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Drivers of farmers' intentions to use eco-breeding: Integrating the theory of planned behavior and the norm activation model

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Ecological breeding (eco-breeding) is a systematic ecological farming method for the benefit of the environment and human health, but farmers have adopted this method only to a lesser extent. The main objective of this study was to examine the factors that influence farmers' intentions to use eco-breeding methods. The study model was a combined application of the theory of planned behavior (TPB) and the normative activation model (NAM) to investigate the intentions of 527 Chinese farmers to engage in eco-breeding practices. Structural equation modeling analysis revealed that although the farmers' intention to adopt eco-breeding practices was influenced by both self-interested and altruistic motives, self-interested motives had a greater impact on the farmers' choices. Furthermore, favorable attitudes had the greatest effect on the farmers' intentions to implement eco-breeding, while past habits had no statistically significant effect on the intentions. Nonetheless, past habits significantly influenced attitudes and perceived behavior control in the combined model. In addition, the findings indicated that awareness of consequences had a significant effect on personal norms and the attribution of responsibility. Overall, the findings demonstrate the good efficiency as well as comprehensiveness of the integrated TPB-NAM in explaining the farmers' intentions to engage in eco-breeding practices. This study increases our understanding of the factors influencing the farmers' adoption of eco-breeding practices and helps to promote the adoption of eco-breeding in rural areas while providing a basis for the development of eco-breeding policy interventions.

KEYWORDS

waterfowl production, eco-breeding practice, farmers' behavior, past habit, the theory of planned behavior, the normative activation model

Introduction

Driven by the growing demand for waterfowl products, industrial waterfowl production with higher production efficiency and profitability has become increasingly popular (Hu et al., 2017). Because of intensive rearing, higher stocking density, misuse of feed additives and veterinary drugs for therapy, prophylaxis and growth promotion, and

poor waste management, industrial waterfowl production has seriously threatened ecological balance and human health, triggering both official anxiety and public concern (Hu and Cheng, 2016; Bandyopadhyay and Samanta, 2020). Although China has introduced laws and regulations on the use of feed additives and veterinary drugs, such as the Administrative Regulations on Feed Additives and the Regulation on Veterinary Drug Administration (Hu and Cheng, 2015), the unreasonable use of veterinary drugs and abuse of feed additives in waterfowl production are still widespread, posing a serious threat to the environment and public health (Shao et al., 2021). Farmers can further improve the vitality of waterfowl production and reduce environmental pollution by adopting eco-breeding models (Tilman and Clark, 2015). Hence, increasing the willingness of farmers to use eco-breeding models could reduce the harm to the environment (Röös et al., 2018). In recent years, governments have been actively promoting eco-breeding methods to protect the environment and improve agricultural efficiency (Gomiero et al., 2011). For example, Iran actively promotes integrated pest management, and the United States restricts the use of chemicals in agriculture, etc. (Floress et al., 2017). The Chinese government has also vigorously promoted eco-breeding policies (Yang, 2021), but the expected results have not been achieved, and the farmers' willingness to adopt ecological breeding practices is relatively low (Zeng et al., 2019). Eco-breeding practices are closely dependent upon farmers' willingness (Vasquez et al., 2019), and it is necessary to explore in depth the mechanisms that affect the adoption of eco-breeding practices by farmers. This exploration will help the government develop reasonable policies and adopt appropriate incentives to increase the enthusiasm of farmers.

Because the adoption of eco-breeding models can help improve the safety of waterfowl products and maintain public health—in addition to providing benefits to farmers—clarification of the determining factors that drive farmers' willingness in using eco-breeding model is imperative. Recent studies have been focused on either self-interested motives or altruistic motives (Park and Ha, 2014; Floress et al., 2017). In terms of self-interested motivation, the theory of planned behavior (TPB) proposed by Ajzen (1991) is considered as a rational choice model that mainly considers the comparison of cost effectiveness and benefits (Botetzagias et al., 2015; Chen, 2016), ignoring the roles of irrational and altruistic motives in shaping behavior (Roy et al., 2016). Therefore, TPB is not sufficient to effectively explain the generation of pro-environmental behavior (Ahmad et al., 2020). Conversely, the normative activation model (NAM) was proposed by Schwartz (1977) as a classical model to explain pro-environmental behavior, placing more emphasis on the importance of altruism and morality and ignoring the important role of rational and self-interested motives in predicting intention-driven behavior (Onwezen et al., 2013; Kim and Seock, 2019). On the one hand, farmers may be driven by narrow self-interest, regardless of

whether their use of antibiotics is rational (Albernaz-Gonçalves et al., 2021). On the other hand, farmers may also be driven by the welfare of others and will adopt conservation measures that benefit the ecosystem and public health (Shi et al., 2017). Therefore, considering that farmers' eco-breeding behavior is a pro-environmental behavior, it can be seen as a mixture of self-interest and altruism. The practice of eco-breeding by farmers is a pro-environmental behavior that can be seen as a mixture of self-interest and altruism (Liu et al., 2017; Tang et al., 2021). This study integrates the structure of TPB and NAM and adds interrelationships between past habits and intentions to enhance the predictive power of the proposed framework for explaining farmers' intentions to use eco-breeding practices.

In this study, we investigated farmers' intentions to adopt waterfowl eco-breeding practices by using the TPB-NAM integrated model in both the economic and social value dimensions. Specifically, we investigated (1) applying the integrated TPB-NAM to explain farmers' intention to adopt eco-breeding practices, (2) exploring the causal relationship between the TPB and NAM structures, and (3) examining realistic ways for waterfowl farmers to adopt eco-breeding practices from the perspectives of self-interest and altruism. To achieve these objectives, in the following section, we review the literature and hypothesize the relationships between the variables. Section Methodology presents the methodology. Section Results presents the estimation results. Section Discussion provides a discussion of the results. Finally, implications for policy are presented.

Theory and hypotheses

The theory of planned behavior

TPB, as proposed by Ajzen (1985, 1991), is an extension of the theory of reasoned action, which explains a person's reasons for choosing indicating a certain behavior mainly in terms of costs and benefits (Montano and Kasprzyk, 2015; Conner, 2020). This theory suggests that behavioral intentions are determined by three main factors: attitudes (ATT), perceived behavioral control (PBC), and subjective norms (SN). TPB is used as the most popular social psychological theory to explain the behavior of individuals in numerous domains (Gao Y. et al., 2017); hundreds of researchers have investigated or applied TPB to predict behavior in areas such as health and environmental sustainability (Ibrahim et al., 2019).

According to TPB, ATT is the degree to which an individual has a favorable or unfavorable evaluation of a particular behavior (Ajzen, 1991). Usually, positive ATT encourage individuals to take action (Chen, 2017). Compared to other TPB variables, ATT toward behavior most significantly influences a person's behavioral intention (De Groot and Steg, 2007; Chen, 2016). Thus, ATT can be considered as a potential determinant of

an individual's intentions to implement pro-environmental behaviors (Chuang et al., 2018; Rezaei et al., 2019). Farmers intend to use eco-breeding practices only if they believe that these practices are useful and beneficial and give them positive results. Thus, we present the following hypothesis:

H1: A favorable ATT toward eco-breeding practices positively predicts the intention to engage in eco-breeding.

