

Qilian Mountain National Park Study on Residents' Willingness to Pay Ecological Compensation and its Influencing Factors

-- A Case Study of Menyuan Area

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Abstract: The research on residents' willingness to pay ecological compensation in national parks and its influencing factors is an important basis for establishing the ecological compensation mechanism in national parks. Based on the conditional value method and Logistics model, this paper takes Menyuan area of Qilian Mountain National Park as a case study to study the residents' willingness to pay ecological compensation and its influencing factors. The results show that: (1) The total willingness of residents to pay ecological compensation in Menyuan County will reach $2.01 \times 10^6 \sim 3.02 \times 10^6$ yuan in 2020. (2) The individual characteristics of residents' willingness to pay ecological compensation are as follows: monthly income and education level are positively correlated with residents' willingness to pay. Male's willingness to pay is higher than females, and age and willingness to pay are "n" type distribution; The psychological perception factors are: humanistic environment perception, ecological environment perception and recreation function perception in order from the largest to the smallest. Finally, the paper puts forward some suggestions and measures to improve residents' willingness to pay and promote the protection and development of Qilian Mountain National Park.

Keywords: Qilian Mountain National Park; Residents; CVM; Ecological Compensation Payment Intention; Influencing Factors; Menyuan Area.

1. Introduction

1.1. Research Background

In 2019, the General Office of the CPC Central Committee and The General Office of the State Council put forward a guideline to establish a system of protected natural areas with national parks as the main body, which refers to specific areas [1]. That achieve scientific protection and rational use of natural resources with the main purpose of protecting nationally representative natural ecosystems. The 19th CPC National Congress clearly pointed out that "a market-based and diversified ecological compensation mechanism should be established." The willingness to pay ecological compensation refers to the amount of fees (or compensation) that residents are willing to pay for behaviors that damage (or protect) resources and environment according to subjective evaluation components such as personal attributes, so as to increase the cost (or benefit) of the behavior. So as to encourage the subject of damaging (or protecting) behavior to reduce (or increase) the external diseconomy (or external economy) brought by its behavior, so as to achieve the purpose [2] Of protecting resources. Residents are the relevant beneficiaries of the ecological compensation mechanism, and play an important role [3]. In maintaining the dynamic balance of ecological compensation interests of various industries. Therefore, the research on the willingness of national park residents to pay ecological compensation and its influencing factors is conducive to improving the ecological compensation mechanism of national parks, enhancing residents' understanding and support for the

ecological compensation system of national parks, coordinating the interest conflicts of ecological compensation among relevant stakeholders such as national park residents, and exploring diversified ecological compensation systems. In order to provide scientific basis and reference [4]. For the promotion of the ecological compensation mechanism of national parks.

The Contingent Valuation Method (CVM) was formally proposed by Davis in 1963 and first applied to the assessment of recreational values such as forest camping in [5]. CVM is the most important and widely used method [6]. In the study of the willingness to pay ecological compensation. In the 1970s, foreign countries began to apply CVM to carry out theoretical studies on willingness to pay ecological compensation. Studies on willingness to [8]. pay and its influencing factors [10-12]. Were conducted in national parks [7], forest recreation areas, and Marine protected areas [9]. China began to study the issue of ecological compensation from the 1990s. In the early stage, the theoretical exploratory research was mainly carried out, and the related issues of ecological compensation are also deepening [13]. In terms of research objects, a wide range of researches have been carried out from the perspective [14-16] of relevant stakeholders in terms of the willingness to pay ecological compensation and its influencing factors [17-19]. In terms of influencing factors, most of the research is carried out from the individual attributes such as age, monthly income and educational level [20-22].

To sum up, previous researches on the theory and practice of ecological compensation have made some progress. Qilian Mountain National Park is one of the ten pilot park systems

in China, which has an important ecological strategic position, and Menyuan area is an important part of it. However, there are few researches on ecological compensation in Menyuan area of Qilian Mountain National Park. Previous studies on national parks mainly focus on the influencing factors of residents' individual attributes on the willingness to pay, but lack of studies on various influencing factors; Therefore, this paper takes the residents of Menyuan area of Qilian Mountain National Park as the research object to study the willingness and influencing factors of ecological compensation payment, in order to provide a certain theoretical and practical reference for improving the ecological compensation mechanism of Qilian Mountain National Park.

