Spatial Patterns of Local Culinary Resources and Their Implications for Culinary Tourism Planning: A Case Study of Leshan

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Abstract

Local culinary resources are an important component of destination identity and tourism experience, yet their spatial organization and implications for regional culinary tourism planning remain insufficiently understood. Taking Leshan as a case study, this research examines the spatial patterns of six representative local culinary resources using 2,234 point-of-interest (POI) records. Standard Deviational Ellipse and Point Density analyses were employed to characterize spatial concentration, directional tendencies, and clustering patterns, while rated scenic areas and the regional road network were incorporated as supporting spatial information for planning interpretation. The results reveal a pronounced core–periphery structure. The culinary POIs are mainly concentrated in the northeastern plain and hilly areas, with relatively sparse distributions in the southwestern mountainous region. Shizhong and Emeishan constitute the dominant culinary cores, together accounting for 68.9% of all POIs. Five of the six culinary categories exhibit a broadly northwest–southeast orientation, and high-density clusters are mainly concentrated in central Leshan and Emeishan, with progressively lower densities toward peripheral mountainous counties. Based on these patterns, a "Dual-core, One Ring, and Three Belts" spatial framework is proposed to strengthen connections among culinary clusters, scenic attractions, and transport corridors. The study demonstrates how fine-scale culinary POI analysis can support destination-scale spatial organization and provides practical implications for more connected and spatially differentiated culinary tourism planning.

Keywords: Culinary tourism, Local culinary resources, Spatial pattern, Spatial planning, Leshan.

Research Article / *Received: 21 September 2026, Accepted: 23 October 2026, Published Online: 12 November 2026.*

1. Introduction

Food has become an increasingly important component of destination experience, providing visitors with a direct means of engaging with local culture, heritage, identity, and everyday life. Recent research has consequently positioned gastronomic and culinary tourism as an important field linking tourism experience with cultural preservation, sustainable development, and destination differentiation (Dordai et al., 2026). Empirical studies further show that gastronomy can constitute a significant travel motivation and an important element of the urban tourism experience, particularly where visitors seek traditional foods, local ingredients, and culturally distinctive dining experiences (Moura et al., 2025; Pinke-Sziva et al., 2025). Food-related motivations, culinary destination image, involvement, and experience have also been associated with tourists' travel intentions and destination loyalty (Luong & Nguyen, 2025, 2026). Local culinary resources should therefore be regarded not merely as supporting services for tourists, but as place-based resources capable of contributing to destination experience and development.

Recent culinary-tourism research has increasingly emphasized authenticity, memorable experience, destination image, and the cultural meanings attached to local food. Digital communication can shape both food image and destination perceptions (Babalou et al., 2026), while memorable local-food experiences contribute to destination image and tourists' subsequent behavioral responses (Eviana & Yusrini, 2025). Research on regional food festivals likewise

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https://doi.org/10.56479/ijgr-96

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highlights the importance of the material and geographic embeddedness of food authenticity (Yoo, 2026). Other recent studies show that culinary experiences involving traditional food, cultural connection, ambience, and authenticity can strengthen tourist satisfaction and destination branding (Ruliya et al., 2026), while a systematic review identifies sensory experience, authenticity, social interaction, local culture, novelty, and meaningfulness as major components of memorable gastro-tourism experiences (García-Pérez & Castillo-Ortiz, 2024). Moreover, emerging research on multiday food tours indicates that tourists place considerable value on local, authentic, distinctive, and spatially connected food experiences (Matysiak & Stone, 2026). Together, these studies demonstrate the growing importance of local cuisine in tourism, but most approach culinary tourism primarily from the perspectives of tourist perception, motivation, experience, or behavioral intention.

