Open Access Library Journal
2023, Volume 10, e9710
ISSN Online: 2333-9721
ISSN Print: 2333-9705

Study on Environmental Adaptability of Traditional Tibetan Dwellings in Malkang Jiarong under the Background of Rural Revitalization

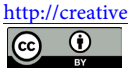
Fang Xu, Yanmei Liu*

School of Architecture, Southwest Minzu University, Chengdu, China
Email: *2076347632@qq.com

How to cite this paper: Xu, F. and Liu, Y.M. (2023) Study on Environmental Adaptability of Traditional Tibetan Dwellings in Malkang Jiarong under the Background of Rural Revitalization. *Open Access Library Journal*, **10**: e9710.
https://doi.org/10.4236/oalib.1109710

Received: December 26, 2022
Accepted: January 17, 2023
Published: January 20, 2023

Copyright © 2023 by author(s) and Open Access Library Inc.
This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).
http://creativecommons.org/licenses/by/4.0/



Open Access

Abstract

Malkang area is the core of Jiarong Tibetan culture with unique ethnic culture and regional ethnic architecture. But with the continuous development of The Times, the traditional folk houses in this area gradually cannot meet the needs of people for production and life. Under the background of rural revitalization, this paper analyzes the adaptability of traditional Tibetan dwellings of Malkang Jiarong to the natural, social and national cultural environment from the two aspects of residential settlements and individual buildings, and tries to put forward a sustainable development strategy that conforms to the modern production and life style, adapts to the local natural, social and national culture, and can continue the traditional construction wisdom. In order to provide the basis for rural revitalization and residential renovation in Malkang Jiarong Tibetan area.

Subject Areas

Architecture

Keywords

Rural Revitalization, Jiarong Tibetans, Traditional Dwellings, Adaptation

1. Background

Rural revitalization is not only about revitalizing rural economy, but also about revitalizing rural spirit and culture, and revitalizing rural ecological environment. Traditional dwellings are the spiritual and material wealth created by hu-

man beings in adapting to environmental changes. They are not only the carrier of human culture, spiritual sustains and embodiment of human adaptation strategies, but also an important part of human living environment, constituting the material space for people to survive and playing an important role in the process of rural revitalization.

As a branch of Tibetan nationality, Jiarong Tibetans are mainly distributed in Jinchuan River basin and the banks of Dadu River to the west of Qionglai Mountain. Besides, they also exist in Lixian County to the east of Qionglai Mountain, Wenchuan County and Baoxing, Tianquan, Kangding, Daofu and other places to the southeast of Qionglai Mountain. In addition, Liangshan Yi Autonomous Prefecture Muli Tibetan Autonomous County also has a small amount of distribution [1]. Nowadays, the core distribution area of Jiarong Tibetans is Jinchuan, Xiaojin, Malkang, Lixian, Heishui, Wenchuan, Danba County, Ganzi Prefecture and other places in Aba Prefecture [2]. Malkang is the cultural heart of Jiarong Tibetans in Aba Prefecture, which is typical and representative of the study of Jiarong Tibetan traditional dwellings in Aba Prefecture.

Traditional Tibetan dwellings in Malkang Jiarong are the result of environmental selection and the embodiment of long-term adaptation to the environment. They not only have ecological advantages such as resource-saving, ecological environment protection, robustness and durability, but also have good characteristics of sustainable development. Therefore, in the face of such problems as the loss of traditional construction skills and the loss of ecological wisdom, it is of great theoretical significance to explore the adaptability of traditional Tibetan dwellings of Malkang Jiarong to the natural environment, social environment and unique national cultural environment, and to excavate the cultural connotation of traditional Tibetan dwellings of Jiarong. It is of far-reaching practical significance to promote the protection and future development and construction of traditional folk houses, explore the path suitable for the sustainable development of traditional folk houses in this region, and guide the rural revitalization, renewal and transformation of folk houses and improvement of people's living conditions in Malkang Jiarong Tibetan area.

