management behaviors. Ryu [31] found that positive ecological emotion has a significant positive effect on ecological behavior. Accordingly, the following hypothesis is proposed:

Hypotheses 9 (H9). *Ecological emotion and ecological protection behavior have a positive correlation.*

Based on all the hypotheses proposed above, an internal mechanism model of ecological protection behavior was developed (Figure 2); we can use this model to build a framework of factors influencing the ecological protection behaviors of entrepreneurial farmers. In this process, the perceptions of individual effects and ecological knowledge affect perceived severity and ecological emotion, and perceived severity and ecological emotion affect the ecological protection behaviors of entrepreneurial farmers. This study investigates the effects of perceptions of individual effects and ecological knowledge on perceived severity, ecological emotion, and the ecological protection behaviors of entrepreneurial farmers; the effects of perceived severity and ecological emotion on the ecological protection behaviors of entrepreneurial farmers; and the mediating effects of perceived severity and ecological emotion on the relationship between the perception of individual effects, ecological knowledge, and the ecological protection behaviors of entrepreneurial farmers.

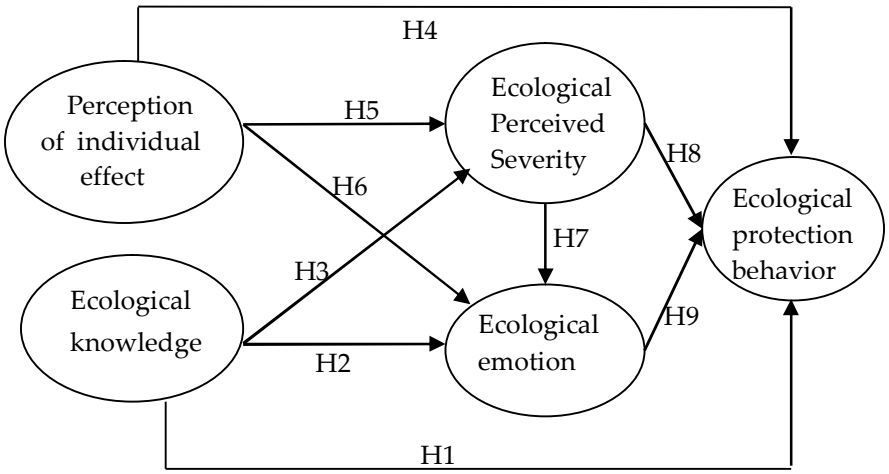

Figure 2. Internal mechanism model of ecological protection behavior.

Combining all the proposed hypotheses, a model is developed (as shown in Figure 2) that depicts an internal mechanism model of ecological protection behavior. From this model, we can build a framework of the influencing factors of ecological protection behaviors of entrepreneurial farmers. It depicts a process where the perception of individual effect and ecological knowledge affect perceived severity and ecological emotion, and perceived severity and ecological emotion affect ecological protection behaviors of entrepreneurial farmers. This study investigates, first, the effects of perception of individual effect and ecological knowledge on perceived severity, ecological emotion, and ecological protection behaviors of entrepreneurial farmers; second, the effects of perceived severity and ecological emotion on ecological protection behaviors of entrepreneurial farmers; and third, the mediating effects of perceived severity and ecological emotion on the relationship between perception of individual effect, ecological knowledge, and ecological protection behaviors of entrepreneurial farmers.

3. Methods

3.1. Scale Design

We created a questionnaire based on the relevant international literature on ecological attitudes to select a suitable scale for this study. The questionnaire mainly draws from Fikret et al. [32], Venkatesh et al. [33], Kaiser [34], Junaedi [35], and Weinstein [36]. The analysis of the relationship between the psychological antecedents of ecological protection behavior mainly elaborates on the perception of individual effects, ecological knowledge, perceived ecological severity, and the four dimensions of ecological emotion to construct a framework of 14 influencing factors or indicators. At this juncture, it should be explained that the perception of individual effect is a reverse question (i.e., the higher the score, the lower the perceived individual effect). As shown in Table 1, to design

the scale and questionnaire for our empirical study, we combined many ecological protection-related research studies and introduced farmers' proposals for how to protect the land before testing the hypotheses.

Table 1. Variable design.

