

Research Article

Rural Landscape Design Update and Optimization Based on Scientific Computing Algorithm of Color Template Space Projection

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Received 15 April 2022; Accepted 2 June 2022; Published 19 July 2022

Academic Editor: Sagheer Abbas

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It is particularly important to plan and design the rural landscape of the Qiang nationality, but the regional characteristics of the rural landscape of the Qiang nationality in the upper reaches of the Minjiang River must be maintained at the same time. On the basis of the regional culture formed by the regional geography and cultural environment of the Qiang ethnic group in the upper reaches of the Minjiang River, combined with the investigation of the Qiang ethnic group in the upper reaches of the Minjiang River, this study explores the formal characteristics and formation reasons of the rural landscape of the Qiang ethnic group in the upper reaches of the Minjiang River from the perspective of rural landscape planning and design. It summarizes the formal features of the Qiang rural landscape in the upper reaches of the Minjiang River in a graphical language. It analyzes the problems faced by traditional rural landscapes. It then summarizes the experience and deficiencies in practice through the research on the existing Qiang rural landscape planning and design. It analyzes the influence of the regional culture of the Qiang nationality on the planning and design of the rural landscape of the Qiang nationality and proposes a strategy for the planning and design of the rural landscape of the Qiang nationality. This study hopes that this can provide theoretical and practical reference for the planning and design methods of the Qiang rural landscape in the upper reaches of the Minjiang River and the protection, development, and dissemination of the Qiang culture in the upper reaches of the Minjiang River. Experiments show that there are 764 settlements when the radius of the river buffer is within 500 meters.

1. Introduction

Regional characteristics are the precious wealth accumulated by the countryside in the development of hundreds of thousands of years. The disappearance of each regional characteristic is irreversible. Regional characteristics formed over thousands of years may become a cookie-cutter new rural model overnight. In the rapid urbanization, the rural construction ignores the regional cultural characteristics of the countryside, which triggers the crisis of the regional characteristics of the countryside. A single development model makes the new countryside mediocre, monotonous, and featureless. There are fewer and fewer scenes of “a hundred miles of different winds and a thousand miles of different customs.” Most of Qiang people live in the upper

reaches of the Minjiang River with inconvenient transportation. However, the Qiang area has accumulated rich cultural resources in the development of thousands of years. After the earthquake, the Qiang cultural area suffered serious losses. This also provides an opportunity for the development of tourism in the Qiang area and enables many people to learn about the culture of the Qiang nationality. Many villages in the Qiang area have carried out rural tourism featuring local cultural landscapes and natural landscapes and have achieved good economic benefits. The rural tourism carried out in the Qiang area is the Qiang village, which has certain rich natural and cultural resources.

The formation of the rural landscape of the Qiang people in the upper reaches of the Minjiang River also reflects the production, life, social, and cultural development of the

Qiang people in the upper reaches of the Minjiang River. It embodies the rich regional humanistic spirit and is the concentrated embodiment of regional memory. It has valuable historical and cultural value and is of great significance to the development of society and the progress of mankind. As a physical witness of regional history and regional culture, the Qiang rural landscape in the upper reaches of the Minjiang River is like a living museum, more valuable than historical records. It has become a positive element for continuing the regional historical context, interpreting regional culture, and promoting social civilization. It is of great significance to explore the rural landscape of the Qiang nationality in the upper reaches of the Minjiang River.

The innovations of this study are as follows:

- (1) *Traditional Rural Landscape of the Qiang Nationality in the Upper Reaches of the Minjiang River.* The rural settlements of the Qiang people in the upper reaches of the Minjiang River are the result of long-term evolution with social development. These Qiang rural settlements have their own special natural environment and cultural features. This results in a unique rural landscape within the area. This provides a better way of development for villages with poor traffic conditions. From the perspective of historical evolution, this study discusses the geographical and human factors that influence the formation of rural landscapes in the upper reaches of the Minjiang River. It is summarized in the long history of the formation process of the Qiang rural landscape in the upper reaches of the Minjiang River. It also studies the rural landscape characteristics of the Qiang nationality in the upper reaches of the Minjiang River. This includes village site selection, spatial layout, internal organization, landscape nodes, agricultural and forestry landscape, etc.
- (2) *Regional Culture of the Qiang People in the Upper Reaches of the Minjiang River.* The rural settlements of the Qiang people in the upper reaches of the Minjiang River are the result of long-term evolution with social development. These Qiang rural settlements have their own special natural environment and cultural features. In the rural settlements of the Qiang nationality in the upper reaches of the Minjiang River, folk customs, traditional morality, ethical order, cultural concepts, and the wisdom of harmonious coexistence between man and land, man and nature, and man and man have been formed. This vividly shows the richness of the national culture. Starting from the characteristic natural environment and humanistic environment of the upper reaches of the Minjiang River, it deeply studies the cultural elements contained in the regional culture of the upper reaches of the Minjiang River. It also studies the cultural connotation represented by the regional culture in the upper reaches of the Minjiang River.

- (3) *Planning and Design of Rural Landscape.* Landscape planning in rural areas is the focus of the article research. Based on the regional culture and traditional Qiang rural landscape research in the upper reaches of the Minjiang River, it conducts in-depth research on relevant rural landscape planning concepts and related cases and analyzes the factors that affect rural landscape planning and design. It starts from the actual situation of the Qiang nationality area in the upper reaches of the Minjiang River and studies the planning and design strategies to solve the problems faced by the rural landscape of the Qiang nationality in the upper reaches of the Minjiang River.

2. Related Work

Many scholars have provided a lot of references for research on color templates, spatial projection, scientific computing, and rural landscape design.

Tang proposed a framework combining cloud computing and high-performance computing for parallel map projection of vector-based large spatial data. Tang investigated the utility of a parallel map projection framework using large LiDAR data as an example of vector-based large spatial data [1].

Chen takes Peitian Village in Fujian Province as the research object, analyzes the problems existing in architecture, infrastructure, population, industry, culture, etc., and proposes solutions that combine cultural tourism industry with public space planning. This study expounds the spatial planning methods for realizing sustainable cultural tourism industry chain and ecological agricultural production mode and discusses the landscape design methods to increase economic income while optimizing the living environment [2].

Imani proposed a morphology-based feature extraction and classification framework. The framework incorporated local neighborhood information in a spatial window for expanding the training set. His proposed method was based on morphological structure preserving projection (MSPP) and attempted to preserve the data structure in the spectral space feature space. In addition, MSPP increases the class recognition ability by defining a similarity matrix constructed from the extended spectral space training samples [3].

Chugui derived the analytical expression of the impulse response and studied the response behavior of various relationships between the objective lens and the filter aperture. He analyzed the correctness of parameter selection of known quasi-invariant optical systems [4].

Li examined the impact of three subsets of environmental factors (i.e., soil physicochemical properties, including pH, organic matter and soil texture, landscape pattern, and parent material) on the spatial variation and sources of soil trace metal pollution across an urban-rural environmental gradient. The findings suggest that improving soil physicochemical properties and landscape design can enhance environmental buffering and carrying capacity, thereby mitigating soil pollution in the study area and reducing nonpoint source pollution [5].

Seregina presented the results of modeling the spatial distribution of minority charge carriers generated by electron probes in semiconductor materials using the Galerkin projection method [6].

Park systematically quantified the 3D spatial resolution of optical diffraction tomography by exploiting the spatial bandwidth of the reconstructed scattering potential. He computed 3D spatial resolution for various types of optical diffraction tomography systems, including illumination scans, sample rotation, and hybrid scan rotation methods [7].

Hu proposed a new synthetic bandwidth method based on frequency domain backprojection. This was used in stepped frequency synthetic aperture radar to improve computational efficiency and enable automatic spatial spectral cutting [8].

