Evaluation of rural landscape of Yanbian Korean Ethnic Group based on AHP method

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Abstract. In the context of the country's vigorous development of ecological civilization, people began to pay more and more attention to the protection and construction of rural landscapes. Rural culture contains the local spirit and beliefs, which is an important part of Chinese traditional culture. Only when the unique rural culture is rooted in the rural landscape design we can create a colorful rural landscape. Yanbian Korean Autonomous Prefecture is the largest settlement of Korean-Chinese in China. But its rural landscape has not yet been studied through a systematic comprehensive evaluation system. The study takes the rural landscape of Yanbian Korean Autonomous Prefecture in Jilin Province as the research object, and uses the Analytic Hierarchy Process (AHP) to establish a comprehensive value of rural landscape evaluation system. The judgment matrix is constructed by 4 criterion layer factors and 28 index layer factors, and the weight of each index is calculated to evaluate and analyze. The results show that: in the criterion layer, ecological environmental value (B2) has the highest weight value, followed by scientific and cultural value (B3) and aesthetic appreciation value (B1), and socio-economic value (B4) has the lowest weight value. The weight values of which are 0.4379, 0.2437, 0.2190 and 0.0994 in order. In the indicator layer, the integrity of landscape elements (C11) of the ecological environment value (B2) of the criterion layer have the highest weight, which is 0.1675; the ecosystem stability (C6) belonging to the same criterion layer is the second, which is 0.1097. By analyzing the differences in the value of various types of rural landscape elements, the symbolic types of landscape elements are explored. The results of study provide guidance for the future development of the rural landscape by establishing an evaluation model of the rural landscape of the Korean ethnic group in Yanbian.

Keywords: rural landscape; AHP; landscape evaluation; the Korean Ethnic Group

1   Introduction

The Fourth Plenary Session of the 19th Central Committee of the Communist Party of China (CPC) proposed to fully grasp and adhere to the construction of ecological civilization and the revitalization of beautiful rural areas. The rooting of rural culture in the

process of building rural landscapes is an indispensable part of the construction of new countryside and should be protected and valued [1]. However, due to the rapid urbanization in China in the past 30 years, the rapid increase in construction land, and the increasing role of human intervention in nature. The domestic rural landscape is facing the following threats: ecological environment destruction, loss of rural landscape characteristics, and lack of rural traditional culture, etc [2]. The rural landscape is disappearing at an alarming rate in the development of modern society.

At present, there are many studies on the evaluation system of rural landscape at home and abroad. In the domestic research, Liu and Wang preliminary researched and constructed a rural landscape index evaluation system [3]. Xie and others conducted research on the evaluation of the aesthetic quality of rural landscapes [4]. Zhang took Huangzhuang Village in Lingchuan County as an example, analyzed the composition and characteristics of traditional mountainous rural landscapes in southeast Shanxi and make reasonable classifications [5]. Chen took the rural landscape in the Yanbian Korean Autonomous Prefecture as the research object, established an evaluation index system for the Korean-Chinese rural landscape [6]. Wen and others through a questionnaire survey of traditional villages in Xiangxi Tujia and Miao Autonomous Prefecture of Hunan Province, and concluded that village style factors have a particularly important impact on the spatial quality of traditional mountain villages [7]. Zhang and others took Qiaokou Town, Changsha City as an example, and carried out a relatively complete landscape feature evaluation study [8]. Wei and others constructed the "evaluation index system for traditional Korean-Chinese villages in the Tumen River area" [9]. In the context of China's promotion of the construction of ecological civilization, the quality of rural landscapes should be jointly judged by ecological value, aesthetic value, scientific and cultural value, etc. Predecessors have done more research on ecological quality, but did not pay attention to the exploration of ecological value. Foreign studies on landscape evaluation include the establishment of a policy evaluation framework for rural landscape development by Marleen and others [10]. Naoki and others research on landscape regionality [11]. Zohre proposed the evaluation standard of rural landscape [12]. Through the literature analysis of domestic and foreign rural landscape evaluation systems in the past 20 years, it is found that the rural landscape quality evaluation has not yet formed a system, and the protection and improvement of rural landscapes need to be studied [13].