PBC is defined as the perceived ease or difficulty of performing a particular behavior (Ajzen, 1991). It depends heavily on weighing the costs and benefits, including financial costs, effort, and time in the process of performing the act (Shi et al., 2017). Thus, the higher the individual's PBC, the stronger the willingness to perform a behavior, in this case "higher" means a greater perceived ease (Gao Y. et al., 2017). Similar conclusions were reached by Gao L. et al. (2017) in research on individual's energy-saving intention. In addition, PBC turned out to be important direct predictor of one's behavior (Botetzagias et al., 2015). However, A general version of the TPB revealed PBC's direct influence on ecological behavior to be non-significant and that finding do not challenge PBC's influence on intention (Kaiser and Gutscher, 2003). This fact can be extended to farmer's eco-breeding practices. When they believe they have the relevant knowledge, skills, and resources to use eco-breeding practices under their control, they are more likely to form the intention to participate in these practices. Therefore, the following hypothesis is proposed:

H2: A high PBC of using eco-breeding practices positively influences the intention to use those practices.

SN refers to perceived pressure from significant others to perform certain kinds of behaviors (Ajzen, 1991). In other words, individuals usually prefer to align themselves with the expectations of significant organizations or people (Shi et al., 2017). Thus, the perception of highly relevant SN from significant others can increase an individual's intention to perform a specific behavior (Passafaro et al., 2019). Arli et al. (2018) confirmed this view in his study of the intentions to purchase green products. Also, Rezaei et al. (2019) applied TPB to explore the intention of Iran farmers to engage in IPM practices and found that subjective norm has a significant effect on intention in the original TPB whereas the effect was not statistically significant in the integrative model of TPB-NAM. The main reason for this can be attributed to the effectiveness of subjective norm in predicting intention varies in various fields. Farmers are more likely to use eco-breeding practices if they perceive that they are under social pressure to do so. Based on this, the hypothesis is formulated:

H3: The SN of using eco-breeding practices positively affects the intention to use those practices.

In addition to the aforementioned hypotheses, which are focused primarily on the relationship between intention and the

focal structure of TPB (i.e., ATT, PBC, and SN), the results of other studies suggest that past habits reinforce the predictive role in behavioral intention (Høie et al., 2010; Leung and Chen, 2017; Abadi, 2018). Past habits are psychological construct, rather than simply past behavioral frequency (Verplanken and Orbell, 2003), which are defined as automatic or unconscious reactions to future behaviors (Honkanen et al., 2005). That is, farmer's past habits are generated by frequency and satisfactorily pairing behaviors with the execution of relevant eco-breeding practices. Past habit has been shown to influence intention regardless of TPB variables (Tuu, 2015; Semencescu and Gavreliuc, 2021). However, Ajzen (1991) suggested past habit is not sufficient, and some scholars have argued that past habit plays an important role in the influence of PBC on decision-making (Sommer, 2011). Furthermore, the predictive power of attitudes should be diminished if people have past habits (Trafimow, 2000), and conversely, ATT should be good predictors of intention when people do not have a habit of exhibiting a behavior (Tuu, 2015). Evidence from other scholars supports the relationship between past habit and intention, ATT, and PBC (Dean et al., 2012; Leung and Chen, 2017; Chen et al., 2019). Because farmer's intentions regarding the adoption of eco-breeding are influenced by past habits, we added past habit to TPB as a theoretical structure for the study of farmers' intentions to adopt eco-breeding practices. In this regard, the following hypotheses are proposed:

H4: Past habit positively affects ATT toward participation in eco-breeding.

H5: Past habit is positively related to PBC of participation in eco-breeding.

H6: Past habit is positively related to the intention to participate in eco-breeding.

The norm activation model

NAM is a model developed by Schwartz (1977) to explain altruistic and environmental behaviors or intentions and is widely used in a variety of pro-social and pro-environmental domains (Bamberg and Möser, 2007; Onwezen et al., 2013; Wang et al., 2019). Examples pertaining to farmers include the choice of travel methods (Park and Ha, 2014), recycling behavior (Zhang et al., 2014), and ecological farming by farmers (Rezaei et al., 2019). The model suggests that the activation of a personal norm (PN) depends on two elements: awareness of consequences (AC) and attribution of responsibility (AR) (Schwartz, 1977). PNs are the self-expectations of individuals to perform specific behaviors in specific situations and include internalized social norms and a sense of moral obligation. AC involves the positive or negative effects that individuals are aware that their behavior can have, and AR indicates individual's sense of responsibility for the consequences of their behavior (Schwartz, 1977).

NAM assumes that when people are aware of negative impacts on the environment (i.e., AC), they tend to take responsibility for the negative consequences (i.e., AR), and thus AC and AR activate PNs to motivate individuals to exhibit certain behaviors or intentions to mitigate negative effects (Kormos et al., 2015; Møller et al., 2018). In addition, it is important to emphasize that people who are not aware of the impact of their actions on the environment are not likely to be held responsible for the consequences (Liu et al., 2017). In other words, an individual's AC is an important antecedent to AR (Rezaei et al., 2019). By applying the concept of NAM to the act of using eco-breeding, we can see that if farmers feel that they are responsible for the results of practicing eco-breeding and are aware of the positive consequences, they will have a moral obligation to use these practices to protect others and the environment. This sense of obligation in turn leads to a strong intention to engage in eco-breeding practices. In summary, based on the assumptions of NAM and the preceding discussion, the following hypotheses are proposed:

H7: PN will positively affect farmer's intention to engage in eco-breeding practices.

H8: AC will positively affect PN in eco-breeding practices.

H9: AR will positively affect PN in eco-breeding practices.

H10: AC will positively affect AR in eco-breeding practices.

Proposed research model

Based on the preceding literature review and hypotheses development, a conceptual model that combines the constructs of NAM and TPB is proposed (Figure 1) to explain the intentions of Chinese farmers to adopt eco-breeding practices. The model is designed to test the association between the endorsement of TPB and the intention to adopt eco-breeding practices. In addition, PN, predicted by AC and AR, was postulated as predictor of farmers' intentions to adopt eco-breeding practices because AC predicts AR.

Methodology

Measures

The questionnaire consisted of two parts. The first part obtained basic information about the respondents, including age, gender, education, and annual household income. The second part measured potential variables related to TPB-NAM to explore the farmer's intentions to implement eco-breeding. We mainly obtained the original measurements for this study from Verplanken and Orbell (2003), Ajzen (2006), Han (2014), and Rezaei et al. (2019). On this basis, we invited foreign experts from academia and researchers familiar with relevant

research topics to review the questionnaire and assess the clarity and rationality of the items. In the prediction review, experts identified problems such as repetitive items, vague sentences, and unreasonable design in the questionnaire, and the final questionnaire was formed through revision. All items were anchored by 1 "do not agree at all" and 5 "strongly agree". The exact wording of the statements used in all scales is reproduced in Table 1.

