

## A Study on Satisfaction with the Settlement Project for Nomadic Herders in Gannan Tibetan Region: A Case Study of Xiahe County (Postprint)

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### Abstract

The nomadic settlement project in the Gannan Tibetan Region constitutes both a major ecological initiative for alleviating grassland pressure and restoring ecosystems, and a significant livelihood project for facilitating herders' poverty alleviation and improving their living environment. Research on settlement satisfaction thus exhibits composite characteristics of urban and rural human settlement environment studies, alongside distinctive regional and ethnic features. Against the backdrop of the Rural Revitalization Strategy, this study adopts a post-occupancy evaluation perspective, employing questionnaire surveys and a fuzzy comprehensive evaluation model to assess satisfaction with the human settlement environment of nomadic settlements in Xiahe County. Quantitatively understanding the project's favorable performance and existing problems holds important reference value for optimizing ecological settlement strategies. The results indicate: (1) The fuzzy comprehensive evaluation yields a "relatively satisfied" rating for the human settlement environment of herder settlements in Xiahe County, with significant inter-dimensional variation, demonstrating a decreasing hierarchy of "public infrastructure and service facilities satisfaction > natural environment satisfaction > cultural environment satisfaction > residential environment satisfaction." (2) Settled herders express high satisfaction with settlement site selection, air quality, and water and forage source allocation, but dissatisfaction with the project's failure to address grassland degradation and waste pollution that contradicts Buddhist environmental ethics centered on reverence for mountains and water. (3) Herders are relatively satisfied with post-settlement dietary structure and sense of kinship and neighborhood, basically satisfied with diversified household income, but dissatisfied with local psychological belonging and its integration with original religious beliefs and living customs. (4) They are very satisfied with housing quality and orientation,

basically satisfied with household religious space configuration, but dissatisfied with overly uniform color tones and style lacking personalization, localization, and rural character, and with modern kitchen, bathroom, and sanitary facilities ill-adapted to ethnic living habits. (5) The settlement project secured water and electricity supply for daily lighting, water, and energy needs; educational facilities reduced school commuting distances and improved enrollment rates; public activity spaces enhanced opportunities for physical exercise, fitness, and traditional customs. Herders are relatively satisfied with this substantially improved support system, but dissatisfied with technical service training provided by local governments due to complex effectiveness factors. (6) Settlement satisfaction in the Gannan Tibetan Region exhibits composite properties of both rural and urban human settlement satisfaction, wherein dissatisfaction reflects herders' nostalgia for original rural environments and adherence to traditional cultural beliefs, while satisfaction demonstrates acceptance and recognition of urban human settlement construction.

## Full Text

### Preamble

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**Abstract:** The nomadic settlement project in the Southern Gansu Tibetan area of Gansu Province, China, represents both a major ecological initiative to reduce pasture pressure and restore grassland ecosystems, and a crucial livelihood project to help herdsmen escape poverty and improve their living conditions. Resident satisfaction with these settlements exhibits hybrid characteristics between urban and rural human settlements, while also displaying distinct regional and ethnic features. Against the backdrop of the Rural Revitalization Strategy, this study employs a fuzzy comprehensive evaluation model based on post-occupancy evaluation perspectives to assess satisfaction with the nomadic settlement project in Xiahe County using questionnaire survey data. The aims are to quantitatively understand project performance and existing problems, and to formulate optimization strategies for future nomadic settlement initiatives. Results indicate: (1) The fuzzy comprehensive evaluation of herders' living environment satisfaction in Xiahe County yields satisfactory results, with significant variation across dimensions, showing a declining order: public infrastructure service satisfaction > natural environment satisfaction > human environment satisfaction > living environment satisfaction. (2) Settled herders in Xiahe County express high satisfaction with air quality and the allocation of water and grassland resources at settlement sites, but show dissatisfaction with

grassland degradation and garbage pollution that violates Buddhist environmental ethics venerating mountains and waters. (3) Settled herders are satisfied with dietary structure and family cohesion, as well as diversified household income, but dissatisfied with their sense of local psychological attachment and the integration of original religious beliefs and living customs. (4) Settled herders are very satisfied with housing quality and living environment orientation, basically satisfied with family religious space configuration, but dissatisfied with modern kitchen and bathroom facilities that are not adapted to ethnic living habits, and with the overly uniform color schemes lacking personalization, localization, and rural style. (5) Settled herders are very satisfied with the settlement project's support system providing daily living electricity, water supply, and educational facilities that shorten school distances for children and increase enrollment rates. They are also very satisfied with spaces for physical exercise and traditional customs development, but dissatisfied with the complex factors affecting technical service training provided by local governments. (6) Nomadic settlement satisfaction in the Southern Gansu Tibetan area represents a combination of rural and urban human settlement satisfaction patterns. Dissatisfaction reflects nomads' nostalgia for original rural settlements and adherence to traditional cultural beliefs, while satisfaction reflects their acceptance and recognition of urban settlement construction.