Exogenous Latent Variables	Observed Variables	Source
Perception of individual effect (PIE)	Personal protection of the ecological environment is a very difficult role to play (PIE1)	Fikret et al. [32]; Venkatesh et al. [33]; Kaiser [34]
	Feel powerless to protect the ecological environment (PIE2)	
Ecological knowledge (EK)	Understanding the degree of "white pollution" (EK1)	Fikret et al. [32]; Venkatesh et al. [33]; Junaedi [35]
	Understanding the degree of "bio-diversity" (EK2)	
	Understanding the degree of "organic food" (EK3)	
Ecological perceived severity (EPS)	The problem of rural environmental pollution is of serious concern (EPS1)	Weinstein [36]; Venkatesh et al. [33]
	The problem of rural ecological environment should be solved at the earliest (EPS2)	
	The rural living environment is also deteriorating (EPS3)	
Ecological emotion (EE)	I feel disgusted when I see people throw litter (EE1)	Venkatesh et al. [33]; Junaedi [35]
	I feel uncomfortable when I see that the river is dirty and not clear (EE2)	
	I will be very sad to see forests destroyed (EE3)	
Ecological protection behavior (EPB)	In the production and life as far as possible in favor of the ecological environment of the product (EPB1)	Fikret et al. [32]; Venkatesh et al. [33]; Kaiser [34]
	I will be conducive to the ecological environment of products (EPB2)	
	I will be considered in the production of water-saving/power-saving measures (EPB3)	

3.2. Data Analysis

The data in this paper were mainly collected from 10 provinces: Hunan, Hubei, Jiangxi, Zhejiang, Fujian, Guangdong, Guangxi, Sichuan, Guizhou, and Yunnan in Southern China, which are characterized as China's forest areas. The total forest area in China is 208 million hectares, and the forest coverage rate is 21.63%. The forest zones of China are mainly concentrated in collective forest zones in southern China and national forest zones in northeast China. The forest in the northeastern zone is mainly state owned and managed by state-owned forest organizations. The forest in the southern collective forest zone belongs to the collective. Over the past 10 years, the reform of collective forest rights has divided forests into households mainly concentrated in the southern collective forest zones. Reformed forest rights are also mainly implemented in this region. By the end of 2011, the reform of the southern collective forest zone was accomplished, and farmers obtained rights to operate in the forest zone. Therefore, the data collected and presented in this paper is concentrated mainly on this zone.

We launched our questionnaire based on a survey of college students returning home to 10 provinces in southern China. The survey area included Hunan (100 samples), Hubei (100 samples), Jiangxi (100 samples), Zhejiang (100 samples), Fujian (100 samples), Guangdong (100 samples), Guangxi (100 samples), Sichuan (100 samples), Guizhou (100 samples), Yunnan (98 samples), and other places. The sampling acquisition method involved randomly selecting farmers and distributing questionnaires. The formal research study issued 980 questionnaires, of which 482 were returned, with 462 being completed fully. This is consistent with Byrne [37] on sample selection requirements. The distribution of the samples is shown in Table 2.

Table 2. Description of the sample statistics.

Properties	Categories	Sample Size	Sample Proportion
Gender	Female	120	25.9
	Male	342	74.1
Age	30 and below	140	30.3
	31~40	31	6.7
	41~50	180	38.9
	51~60	98	21.2
	61 and above	13	2.9
Education	Primary school or less	68	14.7
	Middle school	162	35.1
	High school or vocational school	170	36.8
	Associate's Degree	61	13.2
	Bachelor's Degree	1	0.1
	Advanced Degree	1	0.1
Forest size (hm^2)	<1	90	19.5
	1~2	151	32.7
	2~4	112	24.2
	4~6	55	11.9
	above 6	54	11.7
Years of entrepreneurship	1 year	48	10.4
	2~3 years	201	43.5
	3~4 years	85	18.4
	4~5 years	128	27.7

The factor analysis examined the following: the perception of individual effect, ecological knowledge, perceived ecological severity, ecological emotion, and ecological protection behavior. The KMO adequacy test value was 0.781, and the Bartlett value of the spherical p test was 0.000, which indicated that the method used was appropriate for factor analysis. The validity of the questionnaire was measured to ensure its suitability. Validity assesses whether a tool can accurately measure the degree of the problem to be measured. Higher validity indicates that the tool, in this case, a questionnaire, can be used to measure the specific variables characterizing a research problem. As seen in Table 3, the factor load of each index is greater than 0.6, and the combined reliability (CR) of each factor is greater than 0.8. The average variance extracted (AVE) of each variable was more than 0.6. According to Hair et al. [38] and others, the convergent validity criteria mainly include the following: (1) the standardized factor load should be greater than 0.5; (2) the CR should be greater than 0.7; and (3) the AVE should be greater than 0.5. Therefore, according to these three criteria, the scale demonstrates good convergent validity, implying that the questionnaire is a valid tool.