Su proposed a projection-type multiview holographic three-dimensional (3-D) display using a single spatial light modulator (SLM) and a directional diffractive device. It computed the phase Fresnel hologram and displays the multiview hybrid image of the reconstructed 3D object on the SLM, providing amplitude information of the multiview light field. He reconstructed viewing angles with different viewing zones to express the phase information of the object [9].

Wang proposed a fast projection method to increase the statistical robustness of rich model features in high-dimensional spaces while reducing their dimensionality. The projection method he proposed was suitable for co-occurrence-based steganalysis features. He studied the detection performance and computational complexity of the method on three content-adaptive steganography algorithms in the spatial domain [10].

Liu introduced a technique called enhanced back projection (EBP) and used it as a postprocessing for panchromatic sharpening. His proposed EBP first enhanced the spatial details of the panchromatic sharpening results by histogram matching and high-pass modulation, followed by a backprojection process. The process took into account the modulation transfer function (MTF) of the satellite sensor, so that the panchromatic sharpening results obeyed the consistency property [11].

Butler considers the role of the Irish countryside in regulating clerical understandings of architectural style and taste and priests' political interpretations of the rural landscape [12].

The data from these studies are not comprehensive, and the results of the studies are open to question. Therefore, it cannot be recognized by the public, and thus cannot be popularized and applied.

3. Scientific Computing Algorithms and Rural Landscape Design

The technical route of this study is shown in Figure 1.

3.1. Characteristics of Qiang Rural Landscape. The characteristics of the Qiang rural landscape are as follows:

3.1.1. Village Location. The site selection of traditional Qiang villages is mainly considered from two aspects: one is the consideration of the production and living environment. Generally, the site is selected in areas with fertile land or rich production and living resources. The second is for the consideration of the defensiveness of the Qiang villages, and they are generally selected on mountains with certain defensive capabilities. Based on these, the distribution of Qiang villages generally shows the characteristics of concentrated site selection in river valleys, half mountains, and high mountains [13].

Valley. Many Qiang villages have chosen the location of the villages on the slopes of flat dams that appear on both sides of the tributaries of the Minjiang River due to the impact of the river. These places have fertile land and convenient transportation. It is generally close to Han villages and towns that can conduct trade, and at the same time, it is relatively close to the water source below, so it has become an ideal location for many villages. The location of the village construction is generally on the sloping land facing the east of the river. The sloping land in the east can ensure that the crops have sufficient sunlight, which also provides a good lighting environment for the residents to live. In modern times, due to the convenient traffic conditions in the river valleys, as well as the generally high temperature and good living environment in the river valleys, many Qiang villages in the high mountains and semialpine areas have migrated to the river valleys in large numbers. In more than ten years, many large-scale villages have been formed.

Half Mountain. The site of the half mountain is located in the open area of the river valley and the half mountain. In the zone between the two, the specific height has a lot of space. Many villages choose to sit in this geographic location. This is mainly due to the arable land conditions, and villages are less distributed in this location. This is mainly because there is less arable land in the mid-mountain area. Generally, the slope of the mountainside is steep and there are many cliffs. The distribution of villages is generally based on the mountain topography, along the steep contour lines or perpendicular to the contour lines. This gives full play to the superb stone masonry skills of the Qiang people. According to different life production and defense requirements, it presents a variety of pattern changes.

High Mid-Mountain. The Qiang villages in the high mountains are generally ancient villages with a certain history, which are determined by the geomorphological characteristics of the upper reaches of the Minjiang River. As the main resource limiting the development of settlements, cultivated land is not much in these areas. Sloping cultivated land is more difficult to develop. Lands with large arable land and pastures are only distributed on gently sloping platforms close to or on top of the mountain. The villages built according to the situation are also highly defensive, which provides the villages with high and defensive geographical conditions. The Qiang villages in the modern period are generally relatively closed in the Gaobanshan area. It retains

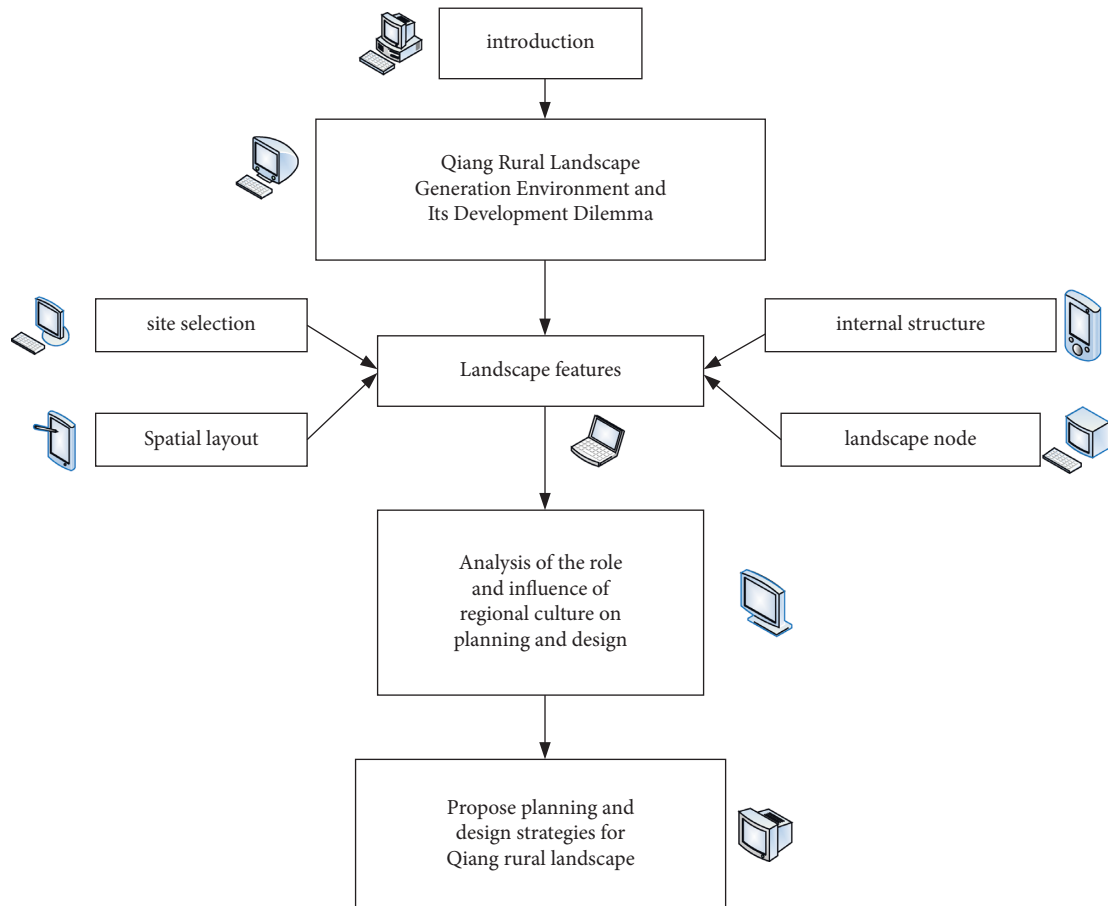


FIGURE 1: Technical route.

the simple living environment of traditional Qiang villages. The distribution of vegetation and soil at different altitudes in the upper reaches of the Minjiang River is shown in Figure 2.

The main tributaries of the Minjiang River are listed in Table 1.

According to the above description, the site selection of Qiang villages is affected by several conditions. This mainly includes historical background, geographical environment, social structure, and so on. The adequacy of living resources such as cultivated land plays a decisive role in the site selection of Qiang villages. For the Qiang people, no matter how harsh the geographical conditions are, as long as they can provide a living space, there will be a village where the Qiang people live. Summarizing the characteristics of Qiang's site selection can be expressed in a few words: mountain, near water, and farmland.

