







Livelihood status and adaptation strategies of ethnic mountain households: Evidence from Sichuan, China

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ABSTRACT

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Household livelihood assessment is an integral approach to determining the status of the development of rural people and society. Therefore, this study aims to explore the status of the livelihood and adaptation strategies of ethnic mountain people. A capital-based livelihood assessment was conducted on households living in Mount Qingcheng in Sichuan, China, under the guidance of the sustainable livelihood framework. Primary data were gathered through a semi-structured household survey of 42 ethnic mountain households complemented by two focus group discussions with community representatives. This study reveals that ethnic mountain households possess low levels of human capital (education, health, and vocational skills), limited natural capital (cultivable land and homestead areas), scarcity of physical capital (poor housing, production tools, vehicles, and durable assets), limited access to financial capital (income, borrowing informal and formal loans, and charity), and poor social capital (loose social networks within relatives, low opportunities for financial help, and job facilities). The analysis revealed a positive relationship between family size and household income, and cultivable land area. Cultivable land and homestead size are significantly positively related to dwelling quality (0.20*), financial security (0.60*), ease of obtaining informal loans (0.20*), and access to formal loans (0.30*). The major adaptation strategies depend on agriculture, off-farm income activities, social networks, traditional ecological knowledge (TEK), and migration for work. This study recommends that a continuous development program be implemented to help protect the culture and enhance the livelihood security of ethnic mountain people.

Contribution/Originality: This study integrates a sustainable livelihood framework with cultural-lifestyle analysis to generate the first mixed-method evidence on how ethnic mountain households in Sichuan combine limited capital with traditional ecological knowledge to adapt. The findings refine livelihood–adaptation theory for resource-poor highlands and offer actionable guidance for targeted poverty alleviation and resilience policy programs.

1. INTRODUCTION

Mountain formations are geological features that can be distinguished by their difficult terrains, scarce resources, and distinctive cultures (Zhou, Jia, Wang, & Fang, 2018). In recent years, the vulnerability of mountain ethnic families, their socioeconomic conditions, and ecological environment have led to increasing curiosity about how they adapt and survive (Chen, Lin, Wang, & Wang, 2025; Fang, Fan, Shen, & Song, 2014). This study focused on ethnic mountain households in Sichuan and their livelihood conditions in China. Furthermore, the adaptation strategies of ethnic mountain households were examined. As such, this research addresses these gaps and contributes to the knowledge of mountain livelihoods. Numerous individuals around the world rely on resources found in mountainous regions for livelihood and nutritional support (FAO, 2015). Mountainous regions, despite their ecological, cultural, and economic value, often face multiple obstacles that undermine them, including geographical isolation, poor infrastructure, poverty, and environmental degradation (Cochard & Dar, 2014). Ethnic minorities living in hilly regions face additional hardships.

In addition to the Chinese context, mountain communities worldwide present similar tensions between cultural change and livelihood security. In Nepal's mid-hills, Gentle and Thwaites (2016) reported that out-migration and remittances simultaneously diversify income and erode traditional ecological knowledge. In Ethiopia's Bale Mountains, Berhanu and Beyene (2015) find that insecure land tenure constrains livelihood adaptation despite extensive social networks. Research from the Ecuadorian Andes (Blackmore, Rivera, Waters, Iannotti, & Lesorogol, 2021) and the Hindu Kush Himalaya (Wester, Mishra, Mukherji, & Shrestha, 2019) emphasizes how external conservation or tourism agendas can reconfigure access to forest and pasture capitals, often benefiting elites at the expense of marginal households. These cases underline the importance of contextualizing livelihood capitals within broader political-economic forces, a perspective we apply to Mount Qingcheng.

Understanding the livelihoods and adaptation strategies of ethnic mountain households is crucial in designing policies and programs that meet their specific needs and are effective (Peng, Xu, & Wang, 2019; Wu et al., 2025). Ethnic mountain groups often have unique cultural practices, knowledge systems, and methods of managing natural resources to support biodiversity preservation and sustainability (Li, Yu, Chen, Hu, & Cui, 2016; Wu, Guo, Zuo, Yang, & Liu, 2025). For the preservation of cultural uniqueness and the sustainable development of alpine areas, it is essential to acknowledge and support their means of subsistence.

The Chinese mountainous region has been considered underdeveloped for a long time, despite China's rapid growth since 1978. Mountains are hampered by many barriers, including those related to finance, politics, and nature. The mountains are distinct geographical regions that rise above lowlands. People living in these regions have their own culture, distinct from that of the plains (Huang, Xi, & Ge, 2017; Wu et al., 2025; Wu, Zuo, Li, & Liu, 2023). Mountainous communities have different livelihoods of mainlanders do. Approximately 73.4% of China's land is mountainous (Xu, Liu, Wang, Tang, & Liu, 2018). To make sound policy decisions, it is important to have a thorough understanding of the culture and lifestyles of the majority. A country's development depends on policies that are well-informed and benefit the government as well as its citizens. To design context-specific policies and foster community development, it is important to understand the living conditions of the target population. Some studies on ethnic minorities in mountainous regions have been conducted (Wu et al., 2025; Yang, Chen, Li, Yang, & Gao, 2024; Zhang & Feng, 2024), but they have not focused on the impact of culture and lifestyle on livelihoods in Sichuan Province, China.