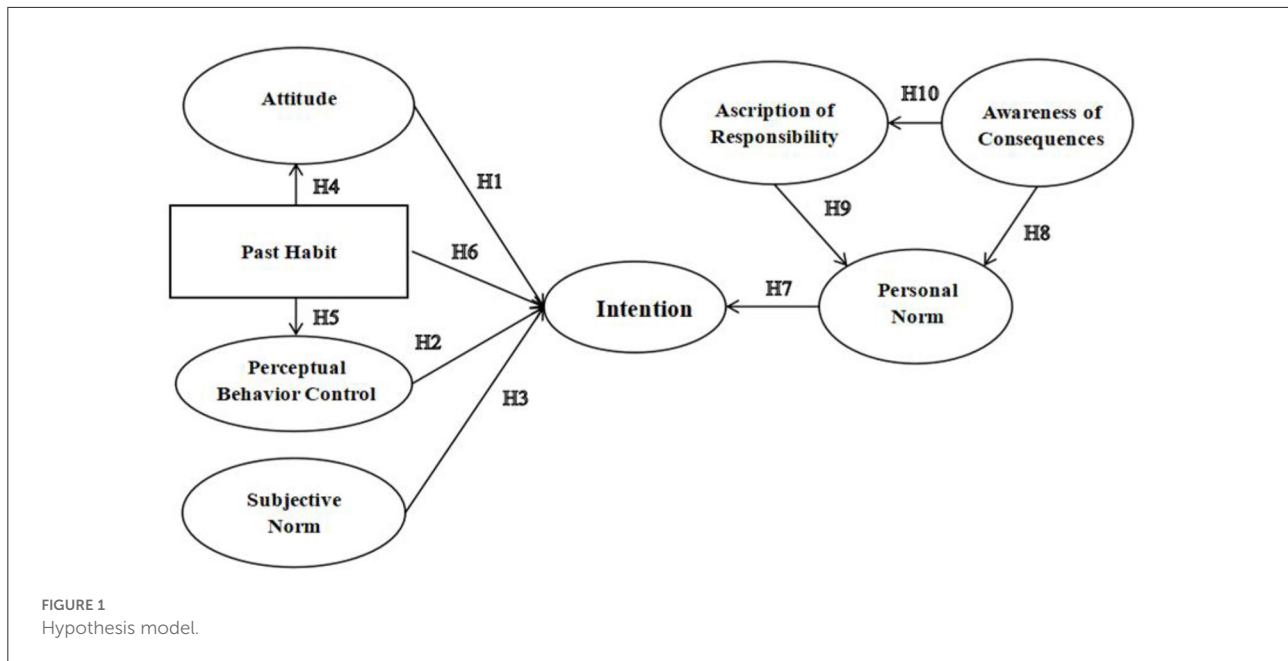
Participants and procedure

Because China is the largest waterfowl producer, accounting for more than 75% of the world's waterfowl rearing (Ibrahim et al., 2019), we randomly selected three provinces, Jiangxi, Hubei, and Yunnan, from 21 major waterfowl-producing provinces in China according to the National Waterfowl Industry Technology System (NWITS). As shown in Figure 2, Jiangxi Province, located in southeastern China, has many lakes, well-developed water systems, and a long history of waterfowl breeding and is one of the dominant production areas of the national waterfowl industry. Hubei Province is a well-known waterfowl production province in central China, which is also famous for its unique waterfowl-processing products. Yunnan Province, located in southwestern China, has a warm climate; lush aquatic plants; and abundant fish, shrimp, and aquatic insects and other invertebrates, providing good habitat and food conditions for waterfowl, and is one of the important waterfowl conservation areas in East Asia.

To investigate the farmers' willingness to adopt eco-breeding practices, we carried out in-person interviews during the period of May–October 2020, randomly selecting 550 waterfowl farmers with a two-stage sampling procedure. We selected a total of 11 counties—six in Jiangxi, three in Hubei, and two in Yunnan—based on the ratio of waterfowl production values in the three sample provinces.¹ Within a sampled county, we selected 50 waterfowl farmers randomly in the second stage. We recruited trained native interviewers to visit each participant to conduct the survey, offering a gift (a telephone card worth RMB 20) to encourage cooperation.² Moreover, we kept responses anonymous to encourage respondents to express their true opinions. This survey resulted in 527 usable questionnaires after the removal of 23 invalid entries.

¹ According to the survey data of NWITS in 2019, the ratio of Jiangxi, Hubei, and Yunnan waterfowl integrated production values is about 6:3:2.

² Interviewers explained every item in the questionnaire for respondents so that they could understand the meaning of each item. The whole process took about 45 min for each respondent.



Data analysis

We used the Statistical Package for the Social Sciences 21.0 (SPSS) as statistical software to perform structural equation modeling (SEM) for evaluating the proposed model and hypotheses.³ Before proceeding to the main analysis, we examined the normality of each variable in the model to determine whether the data met the normality assumption of the maximum likelihood estimation. We performed the main statistical analysis in two stages. First, we performed confirmatory factors analysis (CFA) to verify the reliability and validity of all measured variables and the fit of the measurement model to the data. After evaluating the measurement models, we performed SEM to access the proposed model and research hypotheses.

Results

Participants' profile

As shown in Table 2, the sample is dominated by male participants ($n = 352$, 67.0%). The average age of the respondents was about 50 years old ($SD = 14.69$), and most of the respondents ($n = 473$, 90.1%) had completed junior high school or below. The annual household income

of most respondents ($n = 380$, 72.3%) was around RMB 20,000–100,000, and the average number of poultry stock was 5,083.98 ($SD = 26,041.04$) in 2019. According to the China Statistical Yearbook 2019, China's population has a relatively low level of education, with a per capita disposable income of 32,189 yuan, and about 71.2% of the total population is aged 15–64. All these above indicators suggest that these samples are to some extent representative of the Chinese population.

As shown in Table 1, in the constructs of PBC, the mean values of ATT (3.84) and SN (3.58) were relatively high, whereas the mean value of PBC was low (2.89). These findings show that most respondents had a favorable attitude and high personal norm related to the willingness to engage in eco-breeding practices. However, they did not perceive enough control to use eco-breeding properly. This may be because they did not have the required funds and skills to change the current situation. In the constructs of NAM, the mean scores of PN (3.53), AR (3.72), and AC (3.68) were relatively high, and these findings suggest that respondents felt morally committed to using eco-breeding practices. Also, they showed a relatively high intention (3.71) to engage in eco-breeding practices.

We conducted least significant difference analysis to examine whether there was any significant difference in responses across the three different provinces. No significant difference in the participants' profiles or measured constructs was found at $p < 0.05$. Thus, we combined data from the three provinces in all analyses that followed.

³ A desirable goal of a sample size is to have a 20:1 ration for the number of participants to the number of model parameters (Suhr, 2006); the ration in this study is 27.7:1, which meets the requirement of a sufficient sample size.

TABLE 1 Mean, standard deviation of items and subsections ($n = 527$).