**Keywords:** settled herdsmen; human settlement satisfaction; fuzzy comprehensive evaluation; Xiahe County

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## 1. Introduction

The nomadic settlement project in Southern Gansu Tibetan area represents a major ecological initiative to alleviate grassland pressure and restore ecosystems, simultaneously serving as a vital livelihood project to help herders escape poverty and improve living conditions. Studying resident satisfaction reveals hybrid characteristics between urban and rural human settlements, alongside distinctive regional and ethnic features. Under the Rural Revitalization Strategy framework, this research adopts a post-occupancy evaluation perspective and employs fuzzy comprehensive evaluation models to assess Xiahe County's nomadic settlement project using questionnaire data. The objectives are to quantitatively understand project performance, identify existing problems, and develop optimization strategies for future nomadic settlement initiatives.

[Figure 1: see original paper] Spatial distribution of research sample points

The study area encompasses 1,190 sample points across Xiahe County. The questionnaire survey employed stratified random sampling, covering four dimensions: natural environment, living environment, human environment, and public infrastructure services, with 20 specific indicators.

## 2. Methodology

### 2.1 Data Collection

This study utilized questionnaire surveys and participatory rural appraisal methods. The questionnaire design incorporated four primary dimensions: natural environment, living environment, human environment, and public infrastructure services. A five-point Likert scale was adopted, ranging from “very satisfied” to “very dissatisfied.” The survey covered all townships in Xiahe County, with sample selection based on settlement scale and population distribution.

### 2.2 Evaluation Methods

The fuzzy comprehensive evaluation method addresses the fuzziness and uncertainty inherent in satisfaction assessments. This approach combines qualitative and quantitative analysis through membership functions to transform subjective evaluations into objective measurements. The evaluation process involves: establishing factor sets and evaluation sets, determining indicator weights, constructing fuzzy relation matrices, and performing hierarchical fuzzy synthesis.

### 2.3 Index System and Weight Determination

The evaluation index system comprises four primary criteria (B1-B4) and 20 specific indicators (C1-C20). Weights were determined using the analytic hierarchy process (AHP), with consistency ratios all below 0.1, meeting reliability requirements.

**Table 1. Index system and weight of satisfaction degree of herdsmen settlements in Xiahe County**

Primary Criteria	Weight	Secondary Indicators	Weight
Natural Environment (B1)	0.1575	Air quality (C1)	0.0324
		Water source quality (C2)	0.0230
		Grassland quality (C3)	0.0070
		Vegetation coverage (C4)	0.0123
		Topographic conditions (C5)	0.0133
Living Environment (B2)	0.1301	Housing quality (C6)	0.0439
		Housing orientation (C7)	0.0108
		Kitchen facilities (C8)	0.0128
		Bathroom facilities (C9)	0.0217
		Religious space (C10)	0.0214
		Color style (C11)	0.0805
Human Environment (B3)	0.7568	Dietary structure (C12)	0.1561
		Family cohesion (C13)	0.0514
		Income diversity (C14)	0.0319
		Psychological attachment (C15)	0.1080
		Cultural integration (C16)	0.1509

Primary Criteria	Weight	Secondary Indicators	Weight
Public Services (B4)	0.0993	Social relationships (C17)	0.0863
		Custom preservation (C18)	0.0552
		Religious practice (C19)	0.0328
		Community participation (C20)	0.0483
		Infrastructure (various)	0.4816

### 2.4 Fuzzy Comprehensive Evaluation

Based on the determined weights and fuzzy relation matrices, the comprehensive evaluation yields:

- **B1 (Natural Environment):** (0.1968, 0.5135, 0.1523, 0.1038, 0.0337)
- **B2 (Living Environment):** (0.0904, 0.2567, 0.3277, 0.2951, 0.1268)
- **B3 (Human Environment):** (0.1201, 0.2098, 0.2482, 0.2951, 0.1268)
- **B4 (Public Services):** (0.3368, 0.2780, 0.2299, 0.1034, 0.0519)

The final comprehensive evaluation result is  $\mathbf{V} = (0.1575, 0.6678, 0.1507, 0.0171, 0.0068)$ , indicating that 66.78% of respondents are satisfied or very satisfied.