3.1.2. Spatial Layout. The geographical environment of the Qiang living area in the upper reaches of the Minjiang River is complex. In addition, the diverse cultural influences and the complex political and social environment of the outside world have a huge impact on the layout and characteristics of Qiang villages. The Qiang village integrates different cultural concepts, and it has become a flexible and distinctive layout

form of the Qiang people. According to the centrality of Qiang villages, the layout of Qiang villages can be divided into the following forms, as shown in Figure 3:

- (1) The Qiang village with the watchtower as the center is an important building. It generally has important functions of defense and public activities in many villages. Qiang dwellings are generally arranged with the Qiang tower as the center. The development of residential houses is also centered on the Qiang towers and spreads out to the surrounding space. The shorter the construction time of the dwellings, the farther the distance from the watchtowers. One or more Qiang fortresses echo each other and are extremely defensive in the center of the village. This kind of centrality may take the watchtower as the center of the circle, symmetrical center, and terrain center. The central space of the Qiang nationality is spread out with watchtowers. The main Qiang villages include Bowa Qiang Village, Heihu Qiang Village, and Qiang Feng Village [14].
- (2) *Layout Form Centered on the Canal.* As an important living and production resource of the Qiang people, water source plays a very important role in many villages. The layout of dwellings and other buildings is also based on the canal as the center. This central

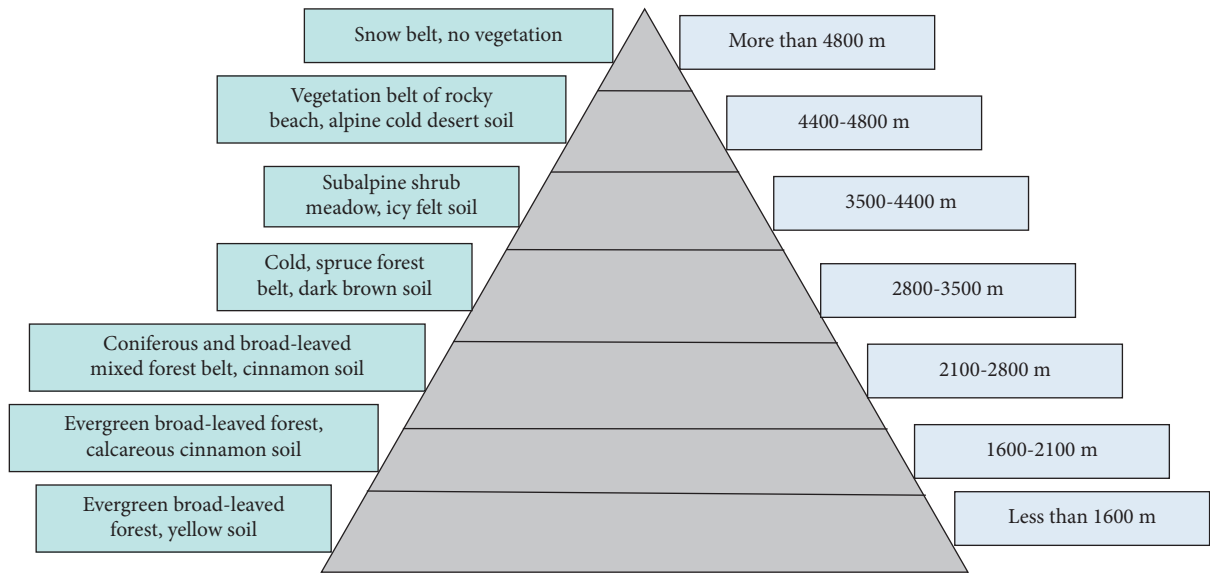
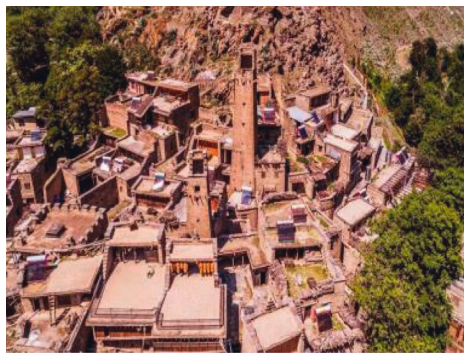


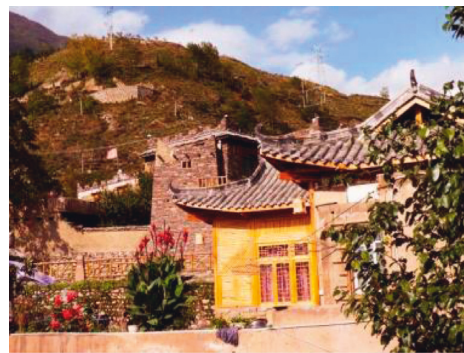
FIGURE 2: Distribution of vegetation and soil at different altitudes in the upper reaches of the Minjiang River.

TABLE 1: Main tributaries of the Minjiang River.

Number of tributaries	Tributary name	Tributary full length (km)
1	Heishuihe	140
2	Zagu Nao River	158
3	Yuzixi	85.5



(a)



(b)



(c)



(d)

FIGURE 3: Qiang villages living in different regions.

Qiang village is mainly distributed in the valley area, or the Qiang village on the mountainside with natural canals flowing into it. The inflowing canals are introduced into the village and into each household. In wartime, it was used as the main way to control water sources. Water mills, wells, cisterns, etc. are set up on the ground where the canals flow. The canal runs through the entire village space, and the dwellings are arranged on both sides, forming a spatial landscape that echoes with the water. Such Qiang villages mainly include Taoping Qiang Village, Tonghua Qiang Village, and Longxi Qiang Village.

- (3) *Layout Form Centered on Roads and Cross-Street Buildings.* Many Qiang villages were initially established for defense purposes. The houses inside the village are arranged around the main road. The towering dwellings are arranged on both sides of the road, making these spaces a relatively closed system. Residents of Qiang village can guard these important roads to prevent invasion by foreign enemies or to interrogate passing personnel. As an important part of the defense space, the cross-street building on the one hand plays a role in connecting the surrounding living space, facilitating the residents' life and facilitating rapid defense; on the other hand, it also plays a role in controlling the main road space. Through the combination of wooden structure and stone masonry technology, it has become a very exciting part of the Qiang space. Among them, the rich culture and landscape are the important elements that make up the Qiang village. The main Qiang villages include Laomuka Village and Napu Qiang Village.
- (4) *Layout with Guanzhai as the Center.* In ancient times, Guanzhai was used as a symbol of the rights and status of the whole village. As the "spiritual leader" and "spatial symbol" of the entire village, Guanzhai's volume, shape, and structure are superior to those of ordinary dwellings, and its spatial centrality in Qiang village is very obvious. The main Qiang villages include Wa Temple Tusi Guan Village in Hanchuan, Taichang Guan Village in Maoxian County, and Ganbao Sangzi Guan Village in Li County.

3.1.3. Internal Space Composition

(1) *Road.* Under the influence of different cultural conditions and topographical environments, the Qiang villages can be generally divided into two types: a kind of Qiang village is far away from the river and it is located in the middle of the mountain or halfway up the mountain. The layout of village roads in these places is generally mainly based on local topographical conditions. Its main purpose is to be able to easily connect the various spaces together. Therefore, the layout of the roads in the village is highly arbitrary, and it is mainly arranged for the purpose of convenience. The other is close to the villages with obvious natural characteristics,

such as the Qiang villages that are closer to the canals and the Qiang villages that are closer to the mountain ridges. The main and secondary roads of Qiang village in these areas are obvious. The layout of its main roads is based on the environment, or the ridge is the main road, or the canal is the main road. Second, the main road is arranged according to the main road as the center. The main road mainly plays the function of defense and external evacuation, and the secondary road mainly plays the role of connecting the internal space of the village. The main road is like the aorta of the whole village, and the secondary road is like the capillaries of the village connecting the whole village.