The term livelihood refers to a way of life that includes a number of activities. Mountain areas rely heavily on actions taken by mountain households and their livelihood security (Cheng et al., 2025; Kuswanto, Hibatullah, & Soedjono, 2019; Wang & Zhao, 2023). Understanding the living conditions of ethnic minorities is critical for designing policies to promote their development (Mutani, Cornaglia, & Berto, 2018; Yang, Qiu, Zhu, Hu, & Xu, 2024). Without understanding and knowing their target communities, sustainable development initiatives are likely to fail (Aniah, Kaunza-Nu-Dem, & Ayembilla, 2019). Ethnic minorities living in mountainous regions often face

socioeconomic disadvantages. These include poverty, food insecurity, and unstable livelihoods (Zhou et al., 2018). Although China has made significant strides in reducing its poverty rate overall, this progress has yet to reach ethnic minorities living in mountainous regions (Liu, Xu, & Li, 2018; Yu et al., 2024). Therefore, it is imperative that policies tailored specifically for each situation focus on increasing livelihood security for ethnic minority groups (Galipeau, 2024; Li et al., 2016).

Adaptation is a systematic process of transitioning in response to environmental, economic, or institutional changes that affect a community's ability to sustain its livelihood. Social adaptation aims to minimize vulnerability and increase resilience to various stressors. Adaptation is influenced by formal and informal structures that regulate human actions and shape how individuals and organizations communicate. Adaptive, versatile, sensitive, multilevel, and diverse organizations contribute to the resilience of social-ecological systems (Adger, 2000). Local institutions play a significant role in influencing climate adaptation, as it takes place at the local level (Wang, Brown, & Agrawal, 2013). The broader institutional, economic, and social contexts also impact local adaptation to climate variability and change. Rural institutions in mountainous areas have undergone significant changes in recent decades (Yang et al., 2024; Yu, 2016). Traditional social standards and collective action laws enabled seasonal migrations, allowing mountain communities to negotiate the use of pastures owned by other tribes in times of danger. Migratory grazing offers the advantage of adapting to highly variable environments by utilizing heterogeneous and extensive geographic space (Wang et al., 2013; Wang, Fang, Beauchamp, Jia, & Zhou, 2021).

While several studies have examined livelihoods (Li et al., 2016; Yang, He, Li, Su, & Xu, 2024), livelihood strategies (Wu et al., 2025; Wu et al., 2025) rural development (Chen et al., 2023; Zhao, Chen, Shao, Xia, & Zhang, 2024) very few have examined the lifestyles and cultures of ethnic minorities living in mountainous regions. Recent research has shown the importance and vulnerability of mountain lifestyles, as well as various adaptation methods. For example, Witharana, Chen, Curio, and Burman (2025) study on the adaptation strategies of the Himalayan mountain community highlighted the importance of traditional ecological knowledge in helping communities adapt to environmental change. While Liu et al. (2018) focused on the role of entrepreneurship and income diversification in supporting sustainable lifestyles among rural mountain households.

Few studies have specifically examined the impact of culture and lifestyle on the lives and livelihoods of ethnic mountain families. This knowledge gap provides an opportunity to gain a better understanding of the challenges, opportunities, and coping strategies of ethnic mountain communities in Sichuan, China. Therefore, this study intends to respond to the following research questions to fill the knowledge gap and further our understanding of the livelihoods of Sichuan's ethnic mountain households. (a) What are the most important factors influencing the livelihood of ethnic mountain families in Sichuan, China? (b) What particular adaptation strategies are employed by ethnic mountain households to overcome livelihood challenges? Therefore, this study investigates the livelihood status, challenges, and adaptation strategies of ethnic mountain households. The study's specific objectives include evaluating the many aspects of livelihood capital, comprehending the difficulties faced by ethnic mountain families, and examining the impact of culture and way of life on their livelihood strategies.

Drawing on the sustainable livelihood framework, we conceptualize cultural change in three interrelated dimensions: (i) the continuity or erosion of traditional ecological knowledge (TEK), (ii) shifts in social network norms that shape mutual aid, and (iii) the rise of market-oriented values that encourage livelihood diversification. Each dimension reconfigures households' access to livelihood capital: (a) TEK affects natural capital (soil and forest management) and the durability of physical capital built with local materials; (b) evolving social norms influence social capital and thereby households' ability to mobilize informal finance and labor; and (c) market values reshape financial capital by motivating nonfarm income pursuits and altering perceptions of risk and investment. By foregrounding these linkages, this study explains why cultural trajectories matter for mountain livelihoods.

By concentrating on the ethnic mountain households in Sichuan, China, this study adds to the body of knowledge on mountain livelihoods and adaptation techniques. By examining the interactions among culture, lifestyle, and

livelihood, this research provides a comprehensive understanding of what influences the means of subsistence of these societies. This research fills a gap in the literature by providing contextual information that can be used to guide policy and development actions.

2. METHODOLOGY

2.1. Geographical Features

This study was conducted in Mount Qingcheng, which is located in the Sichuan Province of China (Figure 1). Sichuan is located in Southwest China, along the Yangtze River Valley. South China shares borders with Gansu and Shaanxi provinces, Chongqing municipality, Guizhou province, Yunnan province, Tibet, Qinghai, and Yunnan (Qian, Sasaki, Jourdain, Kim, & Shivakoti, 2017). Qingcheng, located near Dujiangyan, has a history that dates back thousands of years. It is the birthplace of Taoism and was the center of Taoist study and religious activities under the Yellow Emperor. Qingcheng is home to numerous Taoist temples and 36 peaks that add to the mountain's grandeur. This study focuses specifically on one peak at Mount Qingcheng and Xian Feng Village. Qingcheng, located 87 km away from Chengdu in Sichuan Province, is one of China's top Taoist destinations.