2. Analysis of Natural Environment Adaptability

Natural environment has a profound impact on the construction of residential buildings. Terrain, landform and climate are the main factors influencing the adaptation of residential buildings to natural environment, which have great constraints on settlement site selection, settlement form, residential site selection and spatial layout.

2.1. Adaptation of Folk Dwellings to Topography and Landform

1) Settlement Location

Through field investigation of traditional villages in Malkang, the site selection of villages was analyzed according to different landforms and landforms,

and they were divided into river-side layout type, hillside gentle slope type and hilltop type.

The folk dwellings with a layout along the river have abundant water resources and the flat land near the river bank is generally reserved for cultivation, while the folk dwellings were built at the foot of the mountain with their back to the mountain. When residential settlements are located at the bend of the river, most of them give priority to the convex bank, namely the inner bend of the river, because the convex bank will continuously accumulate a large amount of sediment, and the land here is fertile and conducive to safety, which is not easy to be eroded by water. While the concave bank is constantly scoured by the river, the sediment will be eroded, which is prone to flood disasters [3].

Hillside settlements with gentle slopes are located on the slopes of relatively gentle terrain and have a certain distance from the river at the foot of the mountains, but they can meet the basic domestic water supply. The dwellings are arranged in accordance with the contour line according to the terrain. The foot of the mountain is mostly flat, close to the river, suitable for cultivation, so as cultivated land. The settlement is a certain distance away from the main traffic road, and the branch road connects the village with the main traffic road outside. Sermi Village is a typical site selection (**Table 1**).

The other is hilltop settlement site selection. This type of dwelling is basically on the flat, but some dwellings have staggered heights and certain height differences due to different elevation differences in the terrain. Such site selection is generally on the open site, winding to the hilltop settlement through the zigzag road, for example, Galan Village of Dangba Township (**Table 1**).

From the analysis of traditional villages with different siting types, it can be seen that the dwellings are either laid out along the river, on the gentle slope, or on the open land at the top of the mountain. In short, the purpose is to better facilitate production and life, make better use of nature, conform to nature, and try not to destroy the original ecological environment.

2) Settlement Pattern

Affected by terrain, settlements have different siting types, and their layout forms are also very different according to different siting. According to the tightness of the distribution of residential buildings within the settlements, the settlement forms are divided into compact type and free and loose type (**Table 1**).

a) Compact Type

General layout along the river and hillside gentle slope settlements compact layout, intensive housing. Villages along the river have abundant water and fertile land. Hillside dwellings generally cultivate the flat land near the river bank and build houses on the slope below the foot of the hill. The land resources of the two types of residential settlements are relatively limited, so the layout is compact and the houses are dense.

b) Free Loose Type

Hilltop settlements generally have open sites, and the layout of residential buildings is free and loose. Each residential building is surrounded by corresponding

Table 1. Analysis of settlement morphology.

Settlement pattern	Siting type	Case	Village name
Compact type	River layout type		Zhibo Village
	Hillside gentle slope type		Sermi Village
Free loose type	Hilltop type		Galan Village

Source of the picture: the author shot.

land. This type of site selection has more land and better environment.

3) Location of Residential Buildings

The traditional dwellings of Jiarong Tibetan people in Malkang area carry out site selection and layout along the contour line parallel, vertical or deflection to a certain Angle according to different slopes. According to the mountain situation and local conditions, the dwellings are free and flexible and extend layer by layer, integrating with the natural geographical environment, so as to make the buildings adapt to the terrain as much as possible, avoid damaging the ecological environment as much as possible, and establish a systematic concept of sustainable development of traditional dwellings.

After the siting of residential buildings, the treatment of the terrain depends on different slopes and types of terrain. Different slopes and types of terrain adopt different ways to treat the foundation.