1.2. Overview of the Study Area

The park is located in the northeast of the Qinghai-Tibet Plateau, spanning Gansu and Qinghai provinces, with a total area of 50,200 km², of which Qinghai Province covers a total area of 15,800 km², accounting for 31.5% of the total area of the park. The administrative areas include Menyuan County

and Qilian County of Haibei Tibetan Autonomous Prefecture, Tianjun County of Haixi Autonomous Prefecture and Delingha City, with a total of 41,000 people in 19 townships, 57 villages. It includes a provincial-level nature reserve, a national-level forest park and a national-level wetland park.

Menyuan County is located in the eastern part of Haibei Tibetan Autonomous Prefecture, with a total area of 6896km², 12 townships (8 townships and 4 towns) and 109 villages with a total area of 6902.26km² and a population of 150,000. The geographical coordinates are between 100°25 '28 " ~ 102°41'26"E, 37°03'11" ~ 37°59' 28"N, the altitude is between 2388~5254m, and the annual sunshine hours are 2264.8~2739.8hours. The daily temperature range is 11.6~17.5°C, the average annual temperature is 0.8°C, the average annual precipitation is 520mm, and the annual evaporation is 100mm. Menyuan area covers a total area of 2100km², accounting for 30.45% of Menyuan County. There are Xianmi National Forest Park and Gangshika Snow Peak Scenic spot.