Yanbian Korean Autonomous Prefecture is the largest settlement of the Korean-Chinese in China and has a unique rural landscape, however its rural landscape has not yet been studied by a systematic comprehensive evaluation system. The research takes the rural landscape of Yanbian Korean Autonomous Prefecture as an example. It was carried out using the Analytical Hierarohy Process method to deeply excavate and refine the characteristics and differences of rural landscapes. The research method can help to recognize the inherent characteristics and value of rural landscapes, and maintain the sustainability and stability of the ecological environment of the rural landscape. The relatively scientific and complete evaluation model of rural landscapes are established can provide scientific basis for the protection and sustainable development of the rural landscape in Yanbian.

2   Materials and methods

2.1   Study area

Yanbian Korean Autonomous Prefecture is located in the east of Jilin Province, surrounded by mountains and has a humid monsoon climate. There are 800,000 Korean-Chinese, accounting for nearly half of the Korean-Chinese population in China. The Yanbian Korean-Chinese mainly live in the Tumen River basin, because the sufficient water resources facilitate the development of life and production methods of rice cultivation. At the same time, the Yanbian Korean Autonomous Prefecture is rich in forest resources, which can provide many food and wood resources for the lives of Korean-Chinese. After hundreds of year, the Yanbian Korean-Chinese have formed a distinctive traditional folk culture, and the rural landscape also retains the characteristics of the traditional Korean-Chinese landscape.

2.2   Research methods

The Analytical Hierarohy Process (AHP) was proposed in the 1970s and widely used in the landscape evaluation of urban green spaces. It uses qualitative and quantitative methods to evaluate and calculate each element hierarchically, so as to solve complex decision-making problems more scientifically and flexibly [14-17].

    On the basis of previous studies [18-20], through field research and expert consultation, 40 evaluation indicators were preliminarily drawn up. For each evaluation index, the scoring criteria were established based on five grades: very good 10 points, good 8 points, general 6 points, poor 4 points, and very poor 2 points. At the same time, 20 experts who have been engaged in rural landscape construction for a long time were invited to score various rural landscape evaluation indicators based on survey photos and statistical data tables. Based on the scores, indicators with more than 6 points were selected to determine the indicators of the final evaluation system (Table 1).

    The judgment matrices of A-B, B1-(C1 ~ C5), B2-(C6 ~ C11), B3-(C12 ~ C19), B4-(C20 ~ C28) are constructed in the rural landscape index system of Yanbian Korean Ethnic Group, and the judgment method is 1 ~ 9 ratio scale. The values 1, 3, 5, 7, and 9 respectively represent the comparison of two evaluation factors. One factor is as important as the other, slightly important, more important, very important, and absolutely important. 2, 4, 6 and 8 respectively represent the intermediate value of the importance of the two evaluation factors. The reciprocal represents the inverse comparison of the two evaluation factors. The obtained results were calculated by using the analytic hierarchy process software (yaahp 10.2) to calculate the weight of each index factor, and conduct a consistency test [21].

3   Results and analysis

3.1   Construction of the indicator system

According to the characteristics of the rural landscape of the Korean ethnic group in Yanbian and its functions, an indicator system of the rural landscape of the Korean ethnic group is constructed from four aspects: aesthetic appreciation value, ecological environmental value, scientific and cultural value, and social - economic value. The aesthetic appreciation value is composed of five evaluation factors: pattern and texture recognition, landscape diversity, landscape artistry, landscape spatiality, and landscape artistic conception. Ecological environmental value is composed of ecosystem stability, resource ecological quality, environmental regulation, and surrounding environment integration, landscape dependence, and integrity of landscape elements. Scientific and cultural value is composed of national characteristics, construction techniques, national culture, historical longevity, landscape inheritance, landscape scarcity, landscape science, and cultural beliefs. The social-economic value is composed of 9 evaluation factors: landscape functionality, recreational attraction, industrialization development, social influence, landscape sociality, public awareness, landscape visibility, landscape scale, and landscape experience (Table 1).