If the foundation is located on flat ground, it is only necessary to remove the soft soil on the surface, and the soil can be built when it is hard. The site is located in a place with a gentle slope. During construction, horizontal arrangement is generally made parallel to the contour line, and excavation is adopted to level the foundation to adapt to the gentle slope. Vertical contour lines are usually adopted for those with large terrain gradient. By making full use of limited homestead and using slope as the base, earthwork excavation and backfilling are reduced. During construction, the topographic height difference is decomposed into each building layer [4], and different layers are located on different steps to flexibly adapt to the changes of contour lines. This layout feature is typical of making full use of the topographic height difference. While saving cultivated land, it reduces the excavation, transfer and dumping of earth, minimizes the damage to the local ecological environment caused by construction activities, and reflects the respect for the natural environment [5].

As the foundation of some residential buildings is located on the high steps, there is a certain height difference between the courtyard and the road, which is easy to collapse. Therefore, local stones are used to build the platform, and the stones are laid layer by layer from the next step to the level with the foundation of the building, as shown in **Figure 1**, and then the houses are built on the top. In this type of construction, less earth is dug, but more stone is consumed. The foundation is strong and not easy to sink, and the steps are not easy to collapse.

2.2. Adaptability of Folk Dwellings to Climate

Through years of experience, people have formed a set of living system adapted to the harsh climate environment of the local traditional dwellings. The embodiment of residential buildings to adapt to the climate mainly lies in site selection, vertical layout, building materials, and so on. In the location of the site to choose convenient production and life and good sunlight; Material, structure to consider energy saving, give full play to the wall, floor, roof of heat insulation ventilation performance [6].

Figure 1. Masonry platform (source of the picture: the author shot).

The overall functional layout of the residence also reflects the wisdom of the residents to adapt to the local climate. In the traditional vertical spatial layout, the bottom floor is used for keeping livestock, the bottom floor is cold and humid, the space is small, and the height of the floor is low, which is not suitable for living. The third floor or the top floor is arranged with the sutras, lamas' houses, and the retreating sun dam for stacking and drying grain or crops. People live on the second floor or the middle floor, which is the warmest place in the whole residence. The kitchen is equipped with a fire pool, and the heat of cooking and burning will be distributed to the whole room. Now the fire pool has disappeared and been replaced by a stove. Traditional local dwellings are built with stone as the room, and stone is the main building material, which has thermal delay and thick walls, so indoor heat is not easy to escape, and it is easier to keep heat insulation. During the day, the sun shines; the wall absorbs heat and releases it inward at night, which can provide indoor heating in winter. At the same time, the stone also has the characteristics of low heat transfer coefficient and high thermal resistance, so the heat is not easy to enter the indoor in summer, so that the indoor residential buildings warm in winter and cool in summer. This spatial composition based on the physical properties of the building effectively increases the thermal stability of the interior [7].

People use the existing resources to overcome the harsh cold climate conditions. From the perspective of vertical layout, people are placed in the middle layer to prevent wind and cold (Figure 2), which reflects people's survival wisdom

