Exploration of Farmers' Satisfaction with Ecological Governance and Its Influencing Factors: Based on Survey Data of 1 259 Rural Households

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Abstract Ecological governance satisfaction is one of the important indicators to measure the ecological revitalization. The paper studies the satisfaction of rural households with ecological governance and its influencing factors in depth through questionnaire survey and other research methods. The empirical analysis conclusions are as follows: (1) at the level of personal influence factors, the satisfaction of rural households with ecological governance is significantly affected by the education level, age and family health status of rural households. However, factors such as gender, occupation, residence time and the number of family members have no significant effect on the behavior of rural households' ecological governance satisfaction. (2) At the level of economic development factors, the total annual family income, the total annual consumption and other dimensions have a significantly positive impact on the satisfaction of rural households with ecological governance. This shows that economic development is a key factor for environmental protection, and the behavior characteristics of the family could seriously affect the effectiveness of rural households' ecological governance satisfaction. (3) At the level of living environment factors, the situation of rural environmental pollution governance, infrastructure and medical conditions have a significant and positive impact on the behavior of rural households' ecological governance satisfaction. This shows that the living environment is also one of the important factors affecting the satisfaction of rural households with ecological governance. (4) At the level of ecological system factors, the three factors of government environmental protection investment, government management measures and government propaganda policies have a significantly positive impact on the behavior of rural households' ecological governance satisfaction. (5) At the level of ecological environment factors, the degree of awareness of ecological environment protection and the situation of environmental treatment have a significant correlation with the behavior of rural households' ecological governance satisfaction. (6) At the level of ecological culture factors, environmental protection education, ecological culture propaganda and rural civilization construction all have a significant and positive impact on the satisfaction of rural households with ecological governance. And relevant policy measures are put forward to improve the effectiveness of ecological governance.

Key words Ecological governance; Satisfaction; Ecological capital

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The 20th CPC National Congress laid out a grand blueprint for comprehensively promoting the great rejuvenation of the Chinese nation with Chinese style modernization. The Central Committee of the Communist Party of China believes that it must unremittingly solve the "three rural issues" as the top priority of the Party's work, and use the power of the whole Party and society to comprehensively promote rural revitalization and accelerate agricultural and rural modernization. Therefore, under the background of comprehensively promoting the rural revitalization strategy in China, as one of the important supporting points and links of rural revitalization, ecological revitalization undoubtedly plays a key role in promoting the rural revitalization strategy. The state not only pays attention to the green transformation of agricultural production, but also emphasizes the comprehensive improvement of rural ecological environment. A number of measures to strengthen the governance of rural ecological environment include but are not limited to the promotion of ecological agricultural technology, the implementation of chemical fertilizer and pesticide reduction action, and the promotion of resource utilization of agricultural waste. The implementation of these measures aims to reduce the negative impact of agricultural production on the environment and improve the quality and efficiency of agricultural production. It should intensify efforts to renovate the rural environment, improve the rural living environment, and improve the quality of life of farmers. Whether the implementation of the policy can improve farmers' satisfaction with ecological environment governance is a major issue worthy of our consideration.

The research on farmers' satisfaction with ecological governance has gradually attracted the attention of the academic community. Scholars at home and abroad have conducted a comprehensive analysis on the factors affecting farmers' satisfaction with ecological governance, and adopted a variety of research methods and measurement tools. It provides an important reference for understanding farmers' needs and expectations for ecological governance and improving the governance effect, and also brings considerable enlightenment for the further development of rural ecological civilization construction[1-5]. Although the research on farmers' ecological satisfaction has achieved some results, there are still some deficiencies. First of all, it can be seen that the relevant research