Due to the influence of the Han culture and the foundation of the Qiang's own national culture, the road system in the upper reaches of the Minjiang River, where the Qiang people live, presents the following characteristics.

First, the road system is highly developed and the road density is relatively high. Village roads such as Qiangfeng Village, Taoping Qiang Village, and Muka Village present a checkerboard pattern extending in all directions.

Second, the road space is more abundant. Generally, the layout of roads in Qiang villages is mainly based on the consideration of terrain conditions and defense conditions, so roads are arranged in combination with terrain. Under the influence of complex terrain conditions, the local space has great richness. At the same time, for the purpose of defense, it is difficult for ordinary people to get out of the Qiang village after entering. The road space and the surrounding environment form a relatively closed space. In the process of road change, the slope changes from gentle to steep, and the space changes from wide to narrow. It is also affected by structures such as cross-street buildings. When people walk in it, they will have the following experiences: from opening to closing, then from closing to opening, from light to dark, and from dark to light, which gives a very deep impression.

Third, affected by the climate with little rainfall in the arid valleys of the upper reaches of the Minjiang River, the roads in Qiang village are mostly fine sand roads, and a few main roads are paved with slate.

(2) *Water System.* There are two sources of water in traditional Qiang villages. One is the water from alpine forests and other vegetation (mainly the water sources of Qiang villages living in high mountains and semialpine areas), and the other is from rivers (mainly the water sources of the Qiang people living in river valleys). Qiang village introduced water into the village through different measures according to different situations. In Qiangfeng Village and Guozhupu Village, the buildings are arranged on both sides of the natural waterway or near the waterway, which is convenient for water intake and can bring the dirt in the village into the waterway. Taoping Qiang Village established a canal to adjust the amount of water, then led the water into the village through the open and dark canals along the road, and finally flowed into the farmland. Laomukazhai lacks water. It creates a certain drop by intercepting the water source, uses the drop to make the water seep into the ground, emerges under a steep cliff, and then introduces the

underground filtered water into the village. There are also many stockades repairing wells and establishing water intakes. No matter where the water comes from, for the Qiang people living in the upper reaches of the Minjiang River, water is their most valuable asset. Generally, there are important protected areas for water sources, water intakes, and canals. The rural landscape formed by the water system also enriches the regional characteristics of the Qiang people. The upper reaches of the Minjiang River are dry and rainy [15]. Generally, places with water sources will be lush and lush, with birds singing happily and full of vitality, forming a beautiful natural environment. The Qiang people arranged bridges, plants, roads, fences, and pavilions here. Some will also arrange water mills where the water flow is large. The artificial canals are interspersed in the stockade, bright, or dark, which makes the whole stockade full of vitality.

(3) *Internal Open Space*. The traditional Qiang village has less open space. Due to the geographical environment, land is a very important resource for Qiang village. The houses in Qiang village are generally closely connected, in order to occupy as little arable land as possible and use the precious land resources for agricultural production. The Qiang people generally communicate on the bazi or other open spaces outside the Qiang village. In addition, many Qiang villages have roof-connected platforms. It can usually be used as a communication space for the Qiangzhai people. It can be used as a three-dimensional defense system to defend against enemy invasion during wartime and can be used as a drying field for drying crops during harvest.

Taking Taoping Qiang Village as an example, the larger open space of Taoping Laozhai is the Shaiba located on the north side of the Laozhai. It is surrounded by the Qiang Village Museum and the former seat of the village committee. In the past, the main venue for villagers to obtain information from the outside world was also the main venue for ordinary villagers to dance Guozhuang dance, salang, and eat. It basically has no large open space. The roofs of Taoping Qiang Village are connected layer by layer, and it is the main venue for villagers to communicate and dry food. The interface elements are listed in Table 2.

3.1.4. *Agricultural and Forestry Landscape Space*. The Qiang people have a long history. From the beginning of living by the water and grass to the last living by the mountains, it all changes due to the change of the production object. Agriculture and forestry landscape is an important aspect that distinguishes rural landscape from urban landscape and is an important part of constructing rural landscape (Figure 4). The main economic forests in the Qiang area are prickly ash, walnut, tea tree, sumac, pomegranate, and so on. The Qiang people are self-sufficient in agricultural management, and each family has a small area of arable land. The farming methods of small households will objectively cause scattered, messy, and other agricultural landscapes with strong randomness. However, in the area where the Qiang people live, land resources are very precious to them [16]. Therefore, the Qiang people generally transform and arrange the land that

TABLE 2: Interface elements.

Number of interfaces	Interface elements
1	Volume
2	Permeability
3	Surface
4	Distance
5	Form
6	Open

can be used for production, and the farmland is well inlaid on the terrain, which is perfectly integrated with nature. The agricultural landscape form with a certain gap has become a feature of the Qiang rural landscape. For the Qiang people, traditional forestry is generally planted on the hills with steeper hills or improved with the original tree species. It is distributed in clumps or forests around villages and plays a very important role in the rural landscape and environment.

3.2. *Fusion Color Template Space Projection Scientific Computing Algorithm*. Color formula is as follows:

$$\chi = \Xi + \Omega + \Sigma, \quad (1)$$

where Ξ refers to red light, Ω refers to green light, Σ refers to blue light, and “=” means match.

For the quantitative analysis of chromatic aberration, the distance of the chromaticity coordinates in the Euclidean color stereo can be determined by the tristimulus values μ , ν , and ω of the two colors (Figure 5):

$$\Delta\delta = [(\Delta\mu)^2 + (\Delta\nu)^2 + (\Delta\omega)^2]^{0.5}. \quad (2)$$

Spectral chromaticity coordinates are as follows:

$$\begin{aligned} \varepsilon &= \frac{\bar{\Xi}}{\bar{\Xi} + \bar{\Omega} + \bar{\Sigma}}, \\ \varphi &= \frac{\bar{\Omega}}{\bar{\Xi} + \bar{\Omega} + \bar{\Sigma}}, \\ \psi &= \frac{\bar{\Sigma}}{\bar{\Xi} + \bar{\Omega} + \bar{\Sigma}}. \end{aligned} \quad (3)$$

Among them, $\bar{\Xi}$, $\bar{\Omega}$, and $\bar{\Sigma}$ represent the components of the red, green, and blue primary colors required for iso-energy spectral stimulation of each wavelength, respectively.

In addition

$$\varepsilon + \varphi + \psi = 1. \quad (4)$$

It establishes a corresponding relationship model between (μ, ν, ω) and (Ξ, Ω, Σ) , namely,

$$\begin{pmatrix} \mu \\ \nu \\ \omega \end{pmatrix} = \begin{pmatrix} \gamma_1(\Xi, \Omega, \Sigma) \\ \gamma_2(\Xi, \Omega, \Sigma) \\ \gamma_3(\Xi, \Omega, \Sigma) \end{pmatrix}. \quad (5)$$

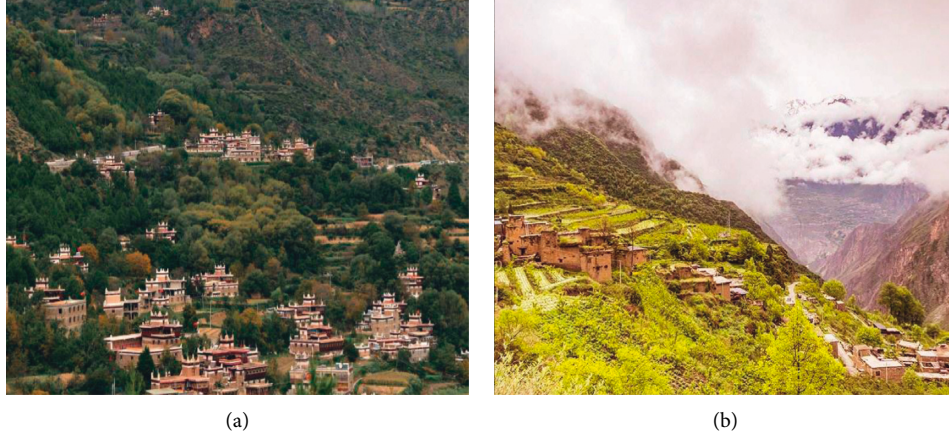


FIGURE 4: Agricultural and forestry landscape of Qiang villages.