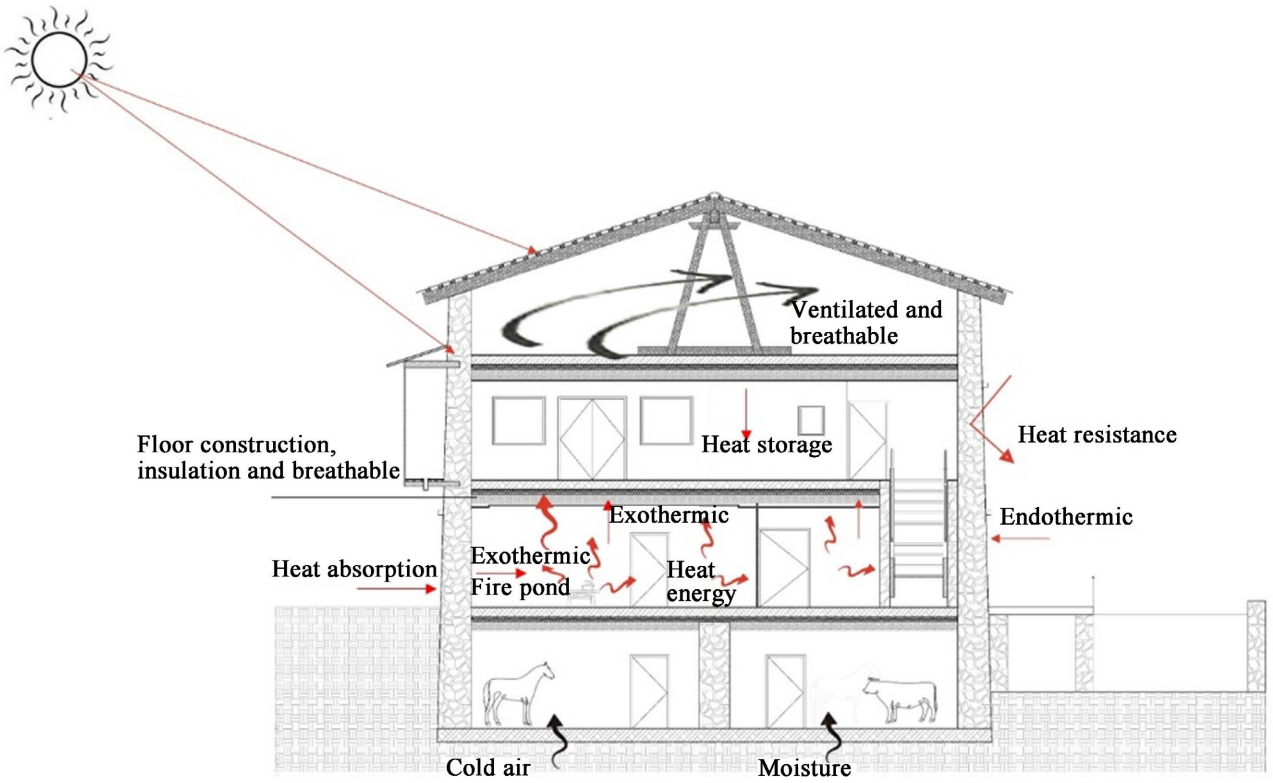


Figure 2. Vertical spatial layout (source of the picture: owner-drawing).

in adapting to the local climate environment.

3. Analysis of Adaptability to Social Environment

Society is a collection of people and a place for people to live and live. As the carrier of social culture, folk dwellings reflect the social forms, lifestyles, economic levels and construction levels of people in different periods [8].

In different social backgrounds, people have different needs for the living environment, and different safety needs have been produced under different backgrounds. Social changes will also lead to the change of people's ideas, which will lead to the change of family structure. The changes under the level of economic development also have a profound impact on the construction methods and materials, decoration, living space pattern and energy utilization of residential buildings.

3.1. Adaptation of Residential Buildings to Safety Requirements

Malkang area is located at the junction of Han and Tibet and is an important passage of Tibetan-Yi corridor. Before the liberation of Aba, wars were frequent in this area and bandits were rampant. Since ancient times, conflicts and conflicts were often caused between ethnic groups due to the limited grasslands and water sources, so the site selection, layout form and architectural structure of residential dwellings showed strong defensive consciousness.

1) Settlement location and layout

In the past, Tusi was in power in Malkang area. Due to the competition among Tusi villages, wars often occurred. Therefore, defensive and safety were taken into account in the location of settlements.

The settlement site is generally located on the top of the hill, the gentle hillside platform or along the river layout. The settlement on the top of the mountain is relatively hidden, so it can monitor the dynamics of the enemy while ensuring its own safety, which is conducive to preventing enemy invasion. It is easy to defend and difficult to attack, with high defensiveness, and relatively safe. Chunkou Village in Dazang Township is a typical highland Tibetan Village on the top of the mountain. On the other hand, the settlements on the mountainside were more secluded and easy to observe the enemy, while the settlements along the river were more convenient for production and living and took the river as the defensive border, which was difficult for the enemy to cross.