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based on farmers' satisfaction with ecological governance is still in its infancy at present, and the results are not rich enough. It is mainly concentrated in some specific governance areas, such as rural environmental governance, land remediation, *etc.*, and there are relatively few studies on governance satisfaction in other aspects. Secondly, the analysis on farmers' satisfaction based on the construction of ecological civilization mostly draws lessons from the theoretical models of satisfaction at home and abroad, and is based on the development achievements at home and abroad. The analysis of the model focuses on descriptive analysis and simple data processing methods, and multi-factor model construction and complex statistical methods are relatively less used. Targeted analysis on farmers' satisfaction with ecological governance and its influencing factors is conducted, and the research on systematically proposing the optimization path of rural ecological governance is less. Finally, the current research on the construction of rural ecological civilization mostly stays at the theoretical level, but few are combined with specific practice. Moreover, the research on the combination of ecological civilization construction and farmers' satisfaction is less, which needs to be further improved. Therefore, it is particularly important to strengthen the research on the correlation between the construction of ecological civilization and farmers' governance satisfaction, and to explore the impact mechanism of ecological civilization construction on farmers' governance satisfaction.

1 Model building and data collection

1.1 Model building Rural ecological environment governance is the key to rural revitalization, and ecological revitalization depends on farmers' willingness and satisfaction with ecological governance. Therefore, it is particularly important to systematically explore the influencing factors of farmers' satisfaction with ecological governance. In previous studies, scholars have discussed the multidimensional demographic characteristics, such as gender, age, income, education level, *etc.* Some scholars believe that regional or rural economic development, living environment, related ecological system, ecological culture atmosphere could have a positive impact on farmers' ecological satisfaction, while others believe that the impact of ecological environment, ecological culture and other factors is stronger than that of economic development. Therefore, in order to further clarify the influencing factors of farmers' ecological satisfaction, the multidimensional demographic characteristics are sorted out, and its impact was systematically analyzed from five levels: economic development, living environment, ecological system, ecological environment, and ecological culture, so as to ensure the smooth implementation of ecological governance modernization.

In order to study the influencing factors of farmers' ecological governance satisfaction behavior decision-making, this paper uses "farmers' ecological governance satisfaction" as the dependent variable for empirical analysis. This behavior variable is not easy to be expressed by continuous values, but is often expressed by "whether or not", so "1" is used when it is positive, and "0" is used when it is negative. However, most of the factors that affect the decision-making of farmers' satisfaction with ecological governance are discontinuous values, which generally use the values of discrete variables with multiple choices such as quintiles. Therefore, the traditional linear regression model is not suitable for this study, so it needs to use *Logistic* regression model or *probit* model. *probit* model emphasizes the standard normal distribution, while *Logistic* regression model does not need the normal continuity of variables. Therefore, *Logistic* regression model is selected in this paper. The specific model is as follows:

$$P_i = F(U_i) = F(\alpha + \beta_i X_i) = \frac{1}{1+e^{-\mu_i}} = \frac{1}{1+e^{-(\alpha+\beta_i X_i)}}$$

Set P as the probability of the occurrence of farmers' satisfaction with ecological governance, *Logistic* model is to gradually transform the probability problem with an interval of $[0, 1]$ into an opportunity ratio problem, that is, the willingness to occur is $\frac{P}{1-P}$ times of the non occurrence. Here, $\ln\frac{P}{1-P}$ is obtained by taking the logarithm. The formula is:

$$\ln\frac{P_i}{1-P_i} = U_i = \alpha + \beta_i X_i + \mu$$

It is assumed that the variables involved in the above model should conform to the probability distribution of *Logistic*, where P_i is the probability of farmers' satisfaction with ecological governance. Supposed $Y=1$, it shows that farmers' satisfaction with ecological governance is relatively high; $Y=0$, it indicates that farmers are not satisfied with ecological governance. X_i is a group of related explanatory variables of Y, and it contains factors related to farmers' ecological governance satisfaction behavior decision-making. *Logistic* model is to explore the influence direction and role of each factor on farmers' ecological governance satisfaction decision-making. α is a constant term, namely a regression intercept term. β_i is the regression coefficient of the influencing factor, which means the influence degree of the variable on Y and P_i. μ is random interference term.