Table 3. Convergent validity index analysis results.

Exogenous Latent Variables	Observed Variables	Load Factor	Combined Reliability (CR)	Average Variance Extracted (AVE)	Arithmetic Square Root of the Mean Refinement Variance
Perception of individual effect (PIE)	PIE1	0.905	0.901	0.819	0.905
	PIE2	0.905			
Ecological knowledge (EK)	EK1	0.867	0.859	0.674	0.821
	EK2	0.922			
	EK3	0.649			
Ecological perceived severity (EPS)	EPS1	0.871	0.896	0.742	0.861
	EPS2	0.828			
	EPS3	0.884			
Ecological emotion (EE)	EE1	0.848	0.868	0.688	0.829
	EE2	0.881			
	EE3	0.755			
Ecological protection behavior (EPB)	EPB1	0.882	0.900	0.751	0.867
	EPB2	0.895			
	EPB3	0.821			

During this study, the internal consistency of the data was analyzed using SPSS 16.0. Table 4 depicts the results of the reliability analysis of the indicators in the questionnaire. The results indicate that Cronbach's alpha of the five latent variables is also greater than 0.7. Therefore, we conclude that the measured items of each research variable have high internal consistency and reliability, and the survey data is therefore reliable.

Table 4. Reliability test of latent variables.

Exogenous Latent Variables	Number of Observed Variables	Cronbach's Alpha
Perception of individual effect (PIE)	2	0.815
Ecological knowledge (EK)	3	0.811
Ecological perceived severity (EPS)	3	0.900
Ecological emotion (EE)	3	0.876
Ecological protection behavior (EPB)	3	0.892

4. Results

Since this paper discusses the complex relationship between four dimensions of ecological attitudes, including the perception of individual effect, ecological knowledge, perceived ecological severity, ecological emotion, and ecological protection behavior, the SEM was adopted. The SEM includes two sets of theoretical models. The first is the structural model, which is used to define both the potential independent variables (i.e., perception of individual effect, ecological knowledge, perceived ecological severity, and ecological emotion) and the potential linear relationships between the variables (i.e., perceived ecological severity, ecological emotion, and ecological protection). The second is the measurement model, which defines the linear relationships between the latent and observed variables.

5. SEM Checking

Based on the reliability and validity of the scale, this study further established the SEM using SPSS 16.0 and AMOS 22 software (IBM, New York, NY, USA) analysis tools to analyze the relationship between these five variables. The AMOS 22 software (IBM, New York, NY, USA) was used to establish the SEM path as shown in the conceptual model in Figure 1, and the data generated by SPSS 16.0 was imported. The test results of its various indicators are shown in Table 5. Any path that did not pass the inspection was deleted, and the model was adjusted accordingly. The revised conceptual model and its solution path coefficients are shown in Figure 3. Table 5 demonstrates that the SEM results confirmed hypotheses, H2, H3, H5, H7, and H9, while H1, H4, H6 and H8 were not confirmed.

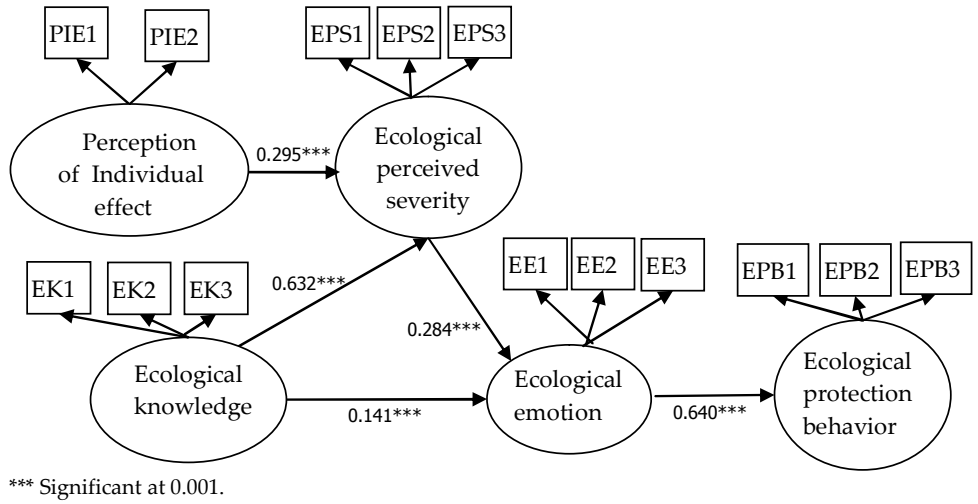

Figure 3. Path graph of structural equation model (SEM).