In parallel, advances in geospatial big data have created new opportunities to examine the spatial organization of food and tourism resources. Point-of-interest (POI) data provide fine-grained information on the locations and categories of establishments and are increasingly used to identify spatial concentration, functional association, and regional differentiation. Recent research using restaurant POIs in Shanghai and New York demonstrates that restaurant locations are closely embedded within broader urban functional structures (Hu et al., 2025). Studies in the Guangdong–Hong Kong–Macao Greater Bay Area and Nanjing further reveal substantial spatial agglomeration of food services and spatial heterogeneity in their relationships with surrounding urban functions (Tan & Bu, 2025; Wang et al., 2025).

Within tourism geography, recent POI-based studies have examined the coupling of tourism resources with urban development (Wu et al., 2025), reconstructed regional tourism spatial structures by integrating resource concentration and spatial connectivity (Song et al., 2025), and identified clustering and directional patterns of tourism attractions through density analysis and Standard Deviational Ellipses (Ding et al., 2024; Jiang et al., 2024). At a finer scale, distance-aware planning for culinary walking tours also demonstrates the practical importance of connecting food establishments through feasible spatial routes (Fukuda et al., 2026). These advances confirm the value of geospatial approaches for tourism and food-service analysis.

Nevertheless, the culinary-tourism and spatial-analysis literatures remain only partially integrated. Recent culinary-tourism studies predominantly examine tourist experience and behavioral outcomes, whereas spatial studies of food establishments commonly treat restaurants or catering services as broad functional categories. Comparatively less attention has been given to the spatial differentiation of multiple locally distinctive food categories within the same tourism destination, or to translating their concentration, directional tendency, and density patterns into a regional culinary-tourism planning framework. This distinction is important because local specialties may differ in geographic reach and clustering patterns, while their tourism potential also depends on their spatial relationships with attractions, urban centers, and transport corridors. Examining these categories separately can reveal spatial differences that are obscured when food establishments are treated as a single category. Linking such differences with scenic areas and transport corridors can also provide a more differentiated spatial basis for culinary tourism planning.

From a spatial planning perspective, local culinary establishments represent place-based resources whose geographic concentration can indicate potential culinary tourism clusters. Scenic attractions provide important tourism nodes, while road networks offer spatial connections between culinary clusters and surrounding destinations. Considering these spatial elements together can provide a basis for identifying differentiated planning priorities and organizing culinary tourism resources at the regional scale. In this study, these relationships are examined from a descriptive spatial perspective rather than through causal or accessibility modeling.

A related study by Xia et al. (2026), conducted within the same research project, examined culinary tourism competitiveness at the block scale in Leshan. That study identified culinary blocks from spatial concentrations of food establishments and evaluated their relative competitiveness by integrating supply conditions, demand perceptions, and online-review-based experiential diagnostics. In contrast, the present study focuses on the municipality-wide spatial organization of six representative local culinary categories. It compares their directional tendencies, spatial dispersion, and density patterns and further translates these patterns into a regional culinary-tourism planning framework. Thus, the present study addresses a different research gap: how multiple locally distinctive food categories are spatially differentiated across an entire destination and how these differences can inform regional-scale culinary tourism planning. The two studies partially share the same project

database, including administrative boundaries, local culinary POIs, scenic areas, and road networks, but differ in research questions, analytical units, methods, and outputs.

Leshan provides a suitable case for addressing this gap because a distinctive local food culture coexists with major heritage attractions, while substantial contrasts in terrain, settlement patterns, tourism resources, and accessibility occur between the northeastern plain and hilly areas and the southwestern mountainous counties. Accordingly, this study uses 2,234 POIs representing six characteristic local food categories to examine the spatial organization of culinary resources in Leshan. Specifically, Standard Deviational Ellipse and Point Density analyses are employed to: (1) characterize the geographic concentration, directional tendency, and spatial dispersion of local culinary POIs; (2) identify major culinary clusters and regional differences in resource density; and (3) interpret these spatial patterns in conjunction with rated scenic areas and the regional road network to derive differentiated planning implications for culinary tourism. By connecting fine-scale culinary POI patterns with destination-scale spatial organization, this study seeks to extend the geographic perspective of culinary-tourism research and provide a spatial basis for coordinating local food resources, tourism attractions, and transport corridors.