Subsections	Items	Mean score, standard deviation ^{a,b,c}
Intention	Would you like to adopt the aforementioned approach to eco-breeding in the coming year?	3.78 ± 0.044 ^a
	Are you willing to take part of the land for green eco-breeding?	3.65 ± 0.048 ^b
	Subsection mean scores	3.71 ± 0.043^a
Attitude	Do you feel good about farming according to green eco-breeding standards?	3.78 ± 0.039 ^a
	Do you feel meaningful about farming according to green eco-breeding standards?	3.87 ± 0.038 ^a
	Do you think you should farm according to green eco-breeding standards?	3.87 ± 0.039 ^a
	Subsection mean scores	3.84 ± 0.035^b
Subjective norm	Do most of the people who are important to me think I should use green eco-breeding standards?	3.58 ± 0.040 ^a
	Do most of the people who are important to me approve of my adopting green eco-breeding standards?	3.65 ± 0.039 ^a
	Do most people like me take a green eco-breeding approach?	3.51 ± 0.042 ^b
	Subsection mean scores	3.58 ± 0.037^b
Perceptual behavior control	Do you think it is easy to implement green eco-breeding methods?	2.93 ± 0.046 ^a
	Do you think you have technical support team, capital, etc. to guarantee the smooth implementation of green eco-breeding?	2.84 ± 0.045 ^a
	Subsection mean scores	2.89 ± 0.041^e
Personal norm	I would feel guilty if I didn't implement eco-breeding ways.	3.46 ± 0.036 ^a
	My principle is to adopt eco-breeding approach.	3.58 ± 0.039 ^b
	I believe I have a moral obligation to adopt eco-breeding practices.	3.55 ± 0.039 ^b
	Subsection mean scores	3.53 ± 0.034^a
Awareness of consequences	Will not adopting green eco-breeding methods cause damage to the environment?	3.74 ± 0.038 ^a
	Will consumers be adversely affected by not adopting green and eco-breeding methods?	3.68 ± 0.038 ^a
	Will products raised without adopting green eco-breeding methods disrupt the consumer market?	3.62 ± 0.040 ^b
	Subsection mean scores	3.68 ± 0.034^d
Ascription of responsibility	To reduce environment pollution, I feel it is my responsibility to adopt eco-breeding method.	3.73 ± 0.038 ^a
	I have some responsibility for the environmental problems caused by not adopting eco-breeding methods.	3.70 ± 0.036 ^a
	Subsection mean scores	3.72 ± 0.035^a
Past habit	The implementation of eco-breeding standards for farming is a habit for me.	3.43 ± 0.043 ^b

^aMean scores of the items superscripted by the same English letter are not significantly different from each other.

^bMean scores of the subsections superscripted by the same Greek letter are not significantly different from each other.

^cAt the 1% level of significance based on the Chi-square (χ^2) test.

The bold values indicate the average score of the subtopic items under the concept.

Common method deviation

Common method bias (CMB), as a covariate property, can be potentially biased and can even lead to misleading research conclusions. To ensure that common method bias did not distort the results of this study, we conducted a Harman one-way test to

analyze the severity of homoscedastic errors during the analysis of the empirical data (Podsakoff et al., 2003). According to the results of the exploratory factor analysis in SPSS, the variance explained by the unrotated first principal component was <50%, indicating that the CMB of the study was not serious (Sun et al., 2015; Bai et al., 2019).

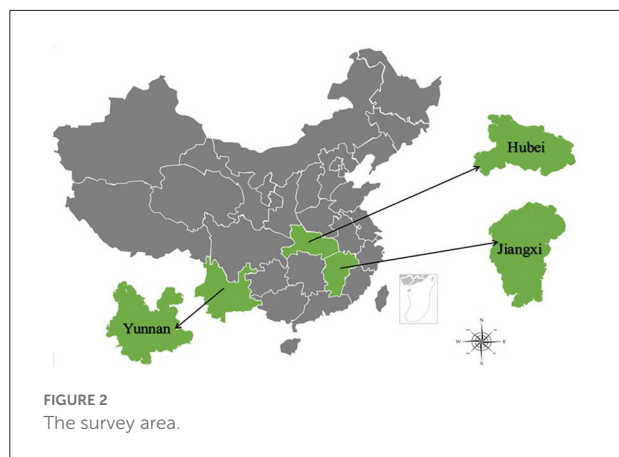


TABLE 2 Demographic characteristics information of the respondents (n = 527).

Variable	Description	n	Frequency (%)/ mean (SD)	χ^2	Df	p
Gender	Male	353	67.0	60.8	1	0.91
	Female	174	33.0			
Age	Years	527	49.67 (14.69)	291.1	64	0.46
Education	Illiterate	48	9.1	217.2	5	0.01
	Primary school	135	25.6			
	Intermediate school	203	38.5			
	High school or junior college	89	16.9			
	College or above	52	9.9			
Annual household income (yuan/RMB) ^a	<20,000	100	19.0	181.0	3	0.00
	20,000–60,000	256	48.6			
	60,000–100,000	125	23.7			
	More than 100,000	46	8.7			
	100,000					

^aAn average of 6.503 China Yuan equals to 1USD at the time of survey.

Reliability and validity

We performed CFA using analysis of moment structures to evaluate internal consistency reliability, convergent validity, and discriminant validity. To assess the fit of the model, various indices were used in the present research, including Chi-square (χ^2), degree of freedom (df), tucker-lewis index (TLI > 0.9), Goodness of-fit Index (GFI > 0.9), comparative fit index (CFI > 0.9), and root mean square error of approximation (RMSEA < 0.08). Initially, the measurement model fit well with the data overall ($\chi^2 = 361.08$, df = 131, $\chi^2/df = 2.76$, CFI = 0.97, GFI = 0.95, TLI = 0.95, RMSEA = 0.06). In addition, the combined reliability of the seven latent variables in the model ranged from 0.78 to 0.89, exceeding the m] recommended 0.70 (Fornell and Larcker, 1981). As described in Table 3, all standardized factor loadings of the measurement model were >0.7, indicating the high internal consistency of the scale, and the average variance extracted (AVE) values of the latent variables were >0.5, indicating good convergent validity of the scale (Hair et al., 2014).

In terms of discriminant validity, the scale is considered to have good discriminant validity if the arithmetic square root of each latent variable's AVE is greater than the correlation coefficient between latent variables (Fornell and Larcker, 1981). As shown in Table 4, the absolute values of the correlation coefficients of most latent variables are <0.5, and the correlation coefficients are smaller than the arithmetic square root of the mean square deviation of the corresponding AVE, so the scale is considered to have good discriminant validity.

Modeling comparisons

To test the robustness of the model, we conducted a modeling comparison. The results of the modeling comparisons are presented in Table 5. First, we tested the original TPB model, and the results showed that the TPB-based predictors explained

59% of the variance in the farmers' behavioral intentions. Second, we tested the expanded TPB model, and ~61% of the variance in farmers' behavioral intentions was explained by the expanded TPB combination. Third, we tested the standard NAM, and 41% of the variance in the farmers' behavioral intentions was contributed by the NAM-based predictors. Finally, we tested the combined model, and the results showed that the combined model performed well in predicting the farmers' behavioral intentions. Approximately 66% of the variance in farmers' behavioral intentions was explained by the predictors of the expanded TPB and NAM. All four models had acceptable fits, but the integrated model outperformed the other models in predicting the farmers' behavioral intentions.

Structural equation modeling

We demonstrated the criteria of reliability and validity by the measuring model, which laid the foundation for analyzing the structural model. We used structural equations to assess the goodness of fit of the theoretical framework, and the results showed that the theoretical model proposed in this paper matched the measured data ($\chi^2 = 503.78$,

df = 136, $\chi^2/df = 3.70$, CFI = 0.95, GFI = 0.95, TLI = 0.93, RMSEA = 0.07). RMSEA met the criterion of <0.08 (Browne and Cudeck, 1992), while the other fitness indices (e.g., CFI, GFI, and TLI) were higher than the recommended criterion of close to 0.9 and higher (Bagozzi and Yi, 1988).