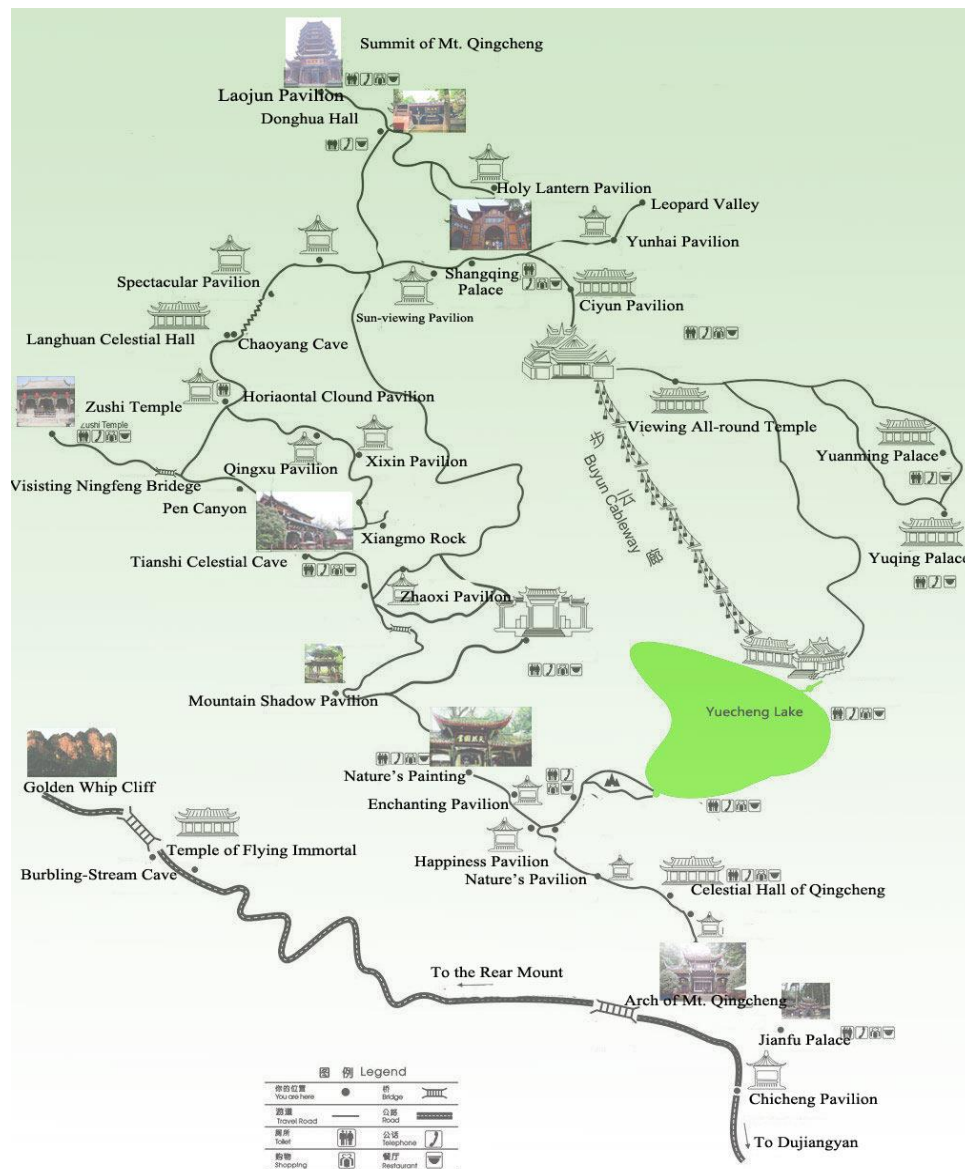


Figure 1. Study areas: Xian Feng village of Mount Qingcheng, Sichuan, China.

Source: <http://www.wegslttisnl.com/sichuan/maps.html>.

Mount Qingcheng has had a reputation since ancient times. It is also considered a “mountain of green” because of the year-round coverage of evergreen forests.

2.2. Analytical Framework

In this study, a sustainable livelihood framework (SLF) was employed to analyze the livelihoods of mountain people (Table 1). The SLF is a widely utilized approach worldwide for examining the conditions of people's livelihoods. It is primarily based on the concept of livelihood capital, which encompasses human, social, natural, physical, and financial capital. Theoretically, the sustainable livelihoods framework (SLF) views the poor as "strategic managers" who navigate their livelihood outcomes through a series of activities and access to resources, influenced by institutional contexts (Moser, 1998). The sustainable livelihoods framework recognizes assets as a central concern, as they are significantly influenced by environmental stressors within vulnerable contexts (Figure 2). Livelihood strategies and institutional processes serve as drivers for transforming vulnerable contexts into sustainable livelihoods. Institutional processes are responsible for converting assets and strategies into actions that lead to desirable and sustainable changes in people's lives. Major strategies in rural livelihoods include agriculture, livelihood diversification, and migration (Ellis, 2000).