Most of the settlements are clustered together in layout. In the early stage of human society, the productivity was low and the population was small. In order to fight against natural disasters, birds of prey and evil beasts, and the harassment of enemies, people needed the aggregation of strength and wisdom, so they needed to adopt the form of gathering, mass gathering, and gathering and close living. As a Tibetan proverb goes, "When a thief steals a single household, a Wolf finds a lone sheep" [9]. Until today, except for individual dwellings built independently on the mountain (**Figure 3**), others are clustered together, some

three or five households, some more than ten households as a whole, and many dozens of households gather together to form a "group", which is closely distributed and gathered together as far as possible (Figure 4), so as to establish physical and material space defense.

2) Structure of Folk Houses

a) Single Wooden Ladder

There were frequent wars in the Malkang area during the period of the Tusi administration. The wooden ladder in the local dwellings was extremely steep and narrow, allowing only one person to pass through (Figure 5). It could not

Figure 3. Freestanding dwellings (source of the picture: the author shot).

Figure 4. Residential settlement (source of the picture: the author shot).

Figure 5. Single wooden ladder (source of the picture: the author shot).

only organize vertical traffic inside, but also quickly withdraw from the upper floor and defend the upper floor in case of enemy attack, thus cutting off the way for the enemy to enter the room and thus play a defensive role [10].

b) Window

The smallest window is only 300 mm wide and 600 mm high. The size of the window varies from position to position. The storage room is small, while the main room is relatively large. However, there are only ventilation and breathable air holes on the ground floor of residential buildings. Air holes are distinctive. They are large inside and small outside in a funnel-shaped shape (**Figure 6**). Small outside the window is conducive to anti-theft, large inside is conducive to daylighting, and the masonry is also very particular, the large stone inside, small stone outside, if the size of the stone is different, the same large end put inside the small end put outside, which is conducive to security defense, prevent thieves from outside the hole will take the stone steal property.

The effect of opening small Windows on anti-theft and enemy defense is greater than the effect of lighting, which reflects the unique survival wisdom in the social background at that time.

3.2. The Adaptation of Residence to Family Structure

Family is the basic unit of social life, but also the basic force of social life change. Therefore, there must be corresponding spatial form to adapt to it. On the one hand, the change of family structure and function is the inevitable result of social development. On the other hand, it is also one of the main driving forces of social progress [11].

Traditional Malkang Jiarong Tibetan families pursue more children and more happiness, and their children do not separate their families. In terms of life style, they mainly live in large families. In daily life, emphasis is placed on the family as a unit of group life. The traditional family structure is mostly in the children, grandchildren family model, there are several child families. There are a large number of families, most of which are more than 10. The order of elders and children is clear, and the elders are the core and live together. In this family structure mode, the living space of folk houses is relatively compact.

Figure 6. Window (source of the picture: the author shot).

After the children get married, the family structure changes and the population increases. The original space is no longer satisfied with the demands of production and living. Therefore, the building area is increased by building more floors or building new space beside the original main building.

3.3. The Adaptation of Residential Buildings to the Level of Economic Development

With the development of economy and the influence of global integration, the architectural form of traditional dwellings in Marcon will be more or less affected. On the one hand, with the development of economy, the use of new materials also makes a new difference in the building structure, which is mainly reflected in the use of cement and steel and other building materials. On the other hand, the change of life style leads to the adjustment and change of traditional residential building function.

1) Construction Methods and Materials

People's methods of building construction and the selection of materials are constantly changing with the development of economy and technology and the passage of time. From the stone and wood buildings built in Sermi Village in the Qing Dynasty (Figure 7), it can be seen that local stone pieces, yellow mud, wood and other materials were used in the initial construction, and the traditional way of building stone pieces together and dividing walls was adopted. With the advent of cement, some residents' household income increased and they had the economic ability to buy cement. Thus, cement appeared in the materials used in the construction of residential buildings.