2. Study area

Leshan is located in central Sichuan Province, within the southwestern Chengdu Plain Economic Zone, and lies at the transition between the Sichuan Basin and the mountainous region of southwestern Sichuan (Figure 1).

It borders Meishan to the north, Zigong and Yibin to the east, Liangshan to the south, and Ya'an to the west. The city combines major heritage attractions with a distinctive regional food culture. Mount Emei-Leshan Giant Buddha is recognized as a World Cultural and Natural Heritage Site, while Dongfeng Weir is designated as a World Heritage Irrigation Site. Leshan cuisine is rooted in Sichuan culinary traditions and is characterized by aromatic seasonings, layered flavors, and diverse preparation techniques. Representative specialties include Qiaojiao Beef, Malatang, Bobo Chicken, Sweet-skinned Duck, Tofu Pudding, Leaf Dumplings, Deep-fried Snack, and Ice Jelly. The spatial analysis in this study focuses on six categories for which POI datasets were compiled: Qiaojiao Beef, Malatang, Bobo Chicken, Sweet-skinned Duck, Tofu Pudding, and Deep-fried Snack.

3. Methodology

This study adopts a quantitative, exploratory case-study design to examine the spatial organization of local culinary resources in Leshan. The analysis is based on 2,234 points of interest (POIs) representing six local culinary categories. Standard Deviational Ellipse (SDE) analysis is used to characterize spatial distribution and directional tendencies, while Point Density analysis identifies areas of culinary resource concentration. The resulting spatial patterns are interpreted alongside the distributions of rated scenic areas and the regional road network to inform a regional culinary tourism planning framework. The study is descriptive and planning-oriented rather than intended to establish causal relationships.

3.1. Standard Deviational Ellipse

The Standard Deviational Ellipse (SDE) method (Lefever, 1926) was employed to examine the spatial distribution, dispersion, and directional characteristics of culinary POIs. The analysis was performed using the built-in Directional Distribution (Standard Deviational Ellipse) tool in ArcGIS Pro 2.5.

This method determines the mean center of the spatial distribution and calculates the standard deviations along the principal axes of the ellipse based on the covariance structure of the spatial coordinates. The orientation of the ellipse reflects the dominant direction of the spatial distribution, while the lengths of its major and minor axes characterize the degree of spatial dispersion. All SDE parameters and resulting ellipses were calculated directly using ArcGIS Pro, following the methodology documented by Esri (n.d.).

3.2. Point Density Analysis

Point Density analysis was used to characterize local concentrations of culinary POIs. For each raster cell, the number of points within a defined neighborhood was divided by the neighborhood area to obtain a density value. This approach provides a direct representation of the intensity and spatial continuity of local food clusters. In this study, Point Density was used to identify areas with different levels of concentration of local culinary resources (Jiang et al., 2024):

$$D = \frac{N}{S}$$

where D represents the density of local culinary POIs at a given location, N is the number of POIs within the specified neighborhood, and S is the area of that neighborhood.