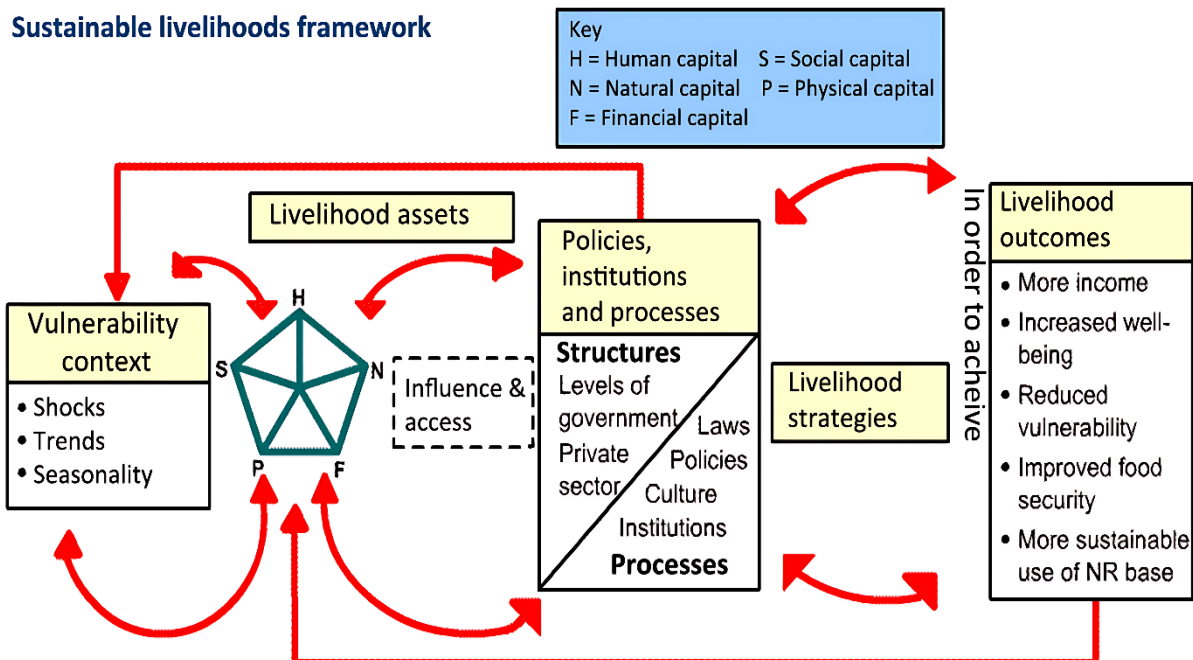


Figure 2. Sustainable Livelihoods Framework (SLF) (Chambers & Conway, 1992).

This research uses the SLF to provide a comprehensive framework for understanding mountain peoples' lives. The SLF allows for an assessment of many capital items, coping mechanisms, and other factors that people use to navigate through their lives within the unique context of their surroundings. The SLF can be understood in three ways: as a framework for examining short-term lifestyles (Huber, Morlok, Weckerle, & Seeland, 2015), as a way of guiding development efforts (Li, Li, Feldman, Daily, & Li, 2012) and as an outline for development in general (Huang et al., 2017).

In the livelihood-related literature, the SLF was possibly envisioned as "a diagram to organize ideas into manageable categories, to identify entry points and critical processes, and to assist with prioritizing catalysts for change that can improve people's livelihoods" (Moser, 1998).

Table 1. Capital-based assessment of mountain household livelihood.

Types of capital	Major indicators	Measurement scale	Expected relationship with livelihood
Human capital	Age of the household head	Actual age of the household (years)	Positive
	Education	No literacy = 0, Primary education = 0.25, Junior middle level = 0.5, Senior middle level = 0.75, Technical secondary level and above = 1	Positive
	Number of earning members	Yes = 1, No = 0	Positive
	Health condition of an earning member	1 = Very bad, 2 = bad, 3 = average, 4 = healthy, 5 = More healthy	Positive
	Earning members' vocational skills	Yes = 1, No = 0	Positive
Natural capital	Cultivable land area	Land under cultivation (ha/Person)	Positive
	Homestead area	Land under homestead garden (ha/Person)	Positive
Physical capital	Having poultry and livestock	Cattle = 1, Sheep = 0.8, Pigs = 0.5, Poultry = 0.2, Bees = 0.1	Positive
	Condition of housing	Wood house = 0.5, Stone house = 0.7, Concrete house = 1	Positive
	Price of the house	Total value of the household's houses (10,000 Yuan)	Positive
	Price of production tools	Total price of the household's tools (10,000 Yuan)	Positive
	Price of vehicles	Total price of the household's vehicles (10,000 Yuan)	Positive
	Price of durable assets	Total price of household's durable assets (10,000 Yuan)	Positive
Financial capital	Income	Household's total income (10,000 Yuan/Person)	Positive
	Access to borrow	Household's access to borrow money from relatives and friends (Yes = 1, No = 0)	Positive
	Access to formal loans	Household's access to borrow money from a financial institution (Yes = 1, No = 0)	Positive
	Access to informal loans	Household's access to borrow money from other people at a high interest rate, not from an institution (Yes = 1, No = 0)	Positive
	Possibility to get a charity or donation	Household's access to get charity or donation (Yes = 1, No = 0)	Positive
Social capital	Help for job opportunities from relatives	Possibility to get help from relatives and friends (Yes = 1, No = 0)	Positive
	Help for economic help from relatives	Possibility to get money by borrowing from relatives and friends urgently (Yes = 1, No = 0)	Positive
	Number of job holders	Having government or private job (Yes = 1, No = 0)	Positive

The SLF has several notable strengths, such as its emphasis on prioritizing the needs and well-being of individuals, its focus on enhancing people's talents, and its comprehensive approach. The SLF, or strengths, limitations, and focus, is a method that emphasizes the examination of individuals' realities, strengths, and difficulties.