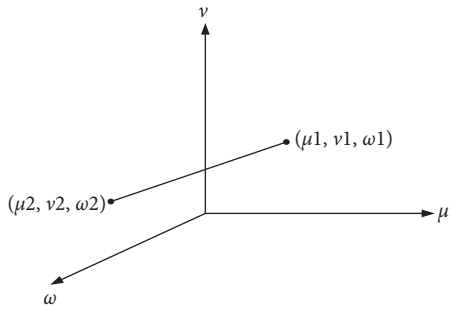


FIGURE 5: Distance of two points in color space.

Curve fitting is obtained as follows:

$$\Pi = \sum_{\sigma=1}^{\xi} [\gamma(\sigma) - \zeta(\sigma)]^2. \quad (6)$$

Among them, ζ is discrete data, and when Π is the smallest, γ is the fitted curve.

It solves the optimization problem:

$$\min \sum_{\sigma=1}^{\psi} \left\| \begin{array}{c} \gamma 1(\Xi, \Omega, \Sigma) - \mu_{\sigma} \\ \gamma 2(\Xi, \Omega, \Sigma) - \nu_{\sigma} \\ \gamma 3(\Xi, \Omega, \Sigma) - \omega_{\sigma} \end{array} \right\|^2. \quad (7)$$

Mental chroma is obtained as follows:

$$\eta_{\kappa\lambda} = [\kappa^2 + \lambda^2]^{1/2}. \quad (8)$$

Mental hue angle is obtained as follows:

$$\omega_{\kappa\lambda} = \frac{180}{\pi} * \tan^{-1}\left(\frac{\lambda}{\kappa}\right). \quad (9)$$

The color difference between two chromaticity values $(\rho_1, \kappa_1, \lambda_1)$ and $(\rho_2, \kappa_2, \lambda_2)$ in the CIELab chromaticity space is as follows:

$$\Delta\delta_{\kappa\lambda} = \sqrt{(\rho_1 - \rho_2)^2 + (\kappa_1 - \kappa_2)^2 + (\lambda_1 - \lambda_2)^2}, \quad (10)$$

$$\Delta\delta_{\gamma} = \left[(\Delta\rho)^2 + (\Delta\eta_{\gamma})^2 + (\Delta\omega_{\gamma})^2 \right]^{1/2}.$$

The gradient at a certain coordinate point (μ, ν) in the continuous function $\zeta(\mu, \nu)$ is as follows:

$$\nabla\zeta(\mu, \nu) = \left[\frac{\partial\zeta}{\partial\mu}, \frac{\partial\zeta}{\partial\nu} \right]. \quad (11)$$

When converting RGB to HSV

$$\Gamma = \begin{cases} \arg \cos \left\{ \frac{(\Xi - \Omega) + (\Xi - \Sigma)}{2\sqrt{(\Xi - \Omega)^2 + (\Xi - \Sigma)(\Omega - \Sigma)}} \right\}, \Sigma \leq \Omega, \\ 2\pi - \left\{ \frac{(\Xi - \Omega) + (\Xi - \Sigma)}{2\sqrt{(\Xi - \Omega)^2 + (\Xi - \Sigma)(\Omega - \Sigma)}} \right\}, \Sigma > \Omega, \end{cases}$$

$$\Lambda = \frac{\max(\Xi, \Omega, \Sigma) - \min(\Xi, \Omega, \Sigma)}{\max(\Xi, \Omega, \Sigma)},$$

$$\Theta = \frac{\max(\Xi, \Omega, \Sigma)}{255}. \quad (12)$$

Image mean filtered pixels are obtained as follows:

$$q(\mu, \nu) = \frac{1}{\tau * \nu} \sum_{\sigma=1}^{\xi} \zeta(\mu, \nu), \quad (13)$$

where $\zeta(\mu, \nu)$ is the image of size $\tau * \nu$ to be processed.

Median filter is obtained as follows:

$$q(\mu, \nu) = \text{median}\{q(\mu, \nu)\}. \quad (14)$$

Ideal low pass filter is obtained as follows:

$$P(\mu, \nu) = \begin{cases} 0, & V(\mu, \nu) > V_0, \\ 1, & V(\mu, \nu) \leq V_0, \end{cases} \quad (15)$$

Among them, V_0 is a decision threshold constant, and $V(\mu, \nu)$ is the distance between point (μ, ν) in the frequency domain and the center line of the frequency matrix.

This study uses the fusion color template space projection scientific computing algorithm to design the overall architecture of the rural landscape. This algorithm has natural advantages in drawing the rural landscape model.

4. Rural Landscape Survey and Design

It uses ArcGIS software to determine and analyze the aggregation of mountain settlements. The results of the settlement distance measurement are shown in Figure 6.

Figure 6 shows that with the expansion of the buffer radius, the number of buffered settlements gradually decreases, but the number of superimposed settlements still increases.

The measurement map at the altitude of the settlement is shown in Figure 7.

Figure 7 shows that the Qiang mountain settlements are mostly distributed in the high mid-mountains. When the altitude is lower than 3000 meters, the settlements become more and more with the height of the altitude, but there is an opposite trend when the altitude exceeds 3000 meters.

The measurement map of the settlement distance from the river is shown in Figure 8.

Figure 8 shows that there are 764 settlements when the river buffer radius is within five hundred meters and 1088 settlements within one kilometer. In addition, the settlements in the mountainous areas of the Qiang people are mostly distributed along the river valleys, and the closer the rivers are, the more obvious the settlements are.

It selected several Qiang villages to issue questionnaires. About 800 questionnaires were distributed, and 673 questionnaires were recovered effectively. The preservation of local culture is shown in Figure 9(a). The preservation of local culture is shown in Figure 9(b).

Figure 9(a) shows that among these respondents, 46% of them choose the natural scenery of the countryside as the most attractive, 24% of the people think that the unique folk traditions of the countryside are very unique and attractive, and 19% of the people think that the rural scenery is very attractive. Compared with cities, the cost of living is low and work pressure is low. About 11% of the people think that the villagers have strong human feelings, harmonious relations, and attractiveness. Figure 9(b) shows that the preservation of traditional handicrafts and festivals is not optimistic. At present, only 23% of handicrafts handed down have remained, and nearly 80% have disappeared or are disappearing. A similar situation occurs with traditional festivals. In addition to major festivals, the disappearance rate of many traditional festivals also accounted for 66%. It can

also be seen from the arrangement of the local traditional weddings and weddings that only 30% of the time remains, while the disappearance and disappearance account for 70%.

The survey results show that there are uneven population distributions in the Qiang villages and the rural landscape needs to be improved. Therefore, the next step is to design and optimize the Qiang rural landscape.

4.1. Qiang Countryside Landscape Design. The framework for constructing the Qiang rural landscape system planning is shown in Figure 10.