The findings from SEM are displayed in Figure 3, Hypotheses 1, 2, and 3 proposed relationships among the original constructs established in TPB. Results showed that

ATT ($\beta = 0.50, p < 0.001$), PBC ($\beta = 0.13, p < 0.001$), and SN ($\beta = 0.21, p < 0.001$), were all significant predictors of the intention to adopt eco-breeding practices. Next, findings indicated that past habit positively influenced farmers' attitudes ($\beta = 0.53, p < 0.001$) toward adopting eco-breeding practices as well as PBC ($\beta = 0.61, p < 0.001$). Hence, Hypotheses 4 and 5 were supported. Hypothesis 6 was also evaluated. The results of the study indicated that the effect of past habit on farmers' intention ($\beta = 0.04, p > 0.1$) to adopt eco-breeding practices was not significant. Therefore, Hypothesis 6 did not pass the test. However, the path from individual norms to the farmers' intention to adopt eco-breeding practices was statistically significant, supporting Hypothesis 7 ($\beta = 0.15, p < 0.01$). Finally, the original variables of NAM, AC ($\beta = 0.41, p < 0.001$), and AR ($\beta = 0.43, p < 0.001$) had a positive effect on PN; and AC ($\beta = 0.75, p < 0.001$) had a significant effect on individual AR. These results supported Hypotheses 8, 9, and 10.

TABLE 3 Measurement model results.

Variable	Item	Standardized factor loading	AVE	Composite reliability
Intention	INT1	0.85	0.74	0.85
	INT2	0.86		
Attitude	ATT1	0.87	0.72	0.89
	ATT2	0.84		
	ATT3	0.84		
Perceptual behavior control	PBC1	0.83	0.64	0.78
	PBC2	0.76		
Subjective norm	SN1	0.91	0.74	0.89
	SN2	0.91		
	SN3	0.75		
Personal norm	PN1	0.81	0.84	0.88
	PN2	0.87		
	PN3	0.84		
Awareness of consequences	AC1	0.76	0.64	0.84
	AC2	0.86		
	AC3	0.78		
Ascription of responsibility	AR1	0.88	0.72	0.83
	AR2	0.81		

TABLE 5 Estimated parameters and goodness-of-fit indices of the test models (n = 527).

Path	TPB model	Expanded TPB model	NAM model	Comprehensive model
χ^2	94.51	115.96	96.92	503.78
χ^2/df	3.78	3.74	3.13	3.70
p	<0.001	<0.001	<0.001	<0.001
RMSEA	0.07	0.07	0.06	0.07
CFI	0.98	0.98	0.98	0.95
GFI	0.97	0.96	0.97	0.95
NFI	0.97	0.97	0.97	0.92
IFI	0.98	0.98	0.98	0.94
TLI	0.96	0.96	0.97	0.93
Adjusted R ² (INT)	0.59	0.61	0.41	0.66

RMSEA, Root-Mean-Square Error of Approximation; CFI, Comparative Fit Index; NFI, Normed Fit Index; GFI, Goodness-of-fit Index; IFI, Incremental Fit Index; TLI, Tucker-Lewis Index; INT, Intention.

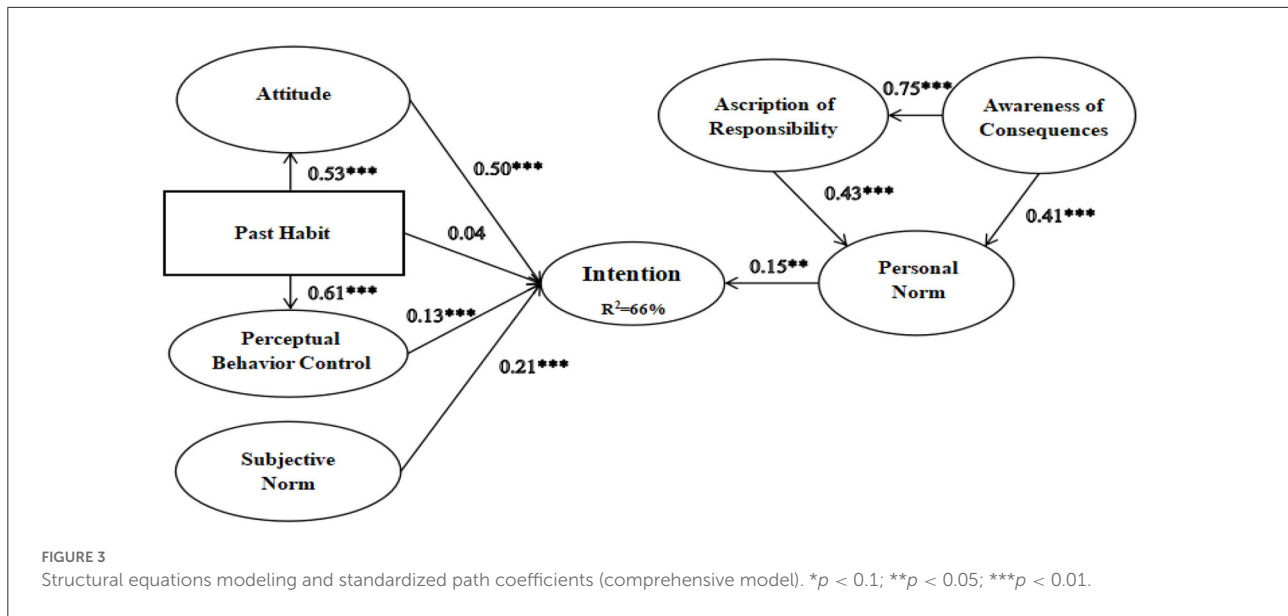
TABLE 4 Results of validity analyses.

	M	SD	ATT	SN	PBC	INT	PN	AR	AC
ATT	3.84	0.79	0.72						
SN	3.58	0.84	0.39**	0.74					
PBC	2.89	0.94	0.25**	0.32**	0.64				
INT	3.71	0.98	0.55**	0.49**	0.42**	0.74			
PN	3.53	0.78	0.35**	0.33**	0.29**	0.44**	0.84		
AR	3.76	0.77	0.31**	0.33**	0.21**	0.38**	0.38**	0.72	
AC	3.68	0.77	0.32**	0.28**	0.19**	0.37**	0.35**	0.34**	0.64

The values on the diagonal are the arithmetic square roots of each latent variable, and the values below the diagonal are the correlation coefficients between the latent variables.

*p < 0.05.

**p < 0.01.



Discussion

Owing to the lack of research on farmers' ecological approaches to waterfowl breeding, in this study we aimed to gain a comprehensive understanding of farmers' intentions to adopt eco-breeding practices by constructing the TPB-NAM model. We found that self-interest and altruistic motives play important roles in the formation of farmers' intentions to choose eco-breeding practices, which was consistent with the previous studies (Floress et al., 2017; Shin et al., 2018). However, the degree of salience of the two motivations varied across research contexts. In the current study, we found that although both self-interest and altruistic motives influenced farmers' intention, self-interested motives were the more dominant influencing factor. This finding suggests that the farmers' intentions to adopt eco-breeding practices were driven by both economic and social effects and that the farmers' intentions were more likely to be influenced by economic effects.

As expected in H1, H2, and H3, ATT, SN, and PBC are determinants of the intention to choose eco-breeding practices. The results suggest that farmers with good attitudes and more resources and abilities, and who perceive more social pressure, are more likely to choose the eco-breeding practices. This finding is consistent with the research of Rezaei et al. (2019) on the intentions of farmers to adopt integrated pest management. However, the relative importance of the influencing factors varied. In the current study, ATT had the greatest influence on farmers' intentions to choose eco-breeding practices.