Table 1. The index system of the rural landscape of Yanbian Korean Ethnic Group

Target layer	Criterion layer	Index layer	Indicator layer description	Score
Research and evalua-tion on the compre-hensive value of the rural land-scape of Yanbian Korean Ethnic Group (A)	Aesthetic apprecia-tion value (B1)	Pattern and texture recognition (C1)	The artistic modeling of the com-prehensive space of ethnic cultural symbols, patterns and textures makes the landscape symbolic and allegorical.	8.82
		Landscape diversity (C2)	Refers to the changes in the layout of the landscape structure, the di-versity of forms, and the symbol of the richness of the landscape.	6.54
		Landscape artistry (C3)	Highlight the regional recognition characteristics of rural landscapes from the performance of landscape color and visual perception.	7.23
		Landscape spatiality (C4)	The transformation of the spatial layout of the rural landscape, and the construction form of the inter-nal space and the external space, etc.	6.80
		Landscape artistic con-ception (C5)	Psychological feelings given by the overall landscape.	7.10
	Ecologi-cal envi-ronmental value (B2)	Ecosystem stability (C6)	The sustainable development of the rural landscape ecosystem maintains a stable value through self-regulation.	9.12
		Resource ecological quality (C7)	Based on the natural environment, the evaluation of the ecological landscape complex composed of vegetation resources, construction	7.19

		resources, land resources, and water resources in the location.	
	Environmental regulation (C8)	Regulating effect on rural landscape resources and environment.	6.75
	Surrounding environment integration (C9)	The rural landscape blends with the surrounding woodland, mountains, farmland, waters, etc.	8.46
	Landscape dependence (C10)	The degree of interdependence between the structure and the natural ecological environment.	8.94
	Integrity of landscape elements (C11)	The degree of completeness of preservation and continuation of natural landscape elements.	9.20
	National characteristics (C12)	Regional characteristics of Korean ethnic group, various activities or skills, etc.	8.65
	Construction techniques (C13)	Buildings and handicrafts use traditional materials, traditional tools and craftsmanship; follow taboo customs and create regional skills.	7.36
	National culture (C14)	Have a certain cultural value, combined with local natural conditions and historical and cultural background.	8.58
Scientific and cultural value (B3)	Historical longevity (C15)	The time when the village was formed; the earliest extant historical relics; the earliest extant building construction time; the construction time in a cluster of traditional buildings.	8.01
	Landscape inheritance (C16)	Inheritance of intangible cultural heritage; inheritance of other cultural and sports activities; inheritance of traditional craftsmanship.	7.95
	Landscape scarcity (C17)	Endow the rural landscape with a unique regional culture and rich in national characteristics.	7.46
	Landscape science (C18)	The scientific value reflected in the site selection, layout, planning and construction of rural landscape.	6.94
	Cultural belief (C19)	The degree of local residents' belief in national culture, including mountain and stone worship, plant and animal worship, etc.	6.51
Socio-economic value (B4)	Landscape functionality (C20)	From the psychological point of view of the user, consider the convenience and convenience of its use. From the perspective of landscape connectivity, recreational service facilities, sanitation facilities, etc.	6.05
	Recreational attraction (C21)	The rural landscape is attractive to tourists by setting up some recreational facilities.	6.48

Industrialization development (C22)	The results of the integration of economy and culture, including the development of economic and cultural industries such as agriculture, animal husbandry, tourism, fishery, etc.	6.02
Social influence (C23)	The influence of historical events, allusions, myths, legends, etc. The popularity of cultural and sports activities.	6.49
Landscape sociality (C24)	The economic wealth brought to the village while providing production and living services to ethnic minorities reflects the productive and openness of the social indicators of the landscape.	6.23
Public awareness (C25)	Public awareness is the degree of people's awareness of the material and spiritual culture of the nation.	6.67
Landscape visibility (C26)	Popularity is one of the prerequisites for visiting rural landscapes. The higher the popularity, the more likely it is to be visited.	7.13
Landscape scale (C27)	The total area of traditional buildings; the proportion of natural areas and farmland to the total area of the village; the degree of participation in intangible cultural heritage, etc.	6.08
Landscape experience (C28)	Combine the rural landscape with local customs and regional culture to enhance the experience of tourists.	7.21

3.2   Analysis of the weight value of the evaluation index system

The weight of each index factor was calculated by using the analytic hierarchy process software (yaahp 10.2), and the consistency test was carried out to obtain the weight and total ranking of each evaluation indicator in Table 2.