Guiding Ideology and Principles. According to the different requirements of the Qiang villages, the different natural environment of the Qiang villages, and the historical and cultural characteristics of the Qiang villages, they determine the guiding ideology of the village landscape planning and design and the principles of landscape planning and design. Due to the different geographical conditions, social economy, and cultural resources of Qiang villages, the rural landscape planning and design of the villages should be carried out according to the actual conditions of each village. Through the establishment of guiding ideology and planning and design principles, it controls the planning and design methods and design principles that should be followed in the Qiang rural landscape from a macro perspective.

Excavation of Qiang Village Resources and Analysis of Development Problems. Many Qiang villages have a history of thousands of years. In these thousands of years of history, a wealth of material and intangible cultural heritage has been formed, which is the precious historical wealth of the Qiang nationality and an important resource for the planning of the regional rural landscape of the Qiang nationality. Before specific planning, he systematically sorted out the internal resources of Qiang villages through interviews, literature review, and other methods. It fully taps the regional cultural resources of the Qiang rural landscape, which will serve as the basis for the planning and design of the Qiang rural landscape in the future [17]. Through on-the-spot investigation, interviews with local residents and tourists, etc., it analyzes the problems existing in the development of the rural landscape of Qiang villages. It summarizes the existing problems and reflects the solutions in future planning and design.

The Qiang architectural decoration is listed in Table 3.

Identify Planning Features. Determining the planning characteristics of Qiang villages according to the natural and human resources characteristics of Qiang villages is of great significance for Qiang rural landscape planning. For Qiang villages, they have some common Qiang characteristics. But for each Qiang village, it also has its own characteristics that are different from other Qiang villages. In the process of specific planning and investigation of Qiang villages, it excavated and analyzed the natural environment and human resources of Qiang villages. It finds out the outstanding characteristics of these Qiang villages and fully expresses and

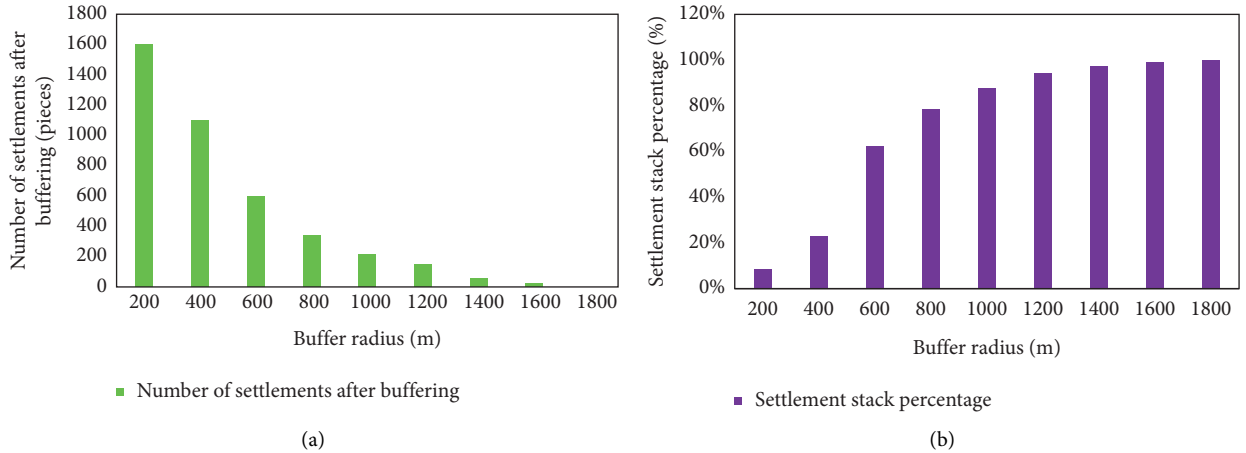


FIGURE 6: Settlement spacing measurement results.

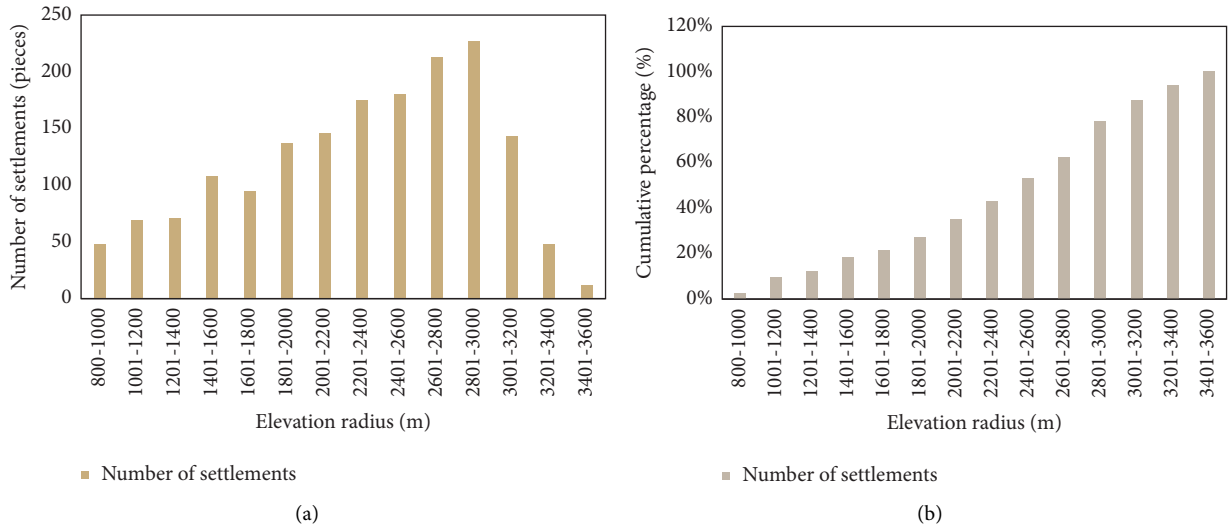


FIGURE 7: Measured map at the altitude of the settlement.

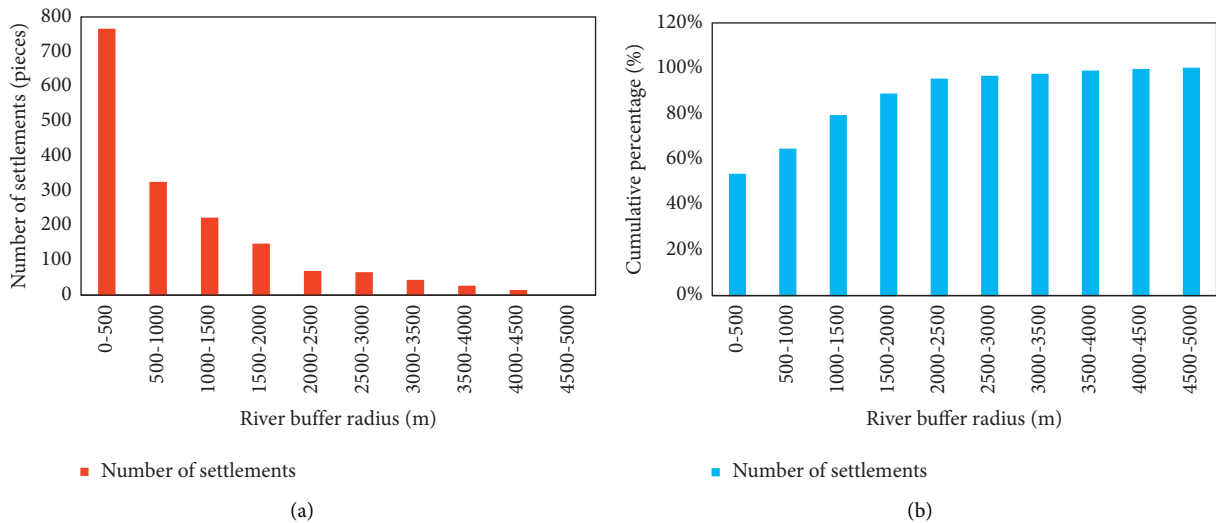


FIGURE 8: Measurement map of settlements from rivers.