Table 5. SEM model checking.

H	Path			Estimate	SE	CR	*p*	Pass or Not
H1	Ecological protection behavior	<—	Ecological knowledge	−0.107	0.073	−1.465	0.143	no
H2	Ecological emotion	<—	Ecological knowledge	0.141	0.068	2.086	0.037	yes
H3	Ecological perceived severity	<—	Ecological knowledge	0.632	0.116	5.438	***	yes
H4	Ecological protection behavior	<—	Perception of individual effect	−0.104	0.056	−1.846	0.065	no
H5	Ecological perceived severity	<—	Perception of individual effect	0.295	0.089	3.318	***	yes
H6	Ecological emotion	<—	Perception of individual effect	−0.077	0.052	−1.494	0.135	no
H7	Ecological emotion	<—	Ecological perceived severity	0.284	0.043	6.633	***	yes
H8	Ecological protection behavior	<—	Ecological perceived severity	0.058	0.050	1.150	0.250	no
H9	Ecological protection behavior	<—	Ecological emotion	0.640	0.086	7.415	***	yes

*** Significant at 0.001.

5.1. Model Goodness-of-Fit Test

After the model was adjusted, the SEM test of goodness-of-fit was conducted, as shown in Table 6. Table 6 shows that the fit index card and degrees of freedom are 2.51; the GFI and NFI values are 0.922 and 0.932, respectively; the CFI and IFI values are 0.958 and 0.957, respectively; and the RMSEA is 0.076, which is less than 0.08, thus clarifying that the model is based upon a representative sample.

Table 6. Goodness-of-fit test results.

	χ^2	df	χ^2/df	GFI	NFI	IFI	CFI
Standard			<3	>0.9	>0.9	>0.9	>0.9
Effect	237.051	71	2.51	0.922	0.932	0.958	0.957

5.2. Intermediary Effect Analysis

Based on the SEM validation, this paper further tests the mediating effect in the model. Baron and Kenny [39] proposed that part of the mediating effect of implementation must meet four conditions, indicating that there should be a significant relationship between (1) the independent variable (ecological knowledge) and mediating variable (ecological perceived severity); (2) the independent variable (ecological knowledge) and dependent variable (ecological emotion); (3) the mediating variable (perceived ecological severity) and dependent variable (ecological emotion); and (4) the independent variable (ecological knowledge), mediating variable (ecological perceived severity), and dependent variable (ecological emotion). Furthermore, the influence of independent variables should be less than that of the mediating variables. As shown in Figure 4, perceived ecological severity has a partial mediating effect between ecological knowledge and ecological emotion.

The realization conditions of the complete mediation effect suggest that there should be a significant relationship between (1) the independent variable (ecological knowledge) and the dependent variable (ecological protection behavior); (2) the independent variable (ecological knowledge) and the mediating variable (ecological emotion); (3) the mediating variable (ecological emotion) and the dependent variable (ecological protection behavior); and (4) the independent variable (ecological knowledge), the mediating variable (ecological emotion), and the dependent variable (ecological protection behavior). Here the indirect effect is significant, but the direct effect is not.