2.3. Data Collection

The research employed a mixed-method approach, incorporating both quantitative and qualitative data to investigate the phenomenon. A semi-structured survey was used to collect data for the study. The focus of this survey was on participants who were household heads. In addition, two focus group discussions (FGDs) were conducted by the researcher to collect and validate the data. A systematic random sample of every third household from the 137-household roster yielded 42 interviews (91% response rate). The sample size meets Yamane's finite-population

formula, $n = 42$, at $\pm 10\%$ precision (95% confidence), and aligns with similar mountain-livelihood studies. Each interview lasted approximately 45 minutes. The interviews had two main purposes: to collect demographic information and to examine lifestyle habits, cultural aspects, and livelihood-related information. Scholars have paid considerable attention to the fields of religions, languages, cuisines, arts, customs, and celebrations. The lifestyle component included social networks, local eco-knowledge, and everyday issues.

2.4. Data Analysis

The information collected from the survey on homes in the mountains was analyzed using descriptive statistics, correlation analyses, and inferential statistical methods. Descriptive statistics were employed to determine the demographic characteristics of the participants. The variables included age, education, farm size, and family size. To gain a comprehensive understanding of the demographic composition, statistical measures such as the mean, standard error, and the minimum and maximum values were calculated.

Correlation analysis was used to investigate the relationships between demographic characteristics and lifestyle variables. Pearson's correlation coefficient is associated with its direction. An asterisk (*) was used to indicate the significance of a relationship. The threshold for statistical significance was set at 5%. This study did not use regression analysis or other inferential statistical methods, such as the t-test. In future studies, these could be used to investigate causal links and pinpoint factors that have an impact on livelihood outcomes.

Qualitative research methods have gained widespread acceptance and significant traction as a way to understand and analyze social phenomena. To ensure concrete and reliable results, it is important to perform a systematic and comprehensive analysis of qualitative data (Nowell, Norris, White, & Moules, 2017). To analyze the qualitative data, a series of comprehensive procedures for content analysis was conducted. A bilingual specialist will translate recorded FGDs in local Chinese into English. The study team conducted a further assessment of the appropriateness of the translated interview. During the data analysis process, the research team thoroughly reviewed the complete dataset, meticulously examining each individual data item to identify prominent characteristics that might function as overarching themes throughout the dataset. The involvement of multiple researchers in the data analysis process enhances the credibility of our analytical technique (Côté & Turgeon, 2005).

2.5. Analytical Scope and Limitations

For 42 households, the quantitative analysis is confined to descriptive statistics and Pearson correlations. These findings reveal associations but do not identify causal effects. All subsequent interpretations are therefore framed as relationships, and readers are cautioned against inferring causality. Future studies with larger samples are needed for multivariate or causal modeling.

2.6. Ethical Statement

Our study focuses solely on the social issues of the mountainous people of Sichuan Province in China. Prior oral permission was obtained from the respondents before each face-to-face interview. In addition, all ethical standards were maintained during the interviews.

3. RESULTS AND DISCUSSION

The results of the study are presented in four subsections: the livelihood characteristics of mountain people, demographic characteristics, livelihood challenges, and adaptation strategies in mountain areas.

3.1. Livelihood Characteristics of Mountain People

Our analysis reveals that a significant proportion of household leaders residing in mountainous areas are in the middle age bracket. This pattern can be linked to the movement of younger individuals who contribute to household

income toward metropolitan centers (Table 2). The migration pattern observed in these communities, which is frequently motivated by the pursuit of improved economic prospects, has substantial ramifications for their socioeconomic structure. The primary engagement of these household heads in agricultural activities can be attributed to their comparatively low levels of educational achievement. The aforementioned highlights the urgent necessity for educational interventions specifically designed for these groups, since education plays a pivotal role in determining socioeconomic mobility (Zeng, Guo, Deng, Zhou, & Xu, 2021).

Qingcheng, owing to its high altitude, has minimal arable land. Most local ethnic communities cultivate vegetables on mountain slopes. Their living quarters, which are situated at the peak of the mountain, also occupy a limited area (0.019 ha). This study defines physical capital as the ownership of poultry and livestock, the condition of housing, housing prices, production tools, vehicles, and durable assets. Our analysis indicates that most households produce poultry and pigs. The economic issues faced by these communities are further emphasized by the high price of houses, which can be attributed to the limited availability of construction materials. Housing prices are high because of the scarcity of construction materials. This scarcity also inflates vehicle prices. The cost of durable assets is average. Overall, the condition of physical assets in these ethnic households is not satisfactory.

Table 2. Mountain people's livelihood status.

Types of capital	Major indicators	Mean	Standard deviation
Human capital	Age of the household head	47.57	11.02
	Education	0.28	0.31
	Number of earning members	2	0.98
	Health condition of an earning member	2.49	2.01
	Earning members' vocational skills	0.07	0.26
Natural capital	Cultivable land area	0.05	0.02
	Homestead area	0.019	0.03
Physical capital	Having poultry and livestock	4.05	15.53
	Condition of housing	0.42	0.2
	Price of the house	11.12	16.53
	Price of production tools	0.27	0.51
	Price of vehicles	1.14	2.68
	Price of durable assets	0.49	0.57
Financial capital	Income	0.31	0.37
	Access to borrow from relatives and friends	0.32	0.36
	Access to formal loans	0.34	0.39
	Access to informal loans	0.12	0.41
	Possibility to get a charity or donation	0.07	0.15
Social capital	Help with job opportunities from relatives	0.59	0.67
	Help for economic help from relatives	0.44	0.81
	Number of job holders	0.18	0.48