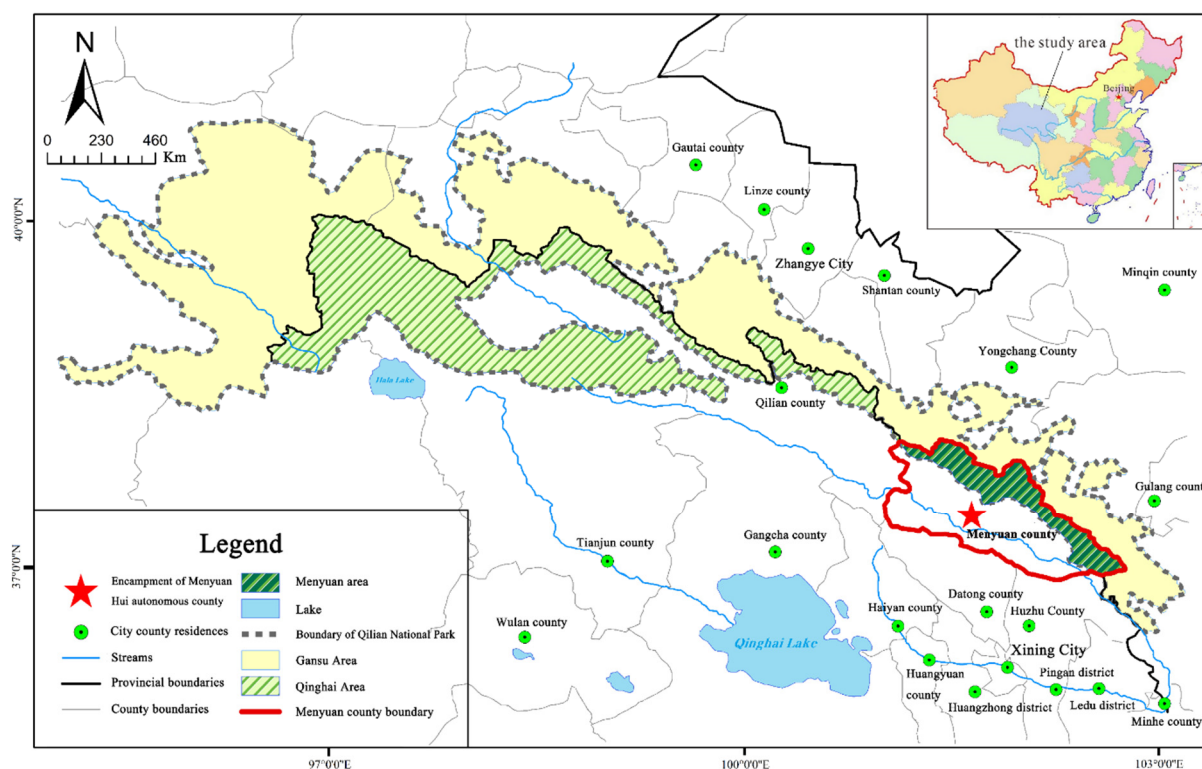


Figure 1. Schematic diagram of Menyuan area of Qilian Mountain National Park

2. Data and Methodology

2.1. Data Sources

This study adopts the double-boundary binary questionnaire to carry out the investigation, which mainly includes four parts: (1) The basic overview of Menyuan District is introduced in the form of illustrations; (2) individual attributes of local residents (gender, age, occupation, monthly income, educational level, etc.); (3) Residents' willingness, motivation, cost and use of ecological compensation in Menyuan District; (4) 9 indicators of residents' perception of ecological environment, humanistic environment and recreation function, and the 5-level Likert scale was used to measure them. Before the formal survey, 50 local settlers were selected in Menyuan District to conduct a

preliminary survey. According to the existing problems in the survey, the questionnaire was supplemented and modified, and the formal questionnaire was finally formed. In order to ensure that the survey results are more representative, Scheaffer formula set the sampling error to 0.06, and calculated the minimum sample size of the resident questionnaire to be 200. After training, the investigators conducted a face-to-face paid random sampling survey on local residents in the 2020 tourist season (July to August). A total of 240 questionnaires were issued, 221 valid questionnaires were recovered, with an effective rate of 92.08%, respectively. The demographic sociological characteristics of Menyuan District residents are shown in Table 1.

Table 1. Statistical table of sociological characteristics of population of valid sample of Menyuan Area residents in 2020

Class	variable	Scale (%)	Class	variable	Scale (%)	Class	variable	Scale (%)
			Job	Civil servants	9.95	Monthly salary	≤1000	20.81
Sex	male	52.49		Worker	12.67		1001-2000	27.15
				Retirees	9.5		2001-3000	20.36
	female	47.51		Students	23.08		3001-4000	9.95
				soldier	6.79		4001-5000	15.38
Age	<16	10.41		Teachers/research staff	7.69		≥5000	6.33
	17-25	25.79		freelancer	8.6	Education attainment	postgraduates	10.41
	26-35	22.17		Farmers	16.74		bachelor	21.27
	36-45	24.89		self-employed	4.98		high school	34.39
	46-60	12.22		Other	0		technical school	26.7
	>60	4.52					Junior high school and below	7.24

2.2. Research Methods

2.2.1. Conditional Value Method (CVM)

The core of the method of conditional value assessment (CVM) is to obtain the respondents' willingness to pay (receive compensation) for public environmental goods through the setting of an imaginary market and questionnaires, and quantitatively express [23] the non-market value of public goods based on the respondents' willingness to pay (receive compensation). The WTP calculation formula is as follows:

$$T(WTP) = WTP_m \cdot M \cdot r \quad (1)$$

Where: $T(WTP)$ is the total value of willingness to pay,

WTP_m is the WTP per capita of respondents, M is the total payer group of respondents, and r is the ratio of willing to pay.

2.2.2. Binary Logistic Model

In this paper, Pearson correlation values were calculated by SPSS23.0. There was a strong correlation between residents' individual attributes and their willingness to pay ecological compensation. In order to extract the factors that meet the requirements of residents and psychological perception factors, according to the standard that the factor load is greater than 0.5 and meets the requirements, the remaining 9 factors are purified.