Table 2. The weight distribution table of the evaluation index of the rural landscape of Yanbian Korean Ethnic Group

Target layer	Weights	Criterion layer	Weights	Index layer	Weights	C-tier total weight	Sort
Research and evaluation on the comprehensive value of the rural landscape of Yanbian Korean Ethnic Group (A)	1	Aesthetic appreciation value (B1)	0.2190	Pattern and texture recognition (C1)	0.4185	0.0916	3
				Landscape diversity (C2)	0.0618	0.0135	19
				Landscape artistry (C3)	0.2625	0.0575	6
				Landscape spatiality (C4)	0.1599	0.0350	10
				Landscape and artistic conception (C5)	0.0973	0.0213	15

Criterion layer (B)	Weight	Index layer (C)	Weight	Total weight	Rank
Ecological environmental value (B2)	0.4379	Ecosystem stability (C6)	0.2504	0.1097	2
		Resource ecological quality (C7)	0.0641	0.0281	12
		Environmental regulation (C8)	0.0428	0.0187	16
		Surrounding environment integration (C9)	0.1006	0.0441	8
		Landscape dependence (C10)	0.1596	0.0699	5
		Integrity of landscape elements (C11)	0.3825	0.1675	1
Scientific and cultural value (B3)	0.2437	National characteristics (C12)	0.3317	0.0808	4
		Construction techniques (C13)	0.0684	0.0167	17
		National culture (C14)	0.2310	0.0563	7
		Historical longevity (C15)	0.0329	0.0080	22
		Landscape inheritance (C16)	0.1062	0.0259	13
		Landscape scarcity (C17)	0.0480	0.0117	20
		Landscape science (C18)	0.1575	0.0384	9
		Cultural belief (C19)	0.0243	0.0059	24
Socio-economic value (B4)	0.0994	Landscape functionality (C20)	0.0520	0.0052	25
		Recreational attraction (C21)	0.1003	0.0100	21
		Industrialization development (C22)	0.0182	0.0018	28
		Social influence (C23)	0.0728	0.0072	23
		Landscape sociality (C24)	0.0326	0.0032	26
		Public awareness (C25)	0.0238	0.0024	27
		Landscape visibility (C26)	0.3148	0.0313	11
		Landscape scale (C27)	0.1601	0.0159	18
		Landscape experience (C28)	0.2252	0.0224	14

As shown in Table 2, in the criterion layer, the weight value of ecological environmental value is the highest, as high as 0.4379. The second is the scientific and cultural value, with a weight value of 0.2437. The weight value of aesthetic appreciation value is 0.2190, which is not much different from the weight value of scientific and cultural value. The weight value of social-economic value is the lowest, only 0.0994, which is about 4 times different from the weight value of ecological environmental value. It shows that experts believe that the ecological environment value occupies a very important position in the evaluation of the rural landscape compared to other values. In particular, the two evaluation factors of the integrity of the landscape elements and the ecosystem stability for the total weight of the C layer obvious advantage.

In the aesthetic appreciation value B1-(C1~C5) layer, the pattern and texture recognition should be considered first. From the perspective of local residents and tourists, the richness of patterns and textures can give people an intuitive feeling, thereby enhancing the attractiveness of the rural landscape and infectiousness. The second thing to pay attention to is the artistry of the landscape, highlighting the regional recognition characteristics of the rural landscape from the performance of the landscape color and visual perception [22]. Finally, the landscape spatiality and the expression of diversity are strengthened to create the artistic conception of the rural landscape.

In the ecological environmental value B2-(C6~C11) layer with the largest weight value, considering the interaction between the rural landscape and the ecological environment. So the two evaluation factors, the integrity of landscape elements and the ecosystem stability, appear to be particularly important in the construction of the rural landscape ecological environment, with the highest weight value. Secondly, we must consider the resource ecological quality and environmental regulation. They are based on the natural environment, the evaluation of the integrated ecological landscape composed of vegetation resources, building resources, land resources, and water resources in the location, as well as the interaction with the rural landscape. Finally, consider the surrounding environment integration and the landscape dependence. The integration of typical regional cultural characteristics with the rural landscape environment, effectively ensuring the sustainable development of the ecological environment.