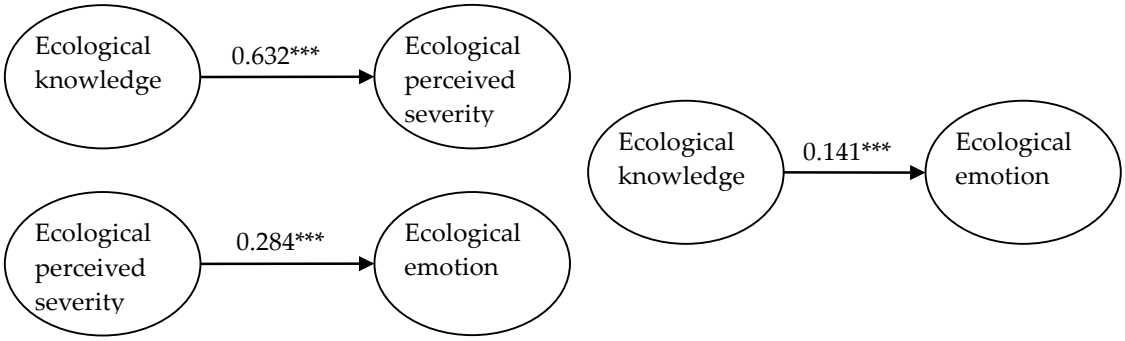

Figure 4. The tests of ecological severity's mediating effect.

The SPSS data analysis results show significant relationships between ecological knowledge and ecological protection behavior ($\beta = 0.091$, $p = 0.044 < 0.05$); ecological knowledge and ecological emotion ($\beta = 0.253$, $p = 0.000 < 0.05$); and ecological emotion and ecological protection behavior ($\beta = 0.517$, $p = 0.000 < 0.05$). Furthermore, when ecological knowledge and ecological emotional interact resulting in ecological protection, the direct effect ($\beta = -0.045$, $p = 0.274 > 0.05$) was not significant, while the indirect effect ($\beta = 0.538$, $p = 0.000 < 0.05$) reached a significant level. Therefore, ecological emotion has a significant effect on the mediation of ecological knowledge and ecological protection behavior, as shown in Figure 5. In other words, ecological knowledge influences farmers' ecological protection behaviors mainly due to the indirect effects of ecological emotion on the intermediary variables. Thus, knowledge is not enough to motivate behavioral change; emotional arousal and the engagement of concern is key.

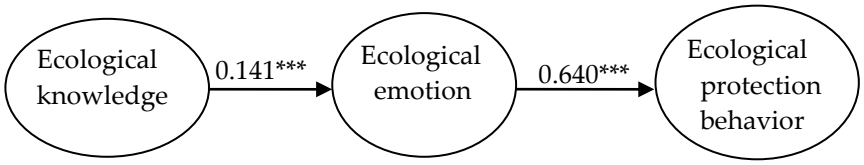

Figure 5. Mediation effect path of cognition, emotion and behavior in ecological protection.

6. Discussion

The existing literature suggests that ecological attitudes directly affect ecological protection behavior [19,40]. However, no literature reveals the intermediate mechanism between the two. Based on past ecological attitudes to ecological protection, this study applies SEM to the psychological path factors that influence farmers' ecological protection behaviors. Furthermore, it studies the ecological attitudes that govern the internal relationship and mechanism, provides conclusions with practical significance, and eventually proposes a cognition → emotion → practice model. In general behavioral intention research, the knowledge → attitude → practice model proposes that the transformation of individual behaviors is a process that has three steps: "knowledge" (cognition), "attitude" (faith), and "practice" (behavior). Individuals possess the knowledge, while a positive understanding of this knowledge can convert it into individual beliefs. It is then possible for individuals to develop positive attitudes and change their behaviors. The knowledge → attitude → practice model is a mental model describing the relational mechanism between cognition, attitude, and behavior; it has been widely used in the fields of education, psychology, behavioral science, etc. In this study, we found that this model could not be used directly to explain ecological protection behavior. Accordingly,

this study further developed the classical knowledge → attitude → practice model and proposed the cognition → emotion → practice model, as shown in Figure 6, to explain the effect of psychological factors on ecological protection behavior.