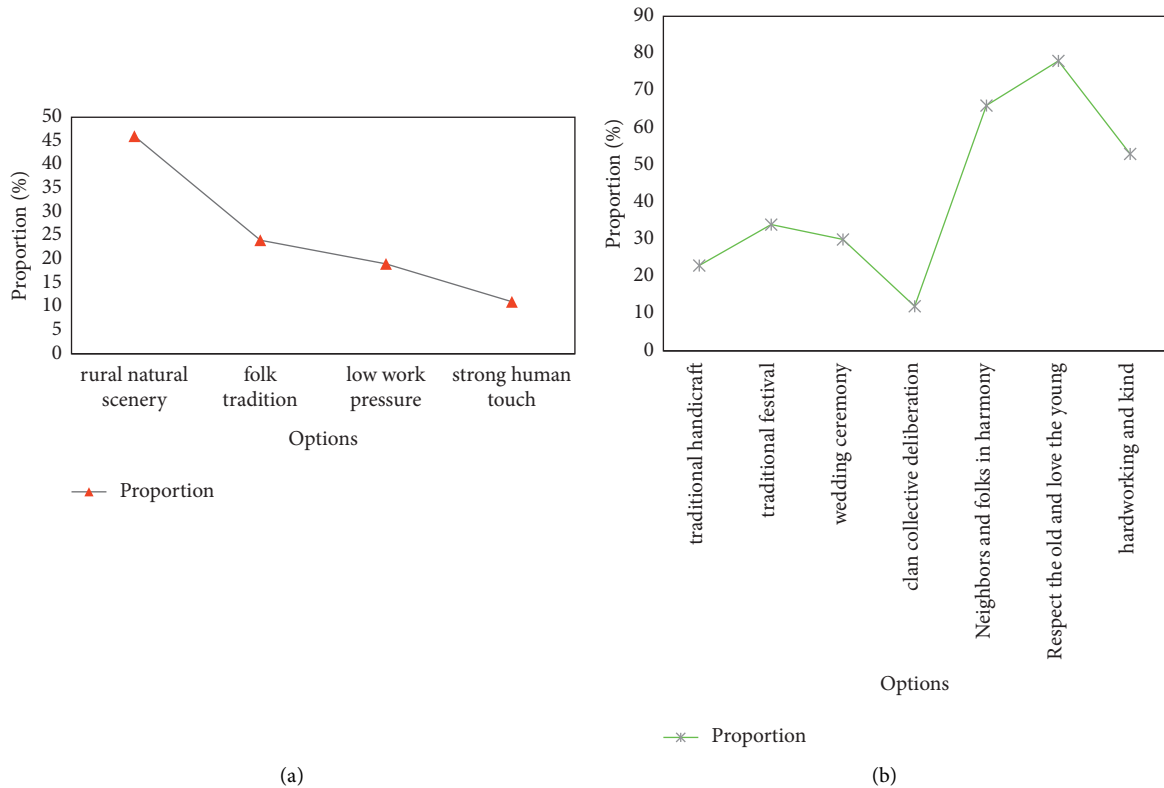


FIGURE 9: Survey questionnaire results.

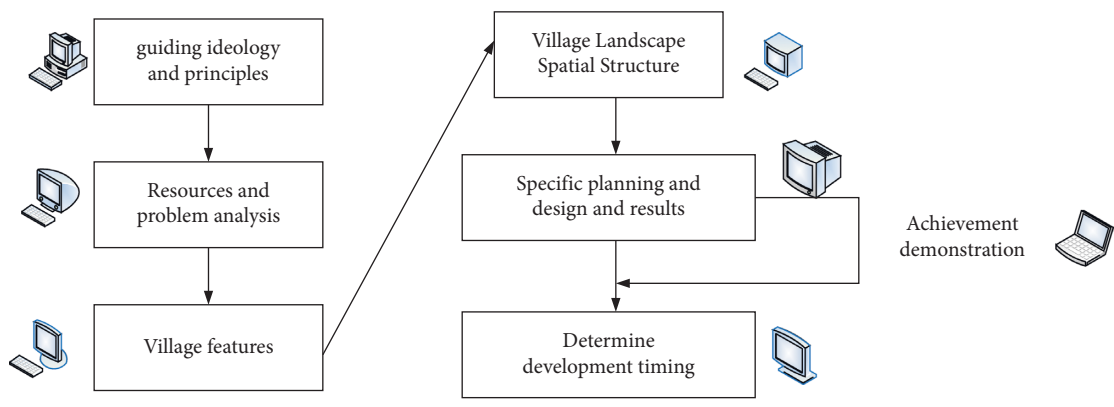


FIGURE 10: Construction of Qiang rural landscape system planning.

TABLE 3: Qiang architectural decoration.

Number of decorations	Decoration type
1	Door
2	Window
3	Le color
4	Shiraishi
5	Shi Gandang
6	Pattern

highlights these Qiang characteristics in the planning. This is of great significance to the rural landscape characteristics of Qiang villages.

Landscape Spatial Structure. According to the survey, land use conditions, topographic conditions, distribution of important landscape elements, etc. of Qiang villages, they determine the spatial structure of Qiang village landscape. It plans the functional zoning of Qiang villages and determines the landscape axis in the overall space. Based on the landscape axis, it also arranges the tourism resources of Qiang villages. It determines the spatial sequence of landscape nodes in Qiang villages. The sequence effects of different stages are listed in Table 4.

Specific Planning and Design. According to the overall structural space planning of the Qiang rural landscape, it

TABLE 4: Sequence effects at different stages.

Number of stages	Stage	Effect
1	Initial stage	Iconic spaces or entities that stand out visually, such as gates
2	Transitional phase	Repeatedly strengthen the space atmosphere with the level of space and the design form of space
3	Orgasm	This is the focus and purpose of the design of the space sequence, and it is for people to achieve resonance
4	End stage	Redirect people's sight as the outer space, and the mood is calm

plans and designs the vertical design, transportation, greening, electricity, water supply, and drainage of the Qiang rural landscape. It carries out specific planning and design for important landscape nodes of rural landscape (such as entrance space, central landscape, main street landscape, and reconstruction of main nodes), and design for landscape sketches.

4.2. Landscape Function Zoning Planning with Regional Characteristics. The biggest difference between rural landscape and urban landscape is the difference between the natural environment and agricultural landscape. Water, mountains, plants, and land in the landscape are important elements of the rural landscape with a local flavor. This requires us to maintain the original ecological characteristics of the geographical environment to the greatest extent in the design of rural landscapes. Country houses and other man-made environments are merely embellishments of the country Earth. The Qiang settlements in the upper reaches of the Minjiang River have continued their farming culture for thousands of years [18]. The regional cultural landscape reveals the shadow of farming culture. Therefore, in the planning, we should start from maintaining the authenticity of farming culture and combine it with the agricultural industry. For example, in the site design, the drying field with agricultural characteristics, the buildings, landscapes, greening, and ancient trees with the iconic characteristics of the village should be based on the scale of the rural landscape, so that people can feel the atmosphere of the countryside.

A productive landscape is an important distinction between urban and rural landscapes. The Qiang people in the upper reaches of the Minjiang River are ethnic groups with a traditional farming culture. Many Qiang landscapes have important connections with rural landscapes. In the planning and design of Qiang rural landscape, it focuses on the design of productive landscape. This is very important for the construction of the Qiang rural landscape. The creation of productive landscapes for the Qiang people not only contributes to the improvement of the rural living environment but also can be combined with industrial planning. It promotes the development of agricultural industries through agricultural productive landscape planning, which is also consistent with national policies such as all-for-one tourism. The agricultural landscape area can provide tourists with functions such as farming cultural experience, agricultural landscape sightseeing, and farming history learning.