Most of the new residential buildings are not built in accordance with the original traditional construction techniques, nor are they built with the original stone and wood materials. Instead, they are built with brick, cement and reinforcement as the main materials, and reinforced concrete and other building materials completely replace the former stone and yellow mud.

Figure 7. Stone and wood buildings built in the Qing Dynasty in Sermi Village (source of the picture: the author shot).

2) Decorate

With the development of economy and the improvement of life quality, people pay more attention to the pursuit of spirit, and the interior decoration of folk houses is more luxurious and rich than before. But there are differences in the decoration style, forming a different type. There are Chinese style, Tibetan style and Chinese-Tibetan combination type. At present, most of the interior decoration is a combination of Tibetan and Chinese style. The traditional national characteristics are mainly reflected in the sutra hall, niche, and bed, especially the sutra hall, no matter what time is the most luxurious and exquisite place in the home decoration.

For the dwellings with Tibetan decoration style, some families with better economy will invest a large amount of money in the interior decoration, and the interior furniture decoration is more abundant, more refined and more diverse. The walls, ceilings, Tibetan tables and Tibetan beds are all painted with thangka, and the niches are beautifully carved, such as the interior decoration of "Ruobu" residence in Zhibo Village (Figure 8).

3) Kitchen Space

In the past, the life style was relatively simple, and the kitchen was often the embodiment of family cohesion. As the core living space of the whole folk house, it integrated the functions of bedroom, kitchen and living room, so the space was large and could accommodate many people. Now, due to the development of economy and the improvement of people's living quality, the original one-room multi-purpose main room mode has gradually been separated from its multiple functions, forming a single function of the living room, bedroom, kitchen, etc. In today's Tibetan central kitchen, it also plays the role of the traditional family core and is a place where family members gather. However, the kitchen has become more modern, with more complete supporting facilities and more independent functions, and it begins to use range hoods, gas stoves, rice cookers and induction stoves. These changes are not only influenced by foreign cultures, but also reflect the improvement of economic strength.

4. Analysis of Adaptability of National Culture

Religious belief is an important part of national culture, and its influence on the architectural form of residential buildings is reflected in all aspects, including

Figure 8. "Ruobu" residence interior decoration (source of the picture: the author shot).

settlement organization, the orientation of the courtyard door of residential buildings, and so on.

1) Settlement Organization

In addition to satisfying the natural environment as far as possible, the Tibetan site selection will invite the highly respected monks in the monastery to point out the most appropriate location and orientation according to the Buddhist classics and books, combined with the situation on the ground and considering various factors comprehensively. The head of the household considers the lama's advice and communicates with experienced elders and artisans before making a final decision [2].

Most Tibetan settlements have temples or Tusi's manor in the center or high places, and the residential buildings are arranged around the temples or Tusi's manor. Almost every village has a temple, and some neighboring villages have a common temple to meet the needs of worship.

2) The Orientation of the Courtyard Door

Tibetans believe that buildings facing the sacred mountain or the gate facing the sacred mountain can directly usher in the blessing of the sacred mountain [12]. The sacred mountain that local people worship is located in the east of the village, where the sun rises in the east. The east is an auspicious position [10]. In order to face the sacred mountain, it is better to Orient the courtyard gate and the mulberry burning stove towards the east.