The explained variable of this paper is the behavior of farmers' satisfaction with ecological governance of poor households, and its influencing factors are many. Based on the previous research, surveys and interviews, the influencing factors are divided into six categories: personal factors, economic development factors, living environment factors, ecological system factors, ecological environment factors and ecological culture factors, and 21 specific factors are summarized by factor analysis of each type.

1.2 Data collection This study completed the production of the online questionnaire through the questionnaire star, and used the social network platform to publish the questionnaire link. The distribution time was from May 1, 2024 to July 10, 2024. A total of 1 259 questionnaires were collected in this online questionnaire survey, of which 1 196 were valid, and the effective recovery rate was 95.00%.

After the completion of data collection, the questionnaire was initially checked to eliminate invalid and incomplete answers. Then, the effective questionnaire data were encoded and input, and the data were processed and analyzed by SPSS24.0 software. Descriptive statistical analysis is used to summarize the basic information of respondents and the data of each part of the questionnaire, and check the data distribution and basic characteristics. The Cronbach's Alpha coefficient was calculated to test the internal consistency of the questionnaire and ensure the reliability of each scale. Next, correlation analysis and regression analysis were carried out to test the research hypothesis and analyze the specific impact on farmers' ecological satisfaction.

2 Empirical analysis and discussion

2.1 Empirical analysis results According to the variable data description and model, SPSS24.0 software is used to conduct *Logistic* regression analysis on the sample data. According to the Wald value, backward stepwise regression analysis is used to gradually eliminate the variable with the minimum Wald value. The results are shown in Table 1. There are two steps: the first step is to include 21 variables into the equation, and get the model I through *Logistic* regression analysis; the second step is to use stepwise regression analysis to eliminate the variables with small correlation coefficient, and then carry out stepwise regression to obtain the results of model II (Table 1).

Table 1 Model estimation results

Variable	Model I			Model II		
	B value	Wald value	*P* value	*B* value	Wald value	*P* value
age	0.008	0.816	0.352	–	–	–
Career	0.124	2.153	0.513	–	–	–
time	−0.172	0.883	0.179	–	–	–
health	−0.018	0.498	0.016***	0.083	1.873	0.021***
family	0.279	2.986	0.051	–	–	–
edu	0.069	2.268	0.007***	0.071	2.259	0.006***
sex	0.433	3.374	0.009***	−0.441	3.368	0.008***
income	0.287	0.275	0.001***	1.022	8.578	0.001***
consumption	0.162	4.515	0.025***	1.011	13.928	0.001***
economic_satisfaction	0.125	3.145	0.041**	0.762	1.798	0.002***
Pollution Control	0.365	3.271	0.076*	0.357	3.268	0.073*
Infrastructure	0.228	2.948	0.000***	0.246	2.975	0.000***
service	1.328	12.978	0.061*	1.351	12.934	0.067*
pub	0.192	2.795	0.062*	0.187	2.791	0.059*
measure	0.087	2.658	0.079*	0.091	2.645	0.072*
pub-p	0.293	1.984	0.013**	0.287	1.995	0.011**
awareness	0.096	3.966	0.056*	1.609	4.955	0.000***
treatment	0.145	7.770	0.005***	1.478	5.809	0.000***
imp	0.874	2.116	0.000***	0.848	2.178	0.000***
cog	1.282	22.975	0.000***	1.296	22.934	0.000***
C	1.432	4.623	0.008***	−4.652	34.468	0.000***
Prediction accuracy//%		84.250			85.160	
−2loglikelihood		190.371			186.972	
Cox & Snell R^2		0.415			0.410	
Nagelkerke R^2		0.571			0.568	

Note: *, **, and *** respectively show significant levels of 10%, 5%, and 1%.