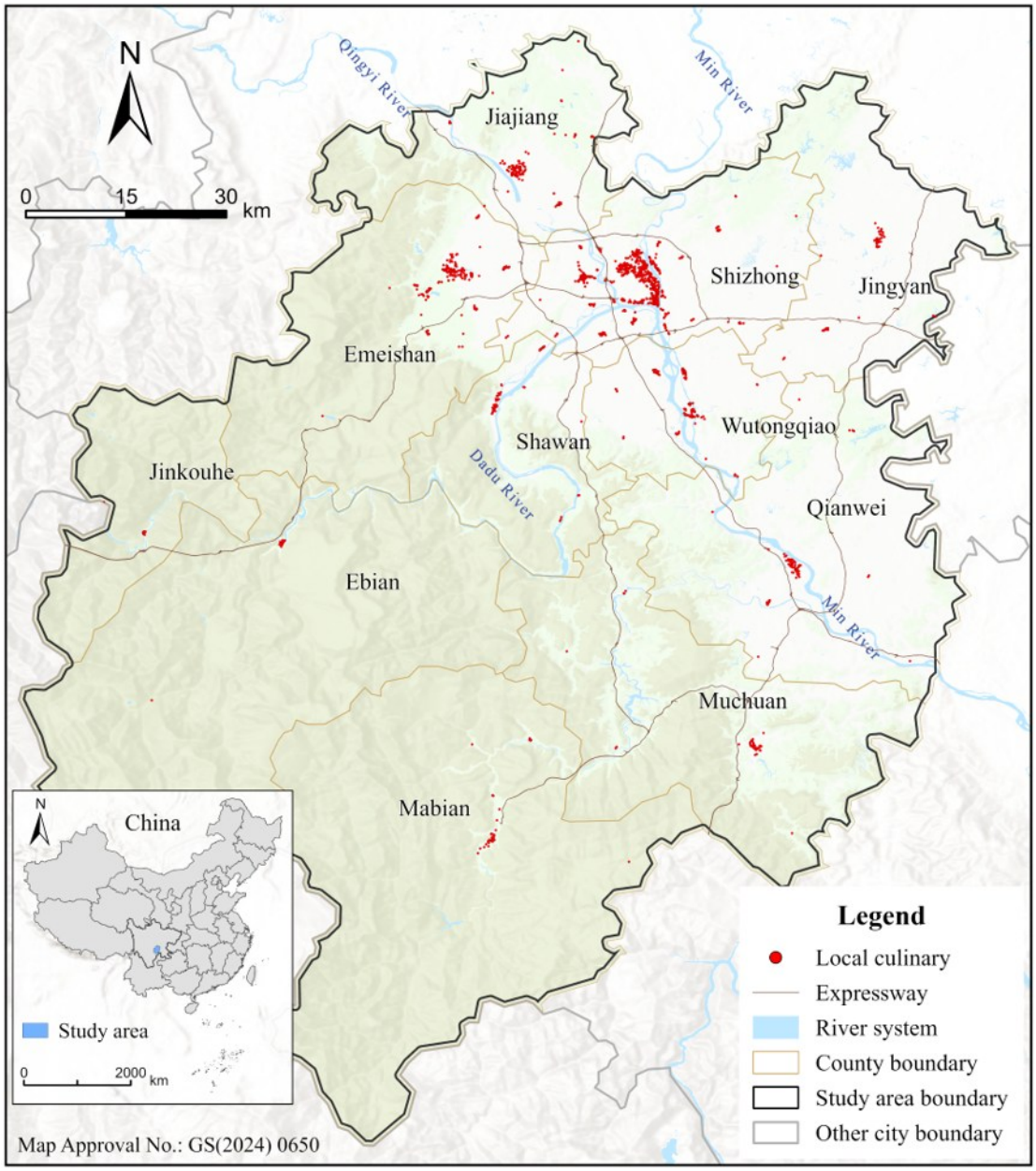


Figure 1. Study area and distribution of local culinary POIs.

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4. Data Sources and Processing

All spatial datasets were standardized to the CGCS2000 / 3-degree Gauss–Krüger zone 34 projected coordinate system (central meridian: 102°E; linear unit: meter). All spatial analyses, including Standard Deviational Ellipse (SDE) and Point Density analyses, were performed using ArcGIS Pro 2.5.

4.1. Administrative division data

Administrative boundary data for Sichuan Province, Leshan, and its county-level units were obtained from the National Platform for Common GeoSpatial Information Services (https://www.tianditu.gov.cn/), with map approval number GS(2024) 0650. The dataset used the CGCS2000 geographic coordinate system. The original GeoJSON files were converted to shapefiles using ArcGIS Pro 2.5.