The current findings suggest that although H6 was supported for the initial expansion of TPB, the effect was

not statistically significant in the integrated TPB-NAM model. The main reason for this situation may be attributed to the effect of past habit in the TPB-NAM integrated model. More precisely, the results suggest that past habits do not directly influence intention (H6) but instead influence intention indirectly through ATT (H4) and PBC (H5). This suggests that the effect of past habit on farmers' intentions to use eco-breeding may be absorbed by ATT and PBC. In this regard, similar findings were reported by Leung and Chen (2017).

PN is influenced by AC and AR, as hypothesized in H8 and H9. The effect of AR on PNs is greater than the effect of AC. In addition, as expected in H10, personal AC has a significant positive effect on AR. This can be interpreted as AR partially mediating the relationship between AC and PN, consistent with the findings of NAM based on empirical evidence (Zhang et al., 2017; Wang et al., 2019). Thus, farmers' PNs can be activated as they recognize the negative consequences of ecological degradation when eco-breeding is not adopted or by feeling responsible for the negative consequences.

Conclusions and policy implications

The current investigation is one of the first attempts to predict Chinese farmers' intentions to use eco-breeding practices based on the TPB-NAM integrated model. Our empirical study showed that although the original TPB or NAM showed a good efficiency in predicting farmers' intention to use eco-breeding practices, the efficiency and comprehensiveness of the integrative model of TPB-NAM

were superior to the original TPB or NAM model. In other words, the use of eco-breeding, which involves rational and moral considerations, can be combined with TPB based on self-interest motives and NAM based on altruistic motives, which contributes to improving the utility of the model and the effectiveness of explaining farmers' intentions to use eco-breeding practices. In general, the conclusions drawn from the study have important implications. On the one hand, they help improve the design reference framework for understanding the psychosocial factors influencing farmers' intentions to use eco-breeding; on the other hand, they help relevant planners and policy makers implement various practical interventions to encourage farmers to use eco-breeding practices to reduce environmental pollution.

From a practical point of view, identifying the influential factors on farmers' intention to use eco-breeding is beneficial for government promoting eco-breeding practices, especially with regard to developing overall communication value orientation. Government who aiming to attract farmers with their eco-breeding practices might want to carefully examine their potential farmers' characteristic such as self-interest and altruistic motivations. Interestingly, in our study, we found that farmers' intentions to adopt eco-breeding practices are driven by both self-interested and altruistic motives and that farmers' choices are more likely to be influenced by self-interest. Therefore, government policies to encourage farmers to voluntarily adopt eco-breeding practices should be based not only on farmers' social responsibility to protect the environment by means of publicity and incentives but also on the premise that farmers want to maximize their own benefits. In addition, attitude is salient factor in choosing eco-breeding practices. Therefore, if government prioritizes the creation of farmers' favorable attitudes toward choosing eco-breeding practices, it may increase the intentions to use eco-breeding and thus directly contribute to the adoption of eco-breeding promotion. Hence, to achieve this goal, the government should make more effort to raise farmers' awareness of eco-breeding methods and improve the overall evaluation of production use. For example, it can encourage more social funds to participate by strengthening relevant policy support; it can also implement a two-way matching model between universities and farmers to scientifically guide farmers' production. Again, our findings suggest that practitioners with previous experience in eco-breeding have a higher ability to overcome various difficulties in using eco-breeding practices (including the lack of knowledge skills, time, and money); they also have more positive attitudes toward eco-breeding practices and have stronger intentions to use eco-breeding practices. In this regard, the government can conduct eco-breeding technology training as well as green-specific subsidy policies to increase the farmers' level of self-efficacy and the consequent impact of their intentions. Finally, our findings suggest that policy implementers can also design

programs aimed at increasing farmers' general awareness of environmental problems caused by waterfowl production. This would help strengthen the farmers' sense of moral obligation to protect the environment, thus facilitating the use of the eco-breeding model.

In general, in this study, we presented an important insight about the Chinese farmers' intentions to adopt eco-breeding practices. In addition, the study is also suggestive of several areas for future research. First, because our respondents came from three provinces in China, future scholars could test the proposed research model in different contexts and compare the results with the current study. Second, the combination of various theories such as motivation theory or value-belief-norm theory is recommended so that future researchers may identify other sociological and psychological factors that might influence farmers' intentions toward eco-breeding practices. Third, we used intentions rather than actual behavior as the explained variable, so future scholars need to investigate how the different components of TPB-NAM affect actual eco-breeding practices. Lastly, while diverse processes were successfully integrated into the TPB-NAM in this study, individuals' decision-making regarding engagement in eco-breeding practices may be more complex than is evident in our framework. Future research will incorporate other influential and essential variables (e.g., government policy, socio-culture, or infrastructure) to gain a more complete understanding of individuals' decisions to implement eco-breeding practices.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study involving human participants in accordance with the local legislation and institutional requirements. Written informed consent to participate in this study was not required from the participants in accordance with the national legislation and the institutional requirements.

Author contributions

XW and PL were the principal investigators of the grants and wrote the first draft. JT revised the draft. WL analyzed the model and further revise and improve the paper. XG contributed to research design and data collection. ZW completed the empirical analysis. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships

that could be construed as a potential conflict of interest.