Financial capital measures the capacity of mountain ethnic peoples to overcome financial challenges, including income, borrowing from friends and family members, formal and unofficial loan access, and the possibility of receiving charity or donations (Rijal, 2011). The average household income among these ethnic groups is 3100 yuan (435 USD). This figure is considerably lower than the average income in Sichuan, which stands at 32,000 yuan; however, these individuals still borrow money (0.32) from friends and family despite limited access to formal loans due to a lack of formal financial institutions or communication/accommodation issues (Huber et al., 2015). Informal loans remain scarce. Normal circumstances make it unlikely that you will receive charity (Zhou et al., 2018). Financial capital is generally low in ethnic mountain households. Social capital is the sum of social networks and bonds that help facilitate a smoother life (Qian et al., 2017). These include job opportunities, the financial support of relatives, and wage earners. The data show that mountain ethnic people rely on their relatives to provide financial and job support (Peng et al., 2019).

Qingcheng is composed primarily of rock-based forests, similar to other mountainous areas in China. Only a small portion of the land can be used for vegetable production. The soil is rocky, mineral-rich, and unsuitable for growing crops. This limits the livelihood of mountain people (Li et al., 2012). This mountain is situated in an area of high seismic activity. The surface of the mountain, which is composed of smooth sandstones, slides down under gravity (Dou et al., 2019).

Climate variation is common in China, and Mount Qingcheng is no exception. While soil-rich areas are suitable for year-round crops, mountains have summer temperatures of approximately 29°C and winter temperatures ranging from 12°C to -8°C. The rainy season typically lasts from April to August, with an annual precipitation of approximately 1000 mm. However, sunshine is scarce, leading to the popular saying in Sichuan, "Sichuan dogs bark when they see the sun." However, such weather conditions are favorable for forest plants and animals.

Agriculture is the primary profession of the people in Sichuan Province, and they are significant exporters of agricultural products (Guo, 2010). However, the scarcity of arable land on Mount Qingcheng makes agriculture a challenging pursuit. Consequently, mountain people often resort to street vending, running small shops, and wage labor. Younger individuals from Mount Qingcheng frequently choose migration as a strategy for diversifying their livelihoods.

3.2. Demographic Profile

Six personal characteristics were selected for the study: age, education, family size, farm size, topography, and distance from cities. These variables effectively depict the demographics of the ethnic minority households (Table 3). Most household heads are middle-aged (47.57 years). The education level of these household heads (0.28) is below the national average, indicating that educational facilities in mountainous areas are limited. The majority of households have a family size larger than the national average. The farm size of mountain households is very small (0.06 ha), suggesting minimal land possession due to the mountainous terrain. Mount Qingcheng, located at the peak of the mountain, is considerably higher than the plain land. The distance from households to cities ranges from 20 km (Dujiangyan city) to 90 km (Chengdu), indicating limited job opportunities in the mountains.

Table 3. Demographic characteristics.

Characteristics	Minimum	Maximum	Mean	Standard deviation
Age (Years)	21	67	47.57	11.02
Education	0	1	0.28	0.31
Family size (Number)	2	7	4	0.89
Farm size (ha)	0	0.08	0.06	0.03
Topography (Mountain)	0	1	1	0
Distance from city (km)	20	90	20.49	16.70

The presence of larger family sizes, in conjunction with the scarcity of arable land, highlights the difficulties that these households encounter in maintaining their means of subsistence. These issues are exacerbated by the distance from urban areas, which restricts their access to a wider range of economic prospects (Zhou et al., 2018). Most households have one or two members who work in nearby towns. Mountain people's eating habits are similar to those of mainlanders: three meals a day. They source some food items from their homestead gardens and purchase the rest from nearby markets. Residents of Mount Qingcheng can grow vegetables around their homes, but crop yields are lower than those in mainland areas. Some inhabitants earn money through daily wage labor. During the winter, they heat rooms with wood fires for warmth. They also preserve food, especially pork, by drying it in a fire room for long-term consumption (Li et al., 2016).

Social networks are critical for the development of social capital. However, the social network situation in mountain areas is poorer than that in plain areas because of low population density, limited interactions, and household isolation. As an ethnic minority, people tend to gather during festivals, sometimes seeking advice from

their peers. They wear traditional attire and visit temples and relatives' homes during celebrations (Mitchell & Brown, 2002). Mountain people share a deep, heartfelt bond with each other.

3.3. Demographic–Livelihood Associations

This study revealed that associations between demographic characteristics and indicators of livelihood offer significant insights (Table 4). For example, a potential sociocultural dynamic can be observed in the positive association between the age of the household head and the number of wage earners (0.30*). This correlation implies that larger families, typically led by older adults, engage in resource pooling to sustain the family. The utilization of a communal strategy for pooling resources serves as evidence of the robustness and flexibility exhibited by these communities (Mai, Luo, & Chen, 2021).

Table 4. Relationships between demographic characteristics and livelihoods.

Variables	Age	education	Family size	Farm size	Topography	Distance from city
Age of the household head	1.00	-	0.30*	-	-	-
Education	-	1.00	-	-	-	-0.30*
Number of earning members	0.30*	-	1.00	0.20*	-	-
Health condition of an earning member	-	-0.40*	-	-	-	-
Earning members' vocational skills	-	0.50*	-	-	-	-
Cultivable land area	-	-	0.20*	1.00	-	-0.40*
Homestead area	-	-	-	0.80*	-	-0.30*
Condition of housing	-	0.30*	-	0.20*	0.20*	-0.25*
Income	-	0.40*	0.25*	0.60*	-	-0.45*
Access to borrow from relatives and friends	-	0.25*	-	0.20*	-	-
Access to formal loans	-	0.30*	-	0.30*	-	-0.20*
Access to informal loans	-	0.20*	-	-	-	-
Possibility to get a charity or donation	-	-	-	-	-	-
Help with job opportunities from relatives	-	0.20*	-	-	-	-0.20*
Help for economic help from relatives	-	-	-	-	-	-
Number of job holders	-	0.25*	-	-	-	-

Note: The asterisk marks significance at the 5% level ($\alpha = 0.05$, two-tailed).