Table 2. Statistical table of sociological characteristics of population of valid sample of Menyuan Area residents in 2020

Public variables	Independent variables	Sig.	Regression coefficient (B)	Satisfaction	Significance mean
Individual attributes Traits	Gender	0.016	0.429		0.014
	age	0.046	0.762		
	Occupations	0.004	0.813		
	Monthly income	0.004	0.667		
	Literacy	0	0.466		
Ecological environment Perception	Construction of ecological and environmental protection infrastructure	0.045	0.045	3.9	0.043
	Implementation of ecological and environmental protection policies	0.059	0.059	4	
	Ecological environment quality status	0.026	0.026	3.81	
Human environment Perception	Residents' relationship with park practitioners	0.104	0.104	3.26	0.272
	Resident and visitor relations	0.662	0.662	4.27	
	Relations between residents and government managers	0.051	0.051	3.36	
Recreation function Perception	Service function	0.032	0.032	2.47	0.025
	Facility Features	0.01	0.137	3.25	
	Landscape appeal	0.034	0.257	3.93	

Then, factor analysis was conducted on the remaining factors again. According to the standard that the cumulative variance contribution rate was greater than 50%, it was indicated that the variables could be expressed. Three common psychological perception factors affecting residents' willingness to pay were extracted, and the validity analysis

showed that the structural validity was good. Among them, the first common factor reflects the residents' perception of ecological conditions such as the construction of ecological environmental protection infrastructure, the implementation of ecological environmental protection policies, and the quality of ecological environment, so it is named "ecological

environment perception". The second public factor reflects residents' perception of the friendliness of park employees, tourists and government managers, so it is named "humanistic environment perception"; The third public factor reflects the residents' perception of the park's service function, facility function, landscape attraction and other leisure measures, so it is named "recreation function perception".

Therefore, in this paper, with the help of SPSS23.0, binary Logistic model was adopted to conduct regression analysis of individual attribute characteristics, psychological perception factors and ecological compensation payment intention of residents in Menyuan County. The results are shown in Table 2.

3. Results and Discussion

3.1. Ecological Compensation Payment Intention

At the beginning of 2020, the registered population of Menyuan County is 162,271, and the rate of residents' willingness to pay is 62.90%. The calculation method of willingness to pay adopts the median value calculation method, that is, the payment amount with a cumulative frequency of 50% is selected as the WTP value. Through the statistical table of residents' willingness to pay (WTP) value of Menyuan County, it can be concluded that the closest to the cumulative frequency of 50% are 37.41% and 53.96% respectively, and the corresponding payment amount is 20 yuan and 30 yuan. Through the calculation of the median value, the WTP is 27.61 yuan. The WTP values of ecological compensation for residents of Menyuan County in 2020 are between 2.01×10^6 and 3.02×10^6 yuan.

3.2. Influencing Factors of Residents' Willingness to Pay Ecological Compensation

3.2.1. The Influence of Individual Characteristics on the Willingness to Pay

(1) The willingness of male residents to pay is higher than that of female residents. In terms of gender, men's willingness to pay is higher than that of women, mainly because men are generally higher than women [24] in terms of their attention to and mastery of social information, personal work income and social status.

(2) The monthly income and education level of residents are positively correlated with the willingness to pay. The survey results show that the occupations of Menyuan residents are mainly students and farmers, and the rates of willing to pay are 78.43% and 54.05% respectively. Students have a higher willingness to pay, mainly because this group can take the initiative to obtain social information, pay more attention to the ecological environment, have an open mind, and easily accept new things. They have a higher degree of support for the protection and development of resources in Menyuan area. The willingness rates of residents with incomes below 1000 yuan, 1001~2000 yuan, 2001~3000 yuan, 3001~4000 yuan, 4001~5000 yuan and ≥ 5000 yuan were 8.63%, 13.67%, 15.11%, 16.55%, 22.30% and 23.74%, respectively; In addition, the rates of willingness to pay in middle school and below, high school, secondary school, university and graduate students were 8.63%, 10.07%, 11.51%, 25.18% and 44.60%, respectively. It shows that residents' willingness to pay is positively correlated with their

economic level and educational level.

On the one hand, residents' income is the root cause of their willingness to pay ecological compensation. Residents with lower income are willing and able to invest less money in ecological compensation for national parks; On the contrary, on the basis of ensuring their own living expenses, the higher the income of residents, the stronger their willingness to pay. On the other hand, the more educated residents are, the more aware they are of environmental protection and the more willing they are to accept the new rules and regulations on ecological compensation.