In the scientific and cultural value B3-(C12~C19) level, the two evaluation factors of national characteristic and national culture have the highest weight value. National culture is the symbol and pronoun of the rural landscape, combined with the local natural conditions and historical and cultural background, so that the rural landscape is unique and attractive. Of course, scientific site selection, layout, intangible cultural heritage, and the inheritance of traditional handicrafts are also indispensable factors. Secondly, it is necessary to consider the uniqueness, regionality, and scarcity of the rural landscape and handicrafts, as well as the long history of the local village, so as to provide a strong basis for the protection and inheritance of the rural landscape. Finally, we must consider the scarcity of the landscape and the degree of cultural beliefs. Culture has been inseparable from religious beliefs and plant worship since ancient times. Historical celebrities' residences, places where mythological stories occur, religious sacred sites and other places with unique imprints, plus cultural beliefs Both the outside and the inside enrich the rural landscape.

At the B4-(C20~C28) level of social and economic value, the visibility of the landscape and the experience of the landscape are particularly important. Visibility is one of the prerequisites for a rural landscape to be visited. The higher the visibility, the greater the chance of being visited. Root the regional culture in the rural landscape, enhance the experience of the landscape, and enhance the social and economic value. Secondly, it is necessary to consider recreational attraction and social influence, promote the development of rural tourism through quantitative indicators of the ability of recreational areas or facilities to attract tourists, as well as the appeal and attraction of historical events and legends. The two evaluation factors of landscape functionality and landscape sociality fully reflect that the rural landscape must be viewed from the perspective of the user, and only when it is open, productive, and functional can it truly reflect its value. The three evaluation factors of public awareness, landscape scale, and industrialization development have little difference in importance. They are all facing the society, establishing industrial scale through local villages, economic development, thereby promoting social economy rapid development.

3.3   Construction of comprehensive evaluation model

The research results are based on the specific calculation of the aesthetic appreciation value, ecological environmental value, scientific and cultural value, and socio-economic value of the rural landscape of the Korean ethnic group in Yanbian, and they are scored through semi-structured interviews. The evaluation model of the rural landscape of the Korean ethnic group in Yanbian is:

$$A=0.2190B_1+0.4379B_2+0.2437B_3+0.0994B_4 \qquad (1)$$

$$B_1=0.4185C_1+0.0618C_2+0.2625C_3+0.1599C_4+0.0973C_5 \qquad (2)$$

$$B_2=0.2504C_6+0.0641C_7+0.0428C_8+0.1006C_9+0.1596C_{10}+0.3825C_{11} \qquad (3)$$

$$B_3=0.3317C_{12}+0.0684C_{13}+0.2310C_{14}+0.0329C_{15}+0.1062C_{16}+0.0480C_{17}+0.1575C_{18}+0.0243C_{19} \qquad (4)$$

$$B_4=0.0520C_{20}+0.1003C_{21}+0.0182C_{22}+0.0728C_{23}+0.0326C_{24}+0.0238C_{25}+0.3148C_{26}+0.1601C_{27}+0.2252C_{28} \qquad (5)$$

Through the calculation of formulas (1)-(5), the evaluation score of the rural landscape of the Korean ethnic group in Yanbian can be obtained.

4   Conclusion and discussion

From the above analysis, it can be seen that the integrality of the landscape elements and the ecosystem stability in the ecological environment value have the highest total weight value, which are the two major landscape elements that affect the quality of the rural landscape of the Korean ethnic group. No rural landscape can be independent from the foundation of the ecological environment. With the unique topographic characteristics of the Yanbian Korean ethnic group, the coordination and stability of the ecological environment should be very important. However, due to the government's vigorous reforms and innovations in the villages, the original ecological environment of the villages has been destroyed, and measures such as returning farmland to forests should be taken. Through the construction of an evaluation model of the rural landscape of the Korean ethnic group in Yanbian, the cultural space of the Korean ethnic group is restored, the elements of the rural landscape are woven, and the ecological road water system is retrieved.

At present, the construction of "village revitalization" in the country is being carried out in full swing, and it is of great practical significance to protect the ecological environment of the rural landscape and to carry out scientific research on the inheritance of history and culture. The study conducted a comprehensive evaluation of the rural landscape system of the Korean ethnic group in Yanbian, and established a rural landscape evaluation model, so as to provide theoretical support and reference for the creation of rural landscape with local cultural characteristics. In addition, the rural landscape contains material landscape elements and intangible cultural landscape elements, which are complex and require further research and discussion.

The source of the topic

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