The analysis results show that the operation results of models I and II are basically similar, and the overall model has passed the significance test. The basic data used in the two models are cross-sectional data. The Cox & Snell R^2 values of models I and II are 0.415 and 0.410, respectively, while the Nagelkerke R^2 values are 0.571 and 0.568, respectively. The fitting degree of the model is relatively good.

2.2 Results discussion According to the above analysis results, farmers' satisfaction with ecological governance are affected by 17 factors.

2.2.1 Personal influence factors. It can be seen from Table 1 that the degree of education (edu), age and family health of the surveyed farmers have significant effects on the behavior of ecological governance satisfaction, and the coefficients are 0.069, 0.433, and −0.018, showing a linear correlation; sex, Career, time of residence (time), number of family members (family) and other factors have no significant impact on farmers' ecological governance satisfaction behavior. The reason may be that farmers with high education level have higher awareness of the importance of ecological environment. In the process of investigation and visit, the research team found that the people who have a strong awareness of ecological protection have a relatively high level of

tion, and they are more inclined to participate in ecological governance and hold a positive attitude towards it. In addition, with the growth of age, farmers' satisfaction with ecological governance also shows some differences, which may be related to farmers' life experience, values and sensitivity to environmental changes in different age groups. As a part of personal factors, family health also has a significant impact on farmers' satisfaction with ecological governance. When family members are in good health, farmers often have more energy to pay attention to and participate in ecological governance activities, so as to improve their satisfaction. On the contrary, if the health status of family members is poor, it may distract farmers' attention and reduce their satisfaction with ecological governance.

2.2.2 Economic development factors. Economic development is the key factor of ecological environment protection, and the behavior characteristics of families will seriously affect the satisfaction effect of farmers' ecological governance. The above statistical data test results show that economic development has a significant impact on farmers' satisfaction with ecological governance. Firstly, the *P* value of annual total household income (income) is 0.001, which is far less than the significance level of 1%. Moreover, the coefficient is 0.287, which indicates that annual total household income has a significantly positive impact on farmers' satisfaction with ecological governance. This may be because that farmers have more economic resources to participate in and support ecological governance activities with the increase of household income, so as to improve their satisfaction with ecological governance. Secondly, the *P* value of annual total household consumption (consumption) is 0.025, which is less than the significance level of 5%. Moreover, the coefficient is 0.162, indicating that annual total household consumption also has a significantly positive effect on farmers' satisfaction with ecological governance. This may be because the improvement of consumption level means the improvement of farmers' quality of life, which enhances their expectation and satisfaction with the quality of ecological environment. In addition, the *P* value of satisfaction with economic development (economic_satisfaction) is 0.041, which is less than the significance level of 10%. Moreover, the coefficient is 0.125, indicating that economic development satisfaction also has a significantly positive impact on farmers' satisfaction with ecological governance. This may be because the higher the farmers' satisfaction with economic development, the more willing they are to trust and support the government's efforts in ecological governance, thus improving their satisfaction with ecological governance. To sum up, economic development factors have a significantly positive impact on farmers' satisfaction with ecological governance in multiple dimensions.

2.2.3 Living environment factors. The results of regression analysis show that the *P* values of environmental pollution control (Pollution Control), infrastructure construction (Infrastructure) and medical conditions (service) in rural areas are 0.076, 0.000 and 0.061, respectively, which are less than the significant level of 10%. Moreover, the correlation coefficients are 0.365, 0.228 and 1.328, respectively, indicating that these three factors have significant and positive correlation with farmers' satisfaction behavior of ecological governance. The reason is that public health maintenance, air quality, garbage collection facilities, housing conditions, drinking water quality and greening status of the village all affect farmers' satisfaction with ecological governance to varying degrees. For example, good public health maintenance can reduce the spread of disease and improve the quality of life of farmers; fresh air and clean living environment are directly related to the physical and mental health of farmers; the perfect garbage collection facilities and housing conditions reflect the government's investment and effectiveness in rural environmental governance, thus enhancing farmers' confidence and satisfaction in ecological governance. In addition, the quality of drinking water is directly related to the daily life and health of farmers, so it is also one of the important factors affecting farmers' satisfaction with ecological governance.