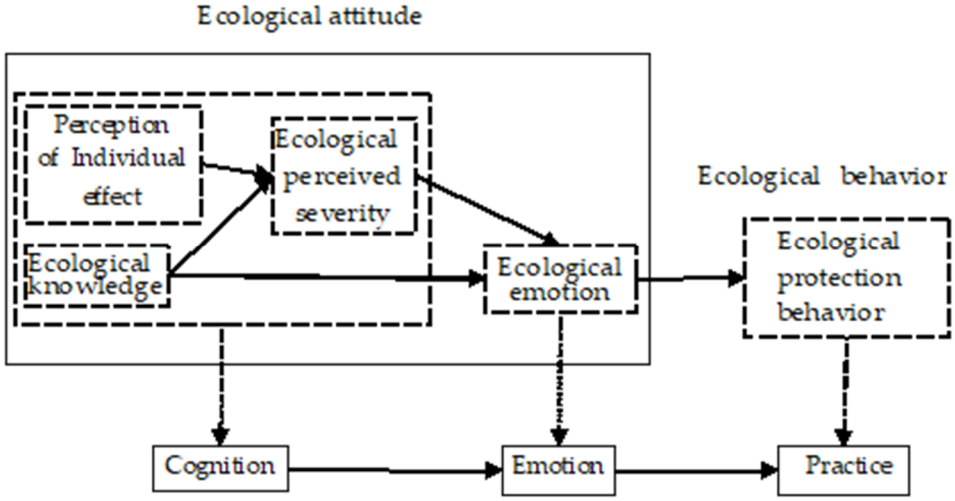

Figure 6. Mechanism of action in the "cognition → emotion → practice" model.

In the proposed cognition → emotion → practice model, ecological attitudes are subdivided into cognition and emotion, where "cognition" refers to "cognitive and perceptual", including ecological knowledge, perceived ecological severity, and the three dimensions of the perception of individual effect. "Emotion" refers to individual ecological attitudes based on an emotional response of compassion and concern, specifically referring to the dimension of ecological emotion. "Practice" refers to "behavior and practice" to protect the life of the ecological environment by consuming specific products, saving water, saving electricity, and other positive ecological behaviors (i.e., the ecological protection behaviors of this dimension). This paper proposes that ecological attitudes exist in complex hierarchical relationships with relationally dynamic mediating effects. Our model is different from the classical knowledge → attitude → practice model because in our extended model, ecological attitudes are divided into the dimensions of cognition and emotion. Within cognition, the perception of individual effect and ecological knowledge will affect perceived ecological severity. "Emotion" is the key factor influencing the internal action of ecological attitudes on ecological protection behavior. Only ecological emotion directly affects ecological protection behavior. Between "cognition", "emotion", and "practice" through the specific dimensions of "cognition, emotion, and practice", the progressive path of cognition, emotion, and practice is realized, but there is no direct path from "cognition" to "practice".

Farmers' behaviors are significantly affected by their intent to conserve ecological achievements, and their intent is significantly influenced by their attitudes [41,42]. Therefore, if we want entrepreneurial farmers to adopt good ecological protection behaviors, some policies should be implemented using the cognition → emotion → practice model. The goal of these policies would be behavioral changes in farmers to achieve a specified objective. A variety of policy instruments may be employed to do this. Some instruments, such as regulations, are intended to compel changes in behavior. Others, like incentives, are intended to induce voluntary changes in behavior [43]. Presently, there are many regulations to protect the forestry areas in China. Cutting trees without permission of government would impose a hefty fine in conservation zones. For example, in Ningxia and other regions in northern China, livestock is not permitted to go into forestry areas which are designated as ecological rehabilitationzones. At the same time, incentives are used in many forestry areas in China [44]. Some entrepreneurial programs (i.e., agricultural circular economy practices) which have excellent results in improving the local ecology can get the subsidies from the

government. Local governments also provide resources in agricultural production (e.g., bees and saplings) to farmers freely, which incentivize the entrepreneurial behaviors with environmental protection behaviors. The findings of this study may provide further policy tools to incentivize ecological protection behaviors in forestry areas in China.

These empirical results have important implications for policy makers. Following the tenure rights reforms in the collective forests, Chinese policy makers want to improve farmers' enthusiasm to take part in ecological protection. At the same time, the governments are afraid farmers will destroy the forest while pursuing entrepreneurial activities. Therefore, the government transfers substantial ecological knowledge to entrepreneurial farmers to protect the ecology of the forest in many ways, including training and advertising campaigns. However, the results of this paper reveal that it is insufficient to train entrepreneurial farmers in this way only. Many other interventions are needed. First, it is necessary to equip entrepreneurial farmers with knowledge about ecological protection in the forest zone. Ecological knowledge comes from education. Therefore, formal and informal training in the management of natural resources is a factor that influences the behaviors of entrepreneurial farmers in Chinese forest zone. However, the average educational level for these farmers tends to be lower than the average level in the world [45]. As such, the central state and local governments should build an incentive structure to improve the educational level of farmers in China. Second, due to the influence of perceived ecological severity upon emotion, entrepreneurial farmers should fully understand the severity of ecological issues to arouse their concern and compassion toward life in the forest zone. As farmers, they may not appreciate that sustainability is essential for businesses that rely on forest resources. However, they will have emotions connected to their origins and their hometowns, and will be willing to do something to ensure the well-being of their descendants. Third, policy-makers should implement systematic policies, including improving ecological knowledge and the perception of the severity of ecological issues in accordance with educational levels, with specific examples. Policies should aim to cultivate ecological emotion and provide financial subsidies to motivate ecological protection behavior.