4.3. Establish a Continuous Landscape Spatial Structure. Because the construction of Qiang villages is mostly for defensive purposes, the complex layout of street spaces can limit the movement of the enemy after entering the village. However, in the modern rural landscape design, this kind of complex street system is not conducive to the display of the village landscape. Tourists walk in it without a clear sense of direction. This subjective consciousness caused the scattered landscape and destroyed the expression of the overall continuity of the rural landscape.

4.4. Highlight the Design of Important Landscape Nodes. The entrance space of the village is the entrance of the village, which is an important node of the rural landscape. It has an immeasurable role in shaping the overall image of the Qiang village and in expressing the overall spatial structure. The entrance space of the village is a concentrated expression of the regional culture of the Qiang village, and it is an entry point for tourists to understand the village culture. From the perspective of the entire spatial sequence, the village space plays an important role in attracting scenery. The appropriate planning and design of the entrance space have a strong sense of substitution, which can arouse tourists' curiosity, expectation, excitement, and other emotions. In the design of the entrance space of the Qiang village, it mainly includes two aspects: the sequence of the entrance space of the village and the elements of the village space. The components of the entrance space are listed in Table 5.

The Central Landscape Design Showing the Cultural Characteristics of the Village. The unique regional culture of the Qiang people has formed its own unique village layout characteristics. The characteristic of Qiang village is that built along the mountain and extends along the mountain. The shape and layout of the Qiang village conform to the undulating terrain. The ingenious changes in the spatial characteristics of Qiang village are formed by its unique squares, water systems, buildings, and other elements. The layout of the Qiang people has the characteristics of centrality. The central space is an important public space of the Qiang village, and it is also an important landscape node of the Qiang people, which embodies the regional characteristics of the Qiang village. In the planning and design of the landscape, the centrality of the Qiang people can be strengthened according to the centrality characteristics of the Qiang people. Its landscape design is based on different central characteristics as follows:

TABLE 5: Components of the entrance space.

Number of elements	Components of the entrance space
1	Architecture
2	Sketch
3	Vegetation
4	Terrain
5	Water body
6	Paving

- (1) *The Design of the Central Landscape of the Square.* The Qiang people have many festivals, among which the main ones are the Mountain Festival, Waer's Foot, and the Qiang New Year's Day. These festivals contain many folk activities, which require a certain space for activities. On the one hand, the design of the Qiang Square as the center of the landscape can provide a venue for the activities of the residents inside the Qiang village, and on the other hand, it also provides a space for the external display of the Qiang culture and a certain resting place for tourists. The planning and design of the Qiang Nationality Square should be mainly based on the expression of the regional culture of the Qiang Nationality.
- (2) *The Design of the Landscape Centering on the Watchtower.* Architecture is a very representative art form in the characteristic culture of the Qiang people, especially the watchtowers and official watchtowers of the Qiang people. For defense purposes, many Qiang villages are arranged with watchtowers as the center. Diaolou is generally located in the center of the whole village or an important geographical location and has the momentum of commanding the overall situation. This is also the embodiment of Qiang's superb construction skills. Diaolou is more than ten meters in height and has a symbolic role in the entire village. The symbolic meaning of modern Qiang Diaolou architecture is greater than its practical value and is more of a symbol at the spiritual level.
- (3) *Design of Water-Centered Landscape.* Qiang villages are mostly built on high mountains. The Qiang area is densely forested and rich in water resources. The water system occupies a very important position in Qiang villages and is an important resource for life. Many buildings, greenery, roads, and villages of the Qiang people are built around the water system. The main landscape nodes of the traditional Qiang village water system include water outlets, water intakes, and water distribution outlets. There are water mills and other buildings upstream of the canal. In modern rural landscape planning, central landscape design can be carried out with water as the center. Plazas, service centers, commercial buildings, residential buildings, etc. are set up around it to provide tourists with a vibrant natural landscape space, which makes the entire village space full of vitality. Water-centered landscape design should mainly

consider: water landscaping and integration with other elements.

5. Discussion

The Qiang people have a long history and culture and have accumulated rich cultural resources in the development of thousands of years. Under the influence of rapid social development and national policies, the traditional way of life and production of the Qiang people is undergoing great changes. The way of life and production of the Qiang people are developing in the direction of modernization. The change of production and lifestyle has brought changes to the rural landscape of the Qiang people. The traditional regional and cultural features of the Qiang rural landscape are gradually fading. With the rise of the tourism industry in the Qiang area, some villages have carried out the transformation of the rural landscape for the purpose of tourism. However, due to the lack of professional and systematic planning for the rural landscape of the Qiang people, the rural landscape of the Qiang people still faces many problems.

We start from the generative environment of the Qiang rural landscape. During the research process, a large amount of literature review was carried out in this study. It successively conducted field research on Taoping Qiang Village, Ruiping Village, Muka Qiang Village, Longxing Qiang Village, Jina Qiang Village, etc., and obtained a large number of photos and textual materials. The Qiang people are rich in natural and cultural resources. After more than ten years of development, Qiang tourism has gradually formed a certain scale. Nowadays, more and more villages of the Qiang people take tourism as their industry. Taoping Qiang Village, Heihu Village, Baishi Qiang Village, and Ruipu Village have initially formed a certain scale. The regional culture of the Qiang nationality is an important support for the development of the tourism industry of the Qiang nationality. The rural landscape design of the Qiang people must also be based on the development of tourism in order to have practical significance. When separated from the regional culture of the Qiang nationality, the development of rural landscape planning will be greatly restricted. Based on the regional culture of the Qiang nationality, this study discusses the planning and design of the rural landscape of the Qiang nationality. According to the problems existing in the development of Qiang rural landscape, relevant research strategies are put forward.

The algorithm used in this study combines the color algorithm and the spatial projection algorithm. The respective advantages are extracted from the two algorithms and used in this research, so that this research can be carried out smoothly.

6. Conclusion

It starts from the connotation and elements of the regional culture of the Qiang nationality. It analyzes the effect of the cultural connotation and cultural elements of the Qiang nationality on the rural landscape of the Qiang nationality

and the influence of the rural landscape of the Qiang nationality on the development of the regional culture of the Qiang nationality in its development. It has obtained the importance of the regional culture-led Qiang rural landscape planning for the development of the Qiang rural landscape and the development of the regional culture of the Qiang nationality. For the problems faced in the development of the Qiang rural landscape, it analyzes the role of the regional culture of the Qiang nationality in the rural landscape of the Qiang nationality. This study analyzes the main content of the Qiang rural landscape, which is greatly influenced by the regional culture of the Qiang nationality, and the planning and design elements that affect these Qiang rural landscapes. It starts from the problem and combines the theory of modern landscape planning and design. It is based on the expression of regional culture. In order to solve the difficulties faced in the development of the Qiang rural landscape, it proposes to construct the Qiang rural landscape planning system, plan the landscape function division of regional characteristics, establish a continuous landscape space structure, highlight the design of important landscape nodes, strengthen the regional cultural characteristics of the building, and enrich the landscape sketch design and other specific planning and design strategies. Because the distribution of Qiang villages is relatively scattered, the cultural characteristics formed are also relatively various. The regional culture and rural landscape features of the Qiang ethnic group, which are unique but have little social influence, have yet to be excavated. It is necessary to further research and summarize the changes and trends of the regional characteristics of the Qiang people in the current stage of the Qiang people in the face of different social environments. This is still a relatively difficult task.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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