2.2.4 Ecological system factors. Government policies and systems are the guarantee of rural ecological governance. The results of regression analysis show that the *P* values of government investment in environmental protection (pub), government management measures (measure) and government publicity policies (pub-p) are 0.062, 0.079 and 0.013, respectively, which are less than the significance level of 10%. Moreover, the correlation coefficients are 0.192, 0.087 and 0.293, respectively, indicating that these three factors have a significant and positive correlation with farmers' ecological governance satisfaction behavior. The reason is that a reasonable ecological system framework not only provides a clear guide for farmers, but also ensures the effective implementation of ecological governance measures through incentive mechanisms and punishment measures. For example, by formulating and implementing strict environmental protection policies, the government clearly stipulates the responsibilities and obligations of farmers in ecological governance, and provides corresponding rewards and subsidies to encourage farmers to actively participate in ecological governance activities. In addition, the perfect ecological environment supervision system also plays an important role. Through regular inspection and evaluation, it ensures that farmers' ecological governance behavior meets the requirements, thus improving farmers' satisfaction and identity with ecological governance. The publicity of environmental protection policies, the implementation of government ecological governance policies, and the perfection of environmental protection laws and regulations are all key factors. Policy publicity can enhance farmers' awareness and attention to ecological governance, so as to actively participate in ecological governance activities. The implementation of government policies and the improvement of laws and regulations are directly related to the effect of ecological governance, and then affect the satisfaction of farmers. Therefore, the government should continue to strengthen the construction of ecological system, improve the breadth and depth of policy publicity, ensure the implementation of ecological governance policies, and provide farmers with a better ecological environment.

2.2.5 Ecological environment factors. From the results of regression analysis, it can be known that the *P* values of awareness of ecological environment protection (awareness) and environmental treatment (treatment) are both 0.000, which are less than the significance level of 1%. Moreover, the correlation coefficients

are 0.096 and 0.145, respectively, indicating that these two factors have a significant correlation with farmers' ecological governance satisfaction behavior. The reason is that the quality of ecological environment is directly related to the quality of farmers' production and life and the effectiveness of ecological governance. First of all, a good ecological environment provides farmers with a high-quality resource base, such as clean water, fertile land and rich natural resources, which are important guarantees for farmers' agricultural production and life. At the same time, the beautiful environment can also improve the quality of life of farmers and increase their sense of happiness and satisfaction. However, the deterioration of the ecological environment also could bring many negative effects to farmers. For example, soil and water pollution could directly affect the quality and safety of agricultural products, and then affect the economic income and health status of farmers. In addition, the destruction of the ecological environment also could aggravate the occurrence of natural disasters and bring huge losses to farmers' production and life. Therefore, it is of great significance to promote farmers' satisfaction with ecological governance by strengthening ecological environment protection and improving the quality of ecological environment. The government should strengthen the governance of rural ecological environment, promote the construction of rural ecological environment, and provide farmers with a more livable production and living environment. At the same time, it should also strengthen the publicity and education of ecological environment, enhance farmers' awareness of environmental protection and sense of responsibility, and guide them to actively participate in ecological governance and environmental protection.