(3) There is an N-type relationship between residents' age and their willingness to pay. Among the survey results, 20.67%, 31.67%, 31.73%, 16.67% and 4% of residents aged 18 to 25, 26 to 35, 36 to 45, 46 to 60 and over 60 are willing to pay, respectively. The results indicate that the willingness to pay increases with age at the beginning, but decreases with age after 45 years old, showing an N-type relationship.

The main reason is that with the increase of residents' age, the willingness to pay is lower. This is mainly because the elderly has weaker cognition and acceptance of ecological compensation, do not understand the ecological compensation mechanism of national parks, and have poor cognition of environmental protection. Therefore, they will be more cautious in choosing ecological compensation payment.

3.2.2. Influence of Psychological Perception on Willingness to Pay

The mean regression coefficients of residents' perception of ecological environment, perception of humanistic function and perception of recreational environment are 0.043, 0.272 and 0.025 respectively (Table 2). The regression analysis results show that the influence of each psychological perception factor on residents' willingness to pay is ranked in the order of humanistic function perception > ecological environment perception > recreational environment perception.

(1) Humanistic function perception is the first factor affecting residents' willingness to pay. The mean regression coefficient of Menyuan County residents' humanistic environment perception is 0.272, which is the first factor affecting residents' willingness to pay. The factors of residents' humanistic function perception are the relationship between residents and tourists, the relationship between residents and park employees, and the relationship between residents and government managers in order from strong to weak.

Tourists' ecotourism behavior makes residents feel that tourists have strong environmental awareness, and tourists' arrival also promotes the development of local tourism, so residents are satisfied with the relationship between them and tourists (satisfaction=4.27). According to the survey, 38.10% of the residents are not willing to pay, among which 46.99% of the residents think that the payment may not be used for the protection of national parks, and 21.69% of the residents think that the government or tourism enterprises should bear the compensation cost (FIG. 2). Mainly due to the lack of trust in the government's executive power and public financial management system due to information asymmetry and unreasonable profit distribution between the residents and the government or tourism enterprises, they are generally satisfied with the relationship between park practitioners (satisfaction=3.26) and government managers (satisfaction = 3.36). Therefore, the perception of humanistic function became the first factor affecting their willingness to pay.

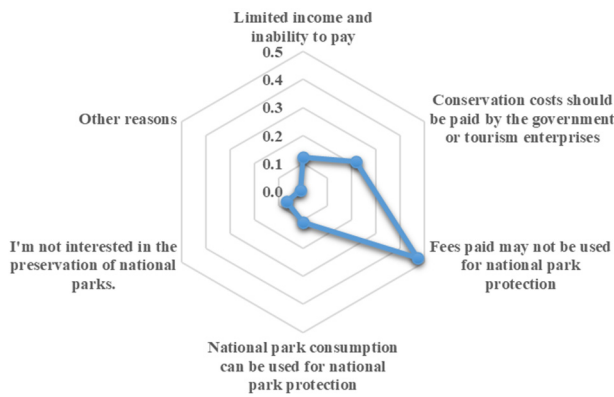


Figure 2. Expected purpose of payment

(2) Ecological environment perception is the second factor affecting residents' willingness to pay

The mean regression coefficient of Menyuan County residents' ecological environment perception is 0.043, which is the second factor affecting residents' willingness to pay. The factors affecting residents' perception of ecological environment are the implementation of ecological environment protection policy, the construction of ecological environment protection infrastructure and the quality of ecological environment in order from strong to weak.

As an important part of the park, Menyuan District has implemented relevant provincial and county ecological policies, so residents are satisfied with the implementation of ecological environmental protection policies in Menyuan District (satisfaction=4.00), and are relatively satisfied with the construction of ecological environmental protection infrastructure and ecological environmental quality (satisfaction=3.90, 3.81). Local residents have a strong sense of responsibility for ecological protection, and in their subjective consciousness, residents believe that they are the main body of ecological compensation payment with the government and tourism enterprises. Therefore, the research shows that 43.88% and 37.41% of residents are willing to spend money on the protection of national park resources and environment and the construction of ecological infrastructure (FIG. 3). Therefore, the perception of ecological environment becomes the second factor affecting their willingness to pay.