## 3. Results and Analysis

### 3.2 Overall Satisfaction Evaluation

The fuzzy comprehensive evaluation results show that herders' overall satisfaction with the living environment in Xiahe County is satisfactory, with clear variation across dimensions. The satisfaction levels follow this descending order: public infrastructure services > natural environment > human environment > living environment.

**Table 2. Evaluation results of each dimension**

Dimension	Very Satisfied (%)	Satisfied (%)	Neutral (%)	Dissatisfied (%)	Very Dissatisfied (%)
Natural Environment (B1)	19.7	51.4	15.2	10.4	3.4

Dimension	Very Satisfied (%)	Satisfied (%)	Neutral (%)	Dissatisfied (%)	Very Dissatisfied (%)
Living Environment (B2)	9.0	25.7	32.8	20.6	11.9
Human Environment (B3)	12.0	21.0	24.8	29.5	12.7
Public Services (B4)	33.7	27.8	23.0	10.3	5.2

[Figure 2: see original paper] Results of natural environment satisfaction of nomadic settlements in Xiahe County

### 3.3 Analysis of Specific Dimensions

**Natural Environment Satisfaction:** Settled herders show high satisfaction with air quality (97.6% satisfied) and water/grassland resource allocation (90.4% satisfied). However, significant dissatisfaction exists regarding grassland degradation (38% dissatisfied) and garbage pollution, which conflicts with Buddhist environmental ethics emphasizing reverence for mountains and waters.

[Figure 3: see original paper] Results of natural environment satisfaction of nomadic settlements in Xiahe County

The spatial analysis reveals that settlements closer to county towns show higher satisfaction with natural environments, while remote pastoral areas express stronger concerns about grassland degradation and water source stability.

**Living Environment Satisfaction:** Herders are very satisfied with housing quality (77.4% satisfied) and orientation (62.7% satisfied), but dissatisfied with modern kitchen and bathroom facilities that don't accommodate ethnic living habits (41.4% dissatisfied). The uniform color schemes lacking personalization and local characteristics also generate dissatisfaction (45.5% dissatisfied).

[Figure 4: see original paper] Results of living environment satisfaction of nomadic settlements in Xiahe County

**Human Environment Satisfaction:** Satisfaction is relatively high regarding dietary structure and family cohesion (76.2% satisfied), but lower concerning

psychological attachment to local communities (34.3% satisfied) and integration of traditional religious beliefs with modern lifestyles (55.4% neutral or dissatisfied). This reflects the tension between maintaining cultural identity and adapting to settlement life.

[Figure 5: see original paper] Results of living environment satisfaction of nomadic settlements in Xiahe County

**Public Services Satisfaction:** Herders are very satisfied with infrastructure improvements, particularly electricity supply, water provision, and educational facilities that reduce school travel distances for children (72% satisfied). However, dissatisfaction exists with technical training services provided by local governments (41.4% dissatisfied), citing complexity and limited practical applicability.

[Figure 6: see original paper] Results of public basic services satisfaction of nomadic settlements in Xiahe County

### 3.5 Conclusions and Recommendations

The satisfaction degree of nomadic settlements in Southern Gansu Tibetan area represents a combination of rural and urban human settlement patterns. Key findings include:

1. **Ecological-Economic Balance:** While herders appreciate improved living conditions, nostalgia for traditional pastoral lifestyles and concerns about grassland ecology remain strong. Future projects should strengthen ecological compensation mechanisms and environmental education.
2. **Cultural Sensitivity:** The mismatch between modern facilities and ethnic living habits highlights the need for culturally adapted designs. Settlement planning should incorporate Tibetan architectural features, religious space requirements, and traditional spatial organization principles.
3. **Community Cohesion:** The relatively low psychological attachment indicates weak community integration. Policies should promote community activities, preserve traditional customs, and enhance social capital building.
4. **Service Optimization:** Public services require improvement in technical training quality and relevance. A demand-driven training system should be established with herder participation in curriculum design.
5. **Sustainable Development:** The 66.78% overall satisfaction suggests room for improvement. Future strategies should balance ecological protection, livelihood development, and cultural preservation under the Rural Revitalization framework.

[Figure 7: see original paper] Comprehensive satisfaction evaluation results

The study demonstrates that successful nomadic settlement requires moving beyond mere housing provision to address ecological, cultural, and social dimensions comprehensively. Policy recommendations include: (1) implementing participatory planning processes, (2) developing culturally appropriate infrastructure standards, (3) strengthening traditional ecological knowledge integration, and (4) establishing long-term community support mechanisms.

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*Note: Figure translations are in progress. See original paper for figures.*

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