5. Summarize

The environment changes dynamically, and folk dwellings are the result of environmental selection. The development and change of folk dwellings is a process of constantly adapting to the environment, transforming the environment and creating the environment, which is the embodiment of human construction wisdom. The traditional dwellings of Jiarong Tibetan people in Malkang area have constantly adapted to the changing environment in terms of settlement site selection, functional structure, spatial layout and energy utilization, and have accumulated rich construction wisdom and adaptive strategies, which are worthy of reference and reference in the construction of modern dwellings. Therefore, under the background of rural revitalization, it is necessary to make full use of local resources, develop appropriate construction techniques, and explore a path suitable for the sustainable development of traditional residential buildings in this region, so that the traditional Tibetan residential forms and construction wisdom of Malkang Jiarong can be better carried forward and inherited in modern residential buildings. In order to guide the revitalization of rural areas in Malkang Jiarong Tibetan areas, residential renovation and improvement of people's living conditions.

Acknowledgements

Thanks to the teachers who gave guidance in the whole process and the students

who did the research together, and thanks to all the warm-hearted people who helped in the process of research.

Project Fund

The research work of this paper is supported by the "Innovative Research Project" of 2022 Graduate students of Southwest Minzu University (Project No. YB2022298) and the Sichuan Soft Science Research Program (Project No. 2021JDR0098).

Supported by the 2022 graduate "Innovative Research Project" of Southwest Minzu University and the Sichuan Soft Science Research Program, this paper systematically integrated the innovative research on the adaptability of traditional Tibetan dwellings in Malkang Jiarong in terms of natural, social and ethnic cultural environment. It has made outstanding contributions to the continuation of local traditional construction wisdom and guiding the rural revitalization and residential renovation of Malkang Jiarong Tibetan area.

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Li, J.H. (2011) Jiarong Traditional Tibetan Settlement of Whole Space and Morphological Characteristics. *Journal of Urban Architecture*, No. 10, 36-39. https://doi.org/10.19892/j.carolcarrollnkiCSJZ.2011.10.015

[2] Zhao, L. (2014) Research on the Construction Mode of Jiarong Tibetan Traditional Dwellings in Western Sichuan. Master's Thesis, Xi'an University of Architecture and Technology, Xi'an.

[3] Xu, F. (2022) Investigation and Adaptability Analysis of Traditional Jiarong Tibetan Dwellings in Aba—A Case Study of Zhibo Village. *Open Access Library Journal*, **9**, e9144. https://doi.org/10.4236/oalib.1109144

[4] Zhou, H.M. and Nong, L.M. (2018) Beijing Cuan under Traditional Mountain Villages Construction Craft of Ecological Adaptability Analysis. *Journal of Adornment*, No. 10, 120-123.

[5] Liu, M.J. (2012) Research on Traditional Settlements in Lhasa. Master's Thesis, Tianjin University, Tianjin.

[6] Li, J.H. and Chen, Y. (2012) Ecological Wisdom and Renovation Design of Jiarong Tibetan People's Habitation in West Sichuan Middle Road. *Journal of Xi'an University of Architecture and Technology* (*Natural Science Edition*), **44**, 512-516. (In Chinese) https://doi.org/10.15986/J.1006-7930.2012.04.022

[7] An, Y.Y. (2008) Climate Adaptability of Tibetan Rural Settlements in Gannan. *Gansu Science and Technology*, No. 2, 52.

[8] Lin, J.H. (2021) Fuzhou Wood Bar Adjacent to Residential Space Adaptive Explore. Master's Thesis, Xi'an Building University of Science and Technology, Xi'an.

[9] Tan, S.J. (1987) Try to Talk about the Ideological Content and Artistic Quality of Tibetan Proverbs. *Journal of Qinghai Social Science*, No. 6, 99-105.

[10] He, Q. (2009) Study on Tibetan Residential Architecture Culture. Ph.D. Thesis, Xi'an University of Architecture and Technology, Xi'an.

[11] Zhu, R.Z. (2012) Study on the Architecture of Zhibo Tibetan Village in Malkang.

Master's Thesis, Xi'an University of Architecture and Technology, Xi'an.

[12] Qi, L. (2007) Study on the Regional Adaptability of Tibetan Settlements in Gannan. Master's Thesis, Huazhong University of Science and Technology, Wuhan.