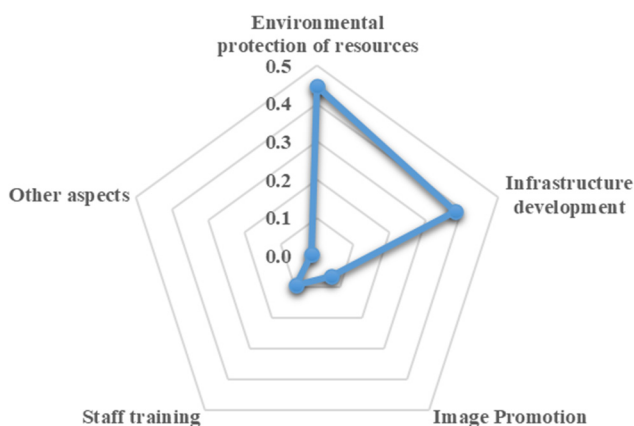


Figure 3. Reasons for refusal of payment

(3) Recreation environment perception is the third factor affecting residents' willingness to pay

The residents are satisfied with the landscape attraction (satisfaction=3.93). The tourism industry in Menyuan district has just started, so the service personnel are lacking in service awareness and service skills. The incompatibility between the

low satisfaction of the service department and the rapid growth of tourism leads to the residents' dissatisfaction with the service function (satisfaction=2.47). However, the high satisfaction of tourism landscape cannot meet the residents' demand for facility functions, and the lag of tourism development leads to the imperfect construction of infrastructure such as transportation, catering and shopping, public toilets and rest facilities in parks. Therefore, residents' satisfaction with facility functions is average (satisfaction=3.25). Therefore, the perception of recreation environment becomes the third factor affecting their willingness to pay.

4. Conclusion and Suggestions

4.1. Conclusion

(1) The residents' willingness to pay ecological compensation in Menyuan area of Qilian Mountain National Park will reach $2.01 \times 10^6 \sim 3.02 \times 10^6$ yuan in 2020.

(2) The difference of the residents' willingness to pay ecological compensation mainly lies in individual characteristics. Occupation and willingness to pay are positively correlated; Age and willingness to pay showed an "n" type distribution; Monthly income and education level were positively correlated with the willingness to pay.

(3) In terms of psychological perception, the perception of human environment is the first factor of residents' willingness to pay, the perception of ecological environment is the second factor affecting residents' willingness to pay, and the perception of recreational function is the third factor affecting residents' willingness to pay.

4.2. Suggestions

The study of residents' willingness to pay ecological compensation in Menyuan District is an important means to improve the ecological compensation mechanism of national parks. The following will put forward corresponding suggestions for the problems existing in Menyuan District.

First of all, it is necessary to improve the public's positive attitude towards national parks.

(1) Through strengthening publicity and education, public opinion guidance, etc., to improve residents' environmental awareness, enhance residents' awareness of the importance of ecological compensation in national parks, strengthen residents' awareness of ecological compensation payment, and reduce residents' idea of "free riding" on ecological compensation payment. Secondly, residents' income should be increased by actively developing eco-tourism and protecting the ecological environment. Finally, through the construction of various infrastructure and service facilities to meet the residents' recreation needs, so as to enhance the residents' willingness to participate in ecological compensation.

(2) To establish the positive interaction between residents, government and practitioners. Establish the positive interaction between residents, government and employees. For the government, the compensation standard and amount of compensation should be disclosed in a timely manner to improve the transparency of the national park ecological compensation policy; For residents, they should take the initiative to participate in the national park ecological compensation, and actively understand the latest information of the national park ecological compensation; For employees, they should regularly participate in job training in national parks to improve service level, service skills and service

awareness.

(3) Visitors are the main body of ecological compensation in national parks. In the future, we should actively carry out comparative studies on the driving force and spatio-temporal evolution of the willingness of multiple visitors such as residents and tourists to pay ecological compensation and the influencing factors; In terms of data collection, the combination of big data, questionnaire survey and in-depth interview can be used to compensate for the limitations of CVM sample bias; To sum up, by further improving the scientific, comprehensive and comparable research results, more reference can be provided for the ecological compensation construction of national parks

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