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References

- Abadi, B. (2018). The determinants of cucumber farmers' pesticide use behavior in central Iran: implications for the pesticide use management. *J. Clean. Prod.* 205, 1069–1081. doi: 10.1016/j.jclepro.2018.09.147
- Ahmad, W., Kim, W. G., Anwer, Z., and Zhuang, W. (2020). Schwartz personal values, theory of planned behavior and environmental consciousness: how tourists' visiting intentions towards eco-friendly destinations are shaped? *J. Bus. Res.* 110, 228–236. doi: 10.1016/j.jbusres.2020.01.040
- Ajzen, I. (1985). "From intentions to actions: A theory of planned behavior," in *Action Control: From Cognition to Behavior*, eds J. Kuhl and J. Beckmann (Berlin: Heidelberg: Springer), 11–39. doi: 10.1007/978-3-642-69746-3_2
- Ajzen, I. (1991). The theory of planned behavior. *Organ. Behav. Hum. Perf.* 50, 179–211. doi: 10.1016/0749-5978(91)90020-T
- Ajzen, I. (2006). *Constructing a theory of planned behavior questionnaire: Conceptual and Methodological Consideration*. Available online at: <http://people.umass.edu/~ajzen/pdf/tpb.measurement.pdf>
- Albernaz-Gonçalves, R., Olmos, G., and Hötzel, M. J. (2021). Exploring farmers' reasons for antibiotic use and misuse in pig farms in Brazil. *Antibiotics* 10, 331. doi: 10.3390/antibiotics10030331
- Arlı, D., Tan, L. P., Tjipiono, F., and Yang, L. (2018). Exploring consumers' purchase intention towards green products in an emerging market: the role of consumers' perceived readiness. *Int. J. Consum. Stud.* 42, 389–401. doi: 10.1111/ijcs.12432
- Bagozzi, R. P., and Yi, Y. (1988). On the evaluation of structural equation models. *J. Acad. Market. Sci.* 16, 74–94. doi: 10.1177/0049124192021002005
- Bai, L., Wang, M., and Hong, S. (2019). Understanding the antecedents of organic food purchases: The important roles of beliefs, subjective norms, and identity expressiveness. *Sustainability* 11, 3045. doi: 10.3390/su11113045
- Bamberg, S., and Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: a new meta-analysis of psycho-social determinants of pro-environmental behavior. *J. Environ. Psychol.* 27, 14–25. doi: 10.1016/j.jenvp.2006.12.002
- Bandyopadhyay, S., and Samanta, I. (2020). Antimicrobial resistance in agri-food chain and companion animals as a re-emerging menace in post-COVID epoch: low-and middle-income countries perspective and mitigation strategies. *Front. Vet. Sci.* 7, 620. doi: 10.3389/fvets.2020.00620
- Botetzagias, I., Dima, A. F., and Malesios, C. (2015). Extending the theory of planned behavior in the context of recycling: the role of moral norms and of demographic predictors. *Resour. Conserv. Recy.* 95, 58–67. doi: 10.1016/j.resconrec.2014.12.004
- Browne, M. W., and Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociol. Method. Res.* 21, 230–258. doi: 10.1177/0049124192021002000
- Chen, M. (2016). Extending the theory of planned behavior model to explain people's energy savings and carbon reduction behavioral intentions to mitigate climate change in Taiwan—moral obligation matters. *J. Clean. Prod.* 112, 1746–1753. doi: 10.1016/j.jclepro.2015.07.043
- Chen, M. (2017). Modeling an extended theory of planned behavior model to predict intention to take precautions to avoid consuming food with additives. *Food. Qual. Prefer.* 58, 24–33. doi: 10.1016/j.foodqual.2017.01.002
- Chen, W., Cao, C., Fang, X., and Kang, Z. (2019). Expanding the theory of planned behaviour to reveal urban residents' pro-environment travel behaviour. *Atmosphere-Basel* 10, 467. doi: 10.3390/atmos10080467
- Chuang, L., Chen, P. C., and Chen, Y. Y. (2018). The determinant factors of travelers' choices for pro-environment behavioral intention-integration theory of planned behavior, unified theory of acceptance, and use of technology 2 and sustainability values. *Sustainability* 10, 1869. doi: 10.3390/su10061869
- Conner, M. (2020). "Theory of planned behavior," in *Handbook of Sport Psychology, Vol. 4*, eds G. Tenenbaum and R. C. Eklund. p. 1–18. doi: 10.1002/9781119568124.ch1
- De Groot, J., and Steg, L. (2007). General beliefs and the theory of planned behavior: the role of environmental concerns in the TPB. *J. Appl. Soc. Psychol.* 37, 1817–1836. doi: 10.1111/j.1559-1816.2007.00239.x
- Dean, M., Raats, M. M., and Shepherd, R. (2012). The role of self-identity, past behavior, and their interaction in predicting intention to purchase fresh and processed organic food. *J. Appl. Soc. Psychol.* 42, 669–688. doi: 10.1111/j.1559-1816.2011.00796.x
- Floress, K., de Jalón, S. G., Church, S. P., Babin, N., Ulrich-Schad, J. D., and Prokopy, L. S. (2017). Toward a theory of farmer conservation attitudes: dual interests and willingness to take action to protect water quality. *J. Environ. Psychol.* 53, 73–80. doi: 10.1016/j.jenvp.2017.06.009
- Fornell, C., and Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *J. Market. Res.* 18, 382–388. doi: 10.1177/002224378101800313
- Gao, L., Wang, S., Li, J., and Li, H. (2017). Application of the extended theory of planned behavior to understand individual's energy saving behavior in workplaces. *Resour. Conserv. Recy.* 127, 107–113. doi: 10.1016/j.resconrec.2017.08.030
- Gao, Y., Zhang, X., Lu, J., Wu, L., and Yin, S. (2017). Adoption behavior of green control techniques by family farms in China: evidence from 676 family farms in Huang-huai-hai Plain. *Crop. Prot.* 99, 76–84. doi: 10.1016/j.cropro.2017.05.012
- Gomiero, T., Pimentel, D., and Paoletti, M. G. (2011). Environmental impact of different agricultural management practices: conventional vs. organic agriculture. *Crit. Rev. Plant Sci.* 30, 95–124. doi: 10.1080/07352689.2011.554355
- Hair, J. F., Gabriel, M., and Patel, V. (2014). AMOS covariance-based structural equation modeling (CB-SEM): guidelines on its application as a marketing research tool. *J. Mark.* 13, 44–55. doi: 10.5585/remark.v13i2.2718
- Han, H. (2014). The norm activation model and theory-broadening: Individuals' decision-making on environmentally-responsible convention attendance. *J. Environ. Psychol.* 40, 462–471. doi: 10.1016/j.jenvp.2014.10.006
- Hoie, M., Moan, I. S., and Rise, J. (2010). An extended version of the theory of planned behavior: prediction of intentions to quit smoking using past behaviour as moderator. *Addict. Res. Theory* 18, 572–585. doi: 10.3109/16066350903474386
- Honkanen, P., Olsen, S. O., and Verplanken, B. (2005). Intention to consume seafood—the importance of habit. *Appetite* 45, 161–168. doi: 10.1016/j.appet.2005.04.005