There is a negative correlation between education and proximity to a city (-0.30*), and a positive correlation between education and the earnings of members' vocational skills, income, access to informal loans, formal loans, and the number of employed people. These findings are in line with the results of other studies (Dehghani Pour, Barati, Azadi, & Scheffran, 2018). Research by Dehghani Pour et al. (2018) has highlighted education as an integral element in driving socioeconomic movement forward. Education increases earning potential while decreasing dependence on urban centers; family size and cultivable area show a positive correlation (0.20*); this may be explained by larger families providing more labor to manage large cultivable areas. The sizes of the homestead and cultivable land are positively correlated with housing quality (0.20), financial stability (0.60), access to formal loans (0.30*), and ease in obtaining informal loans (0.20*). Larger farms could therefore yield better results for household subsistence needs. As the distance between cities and households increases, so do educational attainment (0.30*), the cultivable area (0.40*), the size of homesteads (0.30*), the quality of housing (0.25*), and income (0.45*). These findings are similar to those of other studies that highlight the difficulties faced by rural communities living in distant cities (Huang et al., 2017; Zhao, 2014).

3.4. Livelihood Challenges

The respondents were asked to identify the common challenges faced by ethnic minority people living in mountainous areas. Table 5 lists the six main types of capital used for sustaining livelihoods: natural capital, human capital, social capital, physical capital, financial capital, and cultural capital, along with the obstacles they present. The severity of these issues is also included, with the range of severity being low, medium, or severe. The challenges experienced by mountain inhabitants are outlined below.

Table 5. Common livelihood challenges of the ethnic minority living in Mount Qingcheng.

Major livelihood capitals	Common challenges	Extent of challenges		
		Low	Medium	High
Natural capital	Unusual changes in land use function.		✓	
	Transformation of rural landscapes.			✓
Human capitals	Not enough educational institutions		✓	
	Low job opportunities		✓	
	A health facility is not readily available	✓		
Social capital	Changes in the power structure due to the interruption of traditional, political, and economic elites.		✓	
	Deteriorating social networks among people.			✓
Physical capitals	Transportation problem		✓	
	High cost of construction materials		✓	
	Expensive production materials		✓	
Financial capital	Decreasing farming incomes due to ignoring the agricultural sector.			✓
	Limited access to financial capital reduces people's purchasing power.		✓	
Cultural capital	Rapidly changing rural landscapes and the substitution of traditional crop varieties.		✓	
	Gradual commercialization of ethnic minority culture related to various festivals, different tourist shows, and rituals.		✓	

Source: Summary of focused group discussions.

The difficulties that have been highlighted align with the existing body of literature on the risks faced by mountain communities. The alterations in land utilization and the conversion of rural landscapes are indicative of wider patterns of urbanization and environmental deterioration affecting these areas (Li et al., 2016). The extent of this challenge is considered significant. The transformation of rural landscapes involves changes in the rural environment resulting from various factors, such as urbanization or development projects. This challenge is also deemed significant. The lack of educational facilities in the area makes it difficult for members of the ethnic minority to access quality education. This is a major challenge. Low employment opportunities among ethnic minorities are indicative of their economic instability (Nguyen & Leisz, 2021). Human capital issues related to accessing healthcare and education reveal systemic injustices experienced by these groups, with social networks that support social capital having diminished dramatically, resulting in their increased vulnerability.

Rebuilding social networks is a formidable task. Deterioration can weaken community ties and jeopardize support networks (Nguyen & Leisz, 2021), increasing the difficulty of addressing this epidemic. Transportation issues range from limited connectivity/accessibility, limiting economic activity (Zhu, Zhou, Ma, & Yin, 2022), to increased acquisition costs due to insufficient funds available for construction (Zhu et al., 2022). These issues have far-reaching repercussions. Therefore, infrastructure development in the area has been significantly hindered. The issue is of wide scope: high manufacturing costs have an adverse effect on local businesses, whereas the neglect of agricultural sectors may contribute to declining farm incomes due to possibly reduced productivity, resulting in decreased farm incomes;

additionally, due to limited access to capital, ethnic minorities are often unable to invest or purchase the items needed for development in these sectors.

3.5. Livelihood Adaptation Strategies

Table 6 offers an overview of issues raised during focus groups with members of Mount Qingcheng's minority ethnicities. Understanding and recognizing the challenges facing minority ethnic communities living on Mount Qingcheng can improve living conditions for this community and allow for the implementation of effective adaptation measures. This research can serve as a roadmap for future research, development, and policy initiatives. China's ethnic mountain peoples have created survival and livelihood strategies that reflect the diversity and adaptability of their ecosystems. They have proven to be resilient despite physical, economic, and social hardships by adapting traditional techniques as well as employing cutting-edge adaptations.

Table 6. Livelihood adaptation strategies of ethnic mountain households.