2.2.6 Ecological culture factors. From the results of regression analysis, it can be known that the P values of environmental protection education, ecological culture publicity and rural civilization construction (cog) are all 0.000, which are less than the significance level of 1%. Moreover, the correlation coefficients are 0.874, 1.282 and 1.156, respectively, indicating that these three factors have a significant and positive correlation with farmers' satisfaction with ecological governance, and the results are consistent with the above estimates. The first reason is that the development of environmental protection related education is crucial. It can not only improve the public's awareness of environmental issues, but also cultivate people's awareness of environmental protection and responsibility. Environmental protection education in schools, communities and workplaces can effectively spread environmental protection knowledge, guide people to adopt more environmentally friendly lifestyles and consumption habits, and improve farmers' satisfaction with ecological governance. The second reason is that the government departments strengthen the ecological culture propaganda, which can gradually improve the ecological awareness of farmers and enhance their ecological protection ability. For example, it can popularize the environmental protection knowledge of waste classification, energy conservation and emission reduction, green travel, *etc.* to residents by holding lectures, exhibitions and workshops in rural areas. It can also encourage residents to participate in practical actions of environmental protection by establishing environmental protection volunteer teams, such as community cleaning, greening and tree planting. Such behavior can effectively promote the cultivation of farmers' ecological consciousness. The third reason is that strengthening the construction of rural ecological civilization can further improve the quality of the ecological environment in rural areas, strengthen the publicity and implementation of environmental protection laws and regulations, and ensure that rural residents have a profound understanding of the concept of ecological civilization. Moreover, it also needs to maintain the ecological balance through scientific planning and rational layout, ensure the stability and sustainable development of rural ecosystem, promote the harmonious coexistence of rural natural environment and human environment, and create a beautiful environment suitable for living, working and traveling for rural residents.

3 Research conclusions and suggestions

Through statistical and regression analysis, the main conclusions are as follows: first, in terms of personal influence factors, farmers' satisfaction with ecological governance is significantly affected by farmers' education level, age and family health, while sex, career, residence time, number of family members and other factors have no significant impact on farmers' satisfaction behavior with ecological governance. Second, in terms of economic development factors, household annual total income, household annual total consumption, economic development satisfaction and other dimensions have a significantly positive impact on farmers' satisfaction with ecological governance. It shows that economic development is the key factor of ecological environment protection, and family behavior characteristics could seriously affect the effectiveness of farmers' satisfaction with ecological governance. Third, in terms of living environment factors, rural environment pollution control, infrastructure construction and medical conditions have a significant and positive correlation with farmers' satisfaction with ecological governance. The reason is that public health maintenance, air quality, garbage collection facilities, housing conditions, drinking water quality and the greening status of the village all affect farmers' satisfaction with ecological governance to varying degrees. Fourth, in terms of ecological system factors, the three factors of government investment in environmental protection, government management measures and government propaganda policies have a significant and positive correlation with farmers' satisfaction with ecological governance. The reason is that a reasonable ecological system framework not only provides farmers with clear guidelines for action, but also ensures the effective implementation of ecological governance measures through incentive mechanisms and punishment measures. Fifth, in terms of ecological environment factors, the degree of awareness of ecological environment protection and environmental treatment have a significant correlation with farmers' satisfaction with ecological governance. It can be seen that it is of great significance to promote farmers' satisfaction with ecological governance by strengthening ecological environment protection and improving the quality of ecological environment. Sixth, in terms of ecological culture factors, environmental

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protection education, ecological culture publicity and rural civilization construction have significant and positive effects on farmers' satisfaction with ecological governance, which shows that the development of environmental protection related education and the strengthening of ecological culture publicity by government departments can gradually improve farmers' ecological awareness and ecological protection ability. At the same time, strengthening the construction of rural ecological civilization can further improve the quality of the ecological environment in rural areas, strengthen the publicity and implementation of environmental protection laws and regulations, and ensure that rural residents have a profound understanding of the concept of ecological civilization.

According to the conclusion, it can strengthen the policy measures from the following aspects. First, it could strengthen the construction of legal system and consolidate the laws and regulations of ecological governance. Second, it could increase government investment in the environment, and ensure farmers' ecological governance capacity. Third, it should improve the ecological culture literacy and enhance farmers' awareness of ecological governance. Fourth, it should continue to improve the security of rural ecological environment and improve farmers' satisfaction with the ecological environment. The research aims to provide enlightenment and reference for the improvement of rural ecological governance ability in China, promote ecological sustainable development, and impel the implementation of rural revitalization strategy.

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