- Hu, Y., and Cheng, H. (2015). Use of veterinary antimicrobials in China and efforts to improve their rational use. *J. Glob. Antimicrob. Resist.* 3, 144–146. doi: 10.1016/j.jgar.2015.03.003
- Hu, Y., and Cheng, H. (2016). Health risk from veterinary antimicrobial use in China's food animal production and its reduction. *Environ. Pollut.* 219, 993–997. doi: 10.1016/j.envpol.2016.04.099
- Hu, Y., Cheng, H., and Tao, S. (2017). Environmental and human health challenges of industrial livestock and poultry farming in China and their mitigation. *Environ. Int.* 107, 111–130. doi: 10.1016/j.envint.2017.07.003
- Ibrahim, A., Artama, W. T., Widayanti, R., Yulianto, M. D. E., Faqar, D., and Budisatria, I. G. S. (2019). Sheep traders preferences on marketing place and their satisfaction during eid al-adha period in Yogyakarta, Indonesia. *IOP Conf. Ser.: Earth Environ. Sci.* 372, 012071. Available online at: <https://iopscience.iop.org/article/10.1088/1755-1315/372/1/012071>
- Kaiser, F. G., and Gutscher, H. (2003). The proposition of a general version of the theory of planned behavior: predicting ecological behavior. *J. Appl. Psychol.* 33, 586–603. doi: 10.1111/j.1559-1816.2003.tb01914.x
- Kim, S. H., and Seock, Y. (2019). The roles of values and social norm on personal norms and pro-environmentally friendly apparel product purchasing behavior: the mediating role of personal norms. *J. Retail. Consum. Serv.* 51, 83–90. doi: 10.1016/j.jretconser.2019.05.023
- Kormos, C., Gifford, R., and Brown, E. (2015). The influence of descriptive social norm information on sustainable transportation behavior: A field experiment. *Environ. Behav.* 47, 479–501. doi: 10.1177/0013916513520416
- Leung, L., and Chen, C. (2017). Extending the theory of planned behavior: a study of lifestyles, contextual factors, mobile viewing habits, TV content interest, and intention to adopt mobile TV. *Telemat. Informat.* 34, 1638–1649. doi: 10.1016/j.tele.2017.07.010
- Liu, Y., Sheng, H., Mundorf, N., Redding, C., and Ye, Y. (2017). Integrating norm activation model and theory of planned behavior to understand sustainable transport behavior: evidence from China. *Int. J. Env. Res. Pub. He.* 14, 1593. doi: 10.3390/ijerph14121593
- Møller, P., Seppälä, T. T., Bernstein, I., Holinski-Feder, E., Sala, P., Evans, D. G., et al. (2018). Cancer risk and survival in path_MMR carriers by gene and gender up to 75 years of age: a report from the prospective lynch syndrome database. *Gut.* 67, 1306–1316. doi: 10.1136/gutjnl-2017-314057
- Montano, D. E., and Kasprzyk, D. (2015). "Theory of reasoned action, theory of planned behavior, and the integrated behavioral model," in *Health Behavior: Theory, Research and Practice book*, 5th Edn, eds G. Karen, R. Barbara, and K. Viswanath (San Francisco, CA: Jossey-Bass), 95–124.
- Onwezen, M. C., Antonides, G., and Bartels, J. (2013). The Norm Activation Model: an exploration of the functions of anticipated pride and guilt in pro-environmental behaviour. *J. Econ. Psychol.* 39, 141–153. doi: 10.1016/j.joep.2013.07.005
- Park, J., and Ha, S. (2014). Understanding consumer recycling behavior: combining the theory of planned behavior and the norm activation model. *Fam. Consum. Sci. Res. J.* 42, 278–291. doi: 10.1111/fcsr.12061
- Passafaro, P., Livi, S., and Kotic, A. (2019). Local norms and the theory of planned behavior: understanding the effects of spatial proximity on recycling intentions and self-reported behavior. *Front. Psychol.* 10, 744. doi: 10.3389/fpsyg.2019.00744
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., and Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J. Appl. Psychol.* 88, 879–903. doi: 10.1037/0021-9010.88.5.879
- Rezaei, R., Safa, L., Damalas, C. A., and Ganjkanloo, M. M. (2019). Drivers of farmers' intention to use integrated pest management: integrating theory of planned behavior and norm activation model. *J. Environ. Manage.* 236, 328–339. doi: 10.1016/j.jenvman.2019.01.097
- Röös, E., Mie, A., Wivstad, M., Salomon, E., Johansson, B., Gunnarsson, S., et al. (2018). Risks and opportunities of increasing yields in organic farming. A review. *Agro. Sustain. Dev. Develop.* 38, 1–21. doi: 10.1007/s13593-018-0489-3
- Roy, R., Rabbanee, F. K., and Sharma, P. (2016). Antecedents, outcomes, and mediating role of internal reference prices in pay-what-you-want (PWYW) pricing. *Market Intell. Plan.* 236, 328–339. doi: 10.1108/MIP-08-2015-0157
- Schwartz, S. H. (1977). Normative influences on altruism. *Adv. Exp. Soc. Psychol.* 10, 221–279. doi: 10.1016/S0065-2601(08)60358-5
- Semenescu, A., and Gavreliuc, A. (2021). Structural, psychological and contextual predictors of car use. *Front. Psychol.* 12, 692435. doi: 10.3389/fpsyg.2021.692435
- Shao, Y., Wang, Y., Yuan, Y., and Xie, Y. (2021). A systematic review on antibiotics misuse in livestock and aquaculture and regulation implications in China. *Sci. Total Environ.* 798, 149205. doi: 10.1016/j.scitotenv.2021.149205
- Shi, H., Fan, J., and Zhao, D. (2017). Predicting household PM2.5-reduction behavior in Chinese urban areas: an integrative model of theory of planned behavior and norm activation theory. *J. Clean. Prod.* 145, 64–73. doi: 10.1016/j.jclepro.2016.12.169
- Shin, Y. H., Im, J., Jung, S. E., and Severt, K. (2018). The theory of planned behavior and the norm activation model approach to consumer behavior regarding organic menus. *Int. J. Hosp. Manag.* 69, 21–29. doi: 10.1016/j.ijhm.2017.10.011
- Sommer, L. (2011). The theory of planned behaviour and the impact of past behaviour. *Int. Bus. Econ. Res. J.* 10, 91. doi: 10.19030/iber.v10i1.930
- Suhr, D. (2006). *The Basics of Structural Equation Modeling*. Irvine, CA: SAS User Group of the Western Region of the United States (WUSS). Available online at: <https://www.lexjansen.com/wuss/2006/tutorials/TUT-Suhr.pdf>
- Sun, Y., Wang, N., Yin, C., and Zhang, J. X. (2015). Understanding the relationships between motivators and effort in crowdsourcing marketplaces: A nonlinear analysis. *Int. J. Infm. Manag.* 35, 267–276. doi: 10.1016/j.ijinfomgt.2015.01.009
- Tang, H., Liu, Z., and Long, X. (2021). Analyzing the farmers' pro-environmental behavior intention and their rural tourism livelihood in tourist village where its ecological environment is polluted. *PLoS ONE* 16, e0247407. doi: 10.1371/journal.pone.0247407
- Tilman, D., and Clark, M. (2015). Food, agriculture and the environment: can we feed the world and save the earth? *Daedalus* 144, 8–23. doi: 10.1162/DAED_a_00350
- Trafimow, D. (2000). Habit as both a direct cause of intention to use a condom and as a moderator of the attitude-intention and subjective norm-intention relations. *Psychol. Health* 15, 383–393. doi: 10.1080/08870440008402000
- Tuu, H. H. (2015). Attitude, social norms, perceived behavioral control, past behavior, and habit in explaining intention to consume fish in Vietnam. *J. Dev. Econ.* 22, 102–122. doi: 10.24311/jed/2015.22.3.06
- Vasquez, A. K., Foditsch, C., Dulièpre, S. A. C., Siler, J. D., Just, D. R., Warnick, L. D., et al. (2019). Understanding the effect of producers' attitudes, perceived norms, and perceived behavioral control on intentions to use antimicrobials prudently on New York dairy farms. *PLoS ONE* 14, e0222442. doi: 10.1371/journal.pone.0222442
- Verplanken, B., and Orbell, S. (2003). Reflections on past behavior: a self-report index of habit strength. *J. Appl. Psychol.* 33, 1313–1330. doi: 10.1111/j.1559-1816.2003.tb01951.x
- Wang, S., Wang, J., Zhao, S., and Yang, S. (2019). Information publicity and resident's waste separation behavior: an empirical study based on the norm activation model. *Waste Manage* 87, 33–42. doi: 10.1016/j.wasman.2019.01.038
- Yang, Y. (2021). *Asean-China Cooperation For Environmental Protection And Sustainable Energy Development*. World Scientific Publishing Company. Available online at: <https://www.iresearchbook.cn/f/ebook/detail?id=6d00d0830bc743e9998a25640c56538c>
- Zeng, Y., Zhang, J., He, K., and Cheng, L. (2019). Who cares what parents think or do? Observational learning and experience-based learning through communication in rice farmers' willingness to adopt sustainable agricultural technologies in Hubei Province, China. *J. Environ. Psychol.* 26, 12522–12536. doi: 10.1007/s11356-019-04609-0
- Zhang, J., Lü, F., Shao, L., and He, P. (2014). The use of biochar-amended composting to improve the humification and degradation of sewage sludge. *Bioresour. Technol.* 168, 252–258. doi: 10.1016/j.biortech.2014.02.080
- Zhang, X., Geng, G., and Sun, P. (2017). Determinants and implications of citizens' environmental complaint in China: Integrating theory of planned behavior and norm activation model. *J. Clean. Prod.* 166, 148–156. doi: 10.1016/j.jclepro.2017.08.020