Livelihood adaptation strategies	Percentage of adoption by mountain households
Dependence on agriculture	85%
Dependence on nonagricultural income activities	80%
Role of social networks and mutual aid	78%
Dependence on livestock production	73%
Use of traditional ecological knowledge (TEK)	65%
Dependence on forest resources	61%
Off-farm employment	55%
Migration for work	50%
Emphasis on education and skill development	47%
Income diversification	40%
Reliance on natural resources	38%
Use of local knowledge	35%
Vocational training	30%
Utilization of government support	28%
Role of indigenous institutions	25%
Financial borrowing from relatives and friends	24%

China's mountains, particularly Sichuan Province, remain economically dependent on agriculture for most ethnic groups. The terrain and climate necessitate traditional farming techniques such as terraced farming to allow agriculture on steep slopes while preventing soil erosion. Households can reduce their vulnerability to market and environmental shocks and volatility by altering their crop rotation and planting both food and cash crops (Gioli et al., 2019; Wang et al., 2021). Families typically send money home when their younger members move permanently or temporarily to urban areas (Zhang, Liao, Zhang, & Hua, 2018). Therefore, we need to use sustainable management methods because we depend on natural resources. These communities have devised comprehensive management plans incorporating both conservation and traditional practices to protect and manage forests, wildlife, and other natural resources (Dehghani Pour et al., 2018; Fang et al., 2014). Through traditional knowledge and technologies, such as planting flowers to increase soil fertility or prevent landslides, communities adapt to an ever-evolving environment (Dehghani Pour et al., 2018). Their resourcefulness in adapting despite challenging terrain conditions is evident. The growing attention given to vocational training and the increasing recognition of cultural tourism all point to a change in the socioeconomic dynamics within these communities. Microfinance is a formal service that can be a powerful tool to increase the resilience of local communities. Digital financial services, which enable easier credit and remittance transfers, are becoming increasingly popular.

4. POLICY IMPLICATIONS AND ACTION PRIORITIES

Drawing directly on the capital-specific deficits documented in Sections 4.1–4.4, we propose a three-tier set of interventions. Time frame signal implementation priority.

Table 7. Priority policy recommendations for Mount Qingcheng households.

Priority	Timeframe	Actionable recommendation	Expected outcome
Human & social capitals	1–2 years	<ul style="list-style-type: none"> • Deploy mountain-mobile vocational centers focusing on agro-processing and eco-tourism skills. • Seed village-level mutual-aid funds to formalize existing informal loans. 	Rapid skill upgrading; strengthened safety nets.
Financial capital	1–2 years	Partner with rural credit co-ops to launch microcredit windows backed by loan-guarantee funds; bundle with digital payment training.	Liquidity for farm inputs and microenterprise start-ups.
Natural & physical capitals	3–5 years	<ul style="list-style-type: none"> • Introduce terrace rehabilitation grants and climate-smart seed kits. • Subsidize rooftop rain-harvesting tanks to reduce water stress. 	Higher land productivity; improved dwelling resilience.
Cultural capital	3–5 years	Establish community TEK schools that document, certify, and monetize traditional ecological knowledge for eco-tourism and sustainable harvesting.	TEK preservation; diversified income via cultural tourism.
Market access	>5 years	Advocate for a mountain-feeder road and e-commerce hub under the provincial rural revitalization plan.	Lower transport costs; expanded market reach.

Continuous multistakeholder monitoring of village committees, county governments, microfinance institutions, and local NGOs should track outcome indicators (income, loan uptake, TEK enrollment) to enable adaptive management.

5. CONCLUSION

China officially recognizes 56 ethnic groups, each with distinct cultural traditions that shape livelihood practices particularly in remote mountain regions. Focusing on one such group in Sichuan, this study shows how limited capital intersects with traditional ecological knowledge and social-network norms to influence adaptation strategies. This study reveals that ethnic mountain households possess a low level of human capital, limited natural capital, scarcity of physical capital, limited access to financial capital, and poor social capital. There is a correlation between family size, household income, and cultivable land area. Cultivable land and homestead size are strongly positively correlated with the following variables: ease of obtaining informal loans (0.20*), financial security (0.60*), dwelling quality (0.20*), and access to formal loans (0.30*). Additionally, ethnic groups suffer from several difficulties, including alterations in land use patterns, changes to the rural terrain, shifts in the power structure, lack of resources for purchasing power, and restricted income from farming. The primary adaptation strategies include reliance on agriculture, non-agricultural income sources, social networks and reciprocal assistance, livestock production, traditional ecological knowledge (TEK), forest resources, off-farm employment, and migration for work. Furthermore, this research offers insights into livelihood strategies utilized by mountain farmers in China. While extensive research has been undertaken on livelihoods broadly, our study provides unique insights into the specific challenges and strategies encountered by this population. The findings from our research represent a substantial contribution and have practical implications for policymakers and development practitioners aiming to improve the welfare of mountain communities.

The study recommends several measures for improving the livelihood of mountain households, such as promoting education, health infrastructure development, vocational skills, support for agriculture, and infrastructure

development; enhancing access to financial services; promoting sustainable livelihood practices; investing in infrastructure for sustainable development; preserving and promoting cultural heritage; and strengthening social capital and community networks. A context-specific continuous development program can help to protect culture and enhance the livelihood security of ethnic mountain people.

Our results highlight relational patterns; they should not be read as proving causation. Larger, multivariate studies are needed to test causal pathways between cultural change and livelihood capital. The multidimensional nature of household characteristics can have both direct and indirect effects on livelihood capital. The age and educational background of the household head can have a dual impact, not only on their immediate earning capacity but also on their long-term decision-making about investments in both physical capital and social capital.

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