7. Conclusions

Factors influencing the ecological behaviors of farmers are not independent of each other but rather influence each other, and there is a mutual association between them. This association can only affect individual behavioral factors and cannot necessarily directly improve farmers' ecological protection behaviors. By analyzing the mechanism underlying ecological attitudes and measuring the correlations and path of influencing factors, this study found that accurately positioning the key influencing factors of ecological attitudes toward behaviors required on the path of ecological protection can effectively enhance farmers' ecological protection behaviors. The study shows that ecological attitudes affect ecological protection behavior, including the following five paths. This study contributes to the literature in the following ways. First, prior research on ecological protection lacks a full analysis of factors influencing entrepreneurial farmers. We fill this gap by investigating the effects of ecological knowledge, the perception of individual effect, perceived ecological severity, and ecological emotion on the ecological protective behaviors of entrepreneurial farmers in the Chinese forest zone. Second, there is a lack of empirical studies on the ecologically protective behaviors of entrepreneurial farmers, which limits an understanding of the field of ecological protection. While a few research studies investigating the ecological behaviors of farmers are presently available, they are largely exploratory and limited to a few factors. We have attempted to develop a systematic framework to test a comprehensive model.

In path 1, only the key factors of ecological emotion can directly affect ecological protection behavior. Human behavior is directly driven by emotions, which are complex and diverse, and their strength is small and negative. In path 2, ecological knowledge through intermediary factors indicates that ecological emotion affects ecological protection behavior. Forest farmers' education and scientific levels are not high, and they have lower levels of ecological knowledge. In terms of knowledge, they may be unaware of the impact of their behavior on the ecological environment, which is inconsistent between cognition and behavior. The level is not up to the knowledge affecting the ecological protection behavior. The model of cognition, emotion, and practice needs to have ecological emotional appeal to be transformed into an ecological protection behavior. In path 3, ecological perceived severity affects ecological protection through ecological emotions. The more serious the perception, the more excited the ecological emotion, such as sympathy and concern, eventually resulting in a positive ecological behavior. In path 4, ecological knowledge as the role of endogenous factors as well as the perspective of ecological perceived severity affects ecological emotion to influence ecological protection behavior. In path 5, perception of individual effect and ecological perceived severity are negatively related. The lower the perception of individual effect, the higher the ecological perceived severity. Therefore, the perception of individual effect influences ecological protection behavior through the perception of seriousness and ecological emotion.

The findings of our study have several implications for policy-makers and program implementation. Firstly, as shown in the empirical tests, the ecological cognition and perceptions of entrepreneurial farmers do not impact ecological protection behavior directly; it is rather ecological emotion that impacts their behavior. Therefore, policy-makers and program managers should change the traditional systems which teach entrepreneurial farmers ecological knowledge only. Ecological emotion should be increased by telling them the importance of good ecology in their hometown and helping them to love their natural resources. Secondly, as shown in the empirical tests, the perceived severity of the ecological situation does not impact the ecological protection behaviors of entrepreneurial farmers. Therefore, teaching them to love their hometown is better than warning them about an ecological crisis. We do many things to tell the entrepreneurial farmers the bad results of destroying the ecology in forestry areas. However, it has not helped to influence their ecological protection behavior. Thirdly, as shown in the empirical test, the perception of individual cases does not impact their ecological emotion positively. Therefore, it is more important to teach them ecological understanding instead of increasing their perception of individual cases. The study contributes to the literature in the following two ways. Firstly, prior research on ecological protection rarely discusses factors influencing entrepreneurial farmers. This paper fills this gap by investigating the effects of ecological knowledge, the perception of individual cases, perceived ecological severity, and ecological emotion on the ecological protective behaviors of entrepreneurial farmers in the Chinese forest zone. Secondly, empirical studies of the ecologically protective behaviors of entrepreneurial farmers are still scarce, which limits an understanding of the field of ecological protection. This paper tested some hypotheses with empirical data and gives practical implications to policy-makers and program managers.

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