4.2. Local culinary POI data

A Python script was used to query the Amap API (https://www.amap.com/) and collect POIs corresponding to six representative types of local food establishments. These categories were selected for their strong association with Leshan's local cuisine and relatively large POI samples; Leaf Dumplings and Ice Jelly were excluded because they are also common in other regions and had fewer POIs in Leshan.

Each POI represented an individual food establishment. The POI data were collected in July 2025 using the search terms "翘脚牛肉" or "跷脚牛肉", "麻辣烫", "钵钵鸡", "甜皮鸭", "豆腐脑", and "油炸". Only establishments located in Leshan and identifiable by name and principal food offering as belonging to one of these six categories were included. Each POI record was individually checked for duplication based on establishment name, address, and coordinates, and for location accuracy by comparison with Amap. Duplicate records were removed, and inaccurate locations were corrected. Establishments offering multiple specialties were assigned to only one category according to their name and principal food offering. The operating status of individual establishments was not independently verified.

The POI records included establishment names, addresses, coordinates, and per-capita consumption prices; the present spatial analysis uses their geographic locations. A total of 2,234 POIs were included: 547 Qiaojiao Beef establishments, 338 Malatang establishments, 153 Bobo Chicken establishments, 324 Sweet-skinned Duck establishments, 342 Tofu Pudding establishments, and 530 Deep-fried Snack establishments.

4.3. Scenic area data

The list of rated scenic areas was obtained from the Sichuan Provincial Department of Culture and Tourism (https://wlt.sc.gov.cn/). The dataset included the names and addresses of two 5A-rated, 16 4A-rated, and 14 3A-rated scenic areas. The Geocoder service of the Baidu Maps API (https://map.baidu.com/) was used to convert scenic-area addresses into geographic coordinates.

4.4. Road network data

Road data were obtained from OpenStreetMap (https://www.openstreetmap.org/) and included expressways, arterial roads, major roads, and minor roads. Road network data were used as supporting spatial layers when interpreting the distribution of culinary resources and formulating the spatial planning framework in Section 5.3.

5. Results

5.1. Spatial distribution patterns of local culinary POIs

The 2,234 culinary POIs exhibited a pronounced spatial imbalance, with establishments mainly concentrated in the northeastern plain and hilly areas and relatively sparse distributions in the southwestern mountainous region (Figure 2). At the county level, Shizhong contained 1,242 POIs and Emeishan 298, together accounting for 68.9% of the total. Wutongqiao (157), Jiajiang (160), and Qianwei (112) formed a second tier. Fewer POIs were found in Shawan (67), Jingyan (64), Muchuan (47), and Mabian (53), while Ebian (21) and Jinkouhe (13) had the smallest numbers.

The SDE results show that the mean centers of the six categories were concentrated in or near Angu Town in Shizhong, close to the confluence area of the Min, Dadu, and Qingyi Rivers. The category-specific mean centers were separated from the overall center by approximately 0.29-5.29 km. Five of the six food categories exhibited a broadly northwest-southeast orientation, whereas Malatang showed an approximately north-south distribution, with its major axis deviating by about 2° west of due south. Across the municipality, POIs were concentrated in urban centers and town markets and were relatively sparse in rural areas. At the macro scale, the distribution was centered on Shizhong and extended outward along major river and road corridors; at the local scale, clusters were commonly associated with commercial centers and tourist attractions.

Table 1. Number and proportion of local culinary POIs by administrative area in Leshan

Administrative area	*Number of POIs*	*Proportion (%)*
Shizhong	1242	55.6
Emeishan	298	13.3
Jiajiang	160	7.2
Wutongqiao	157	7.0
Qianwei	112	5.0
Shawan	67	3.0
Jingyan	64	2.9
Mabian	53	2.4
Muchuan	47	2.1
Ebian	21	0.9
Jinkouhe	13	0.6
Total	2234	100.0

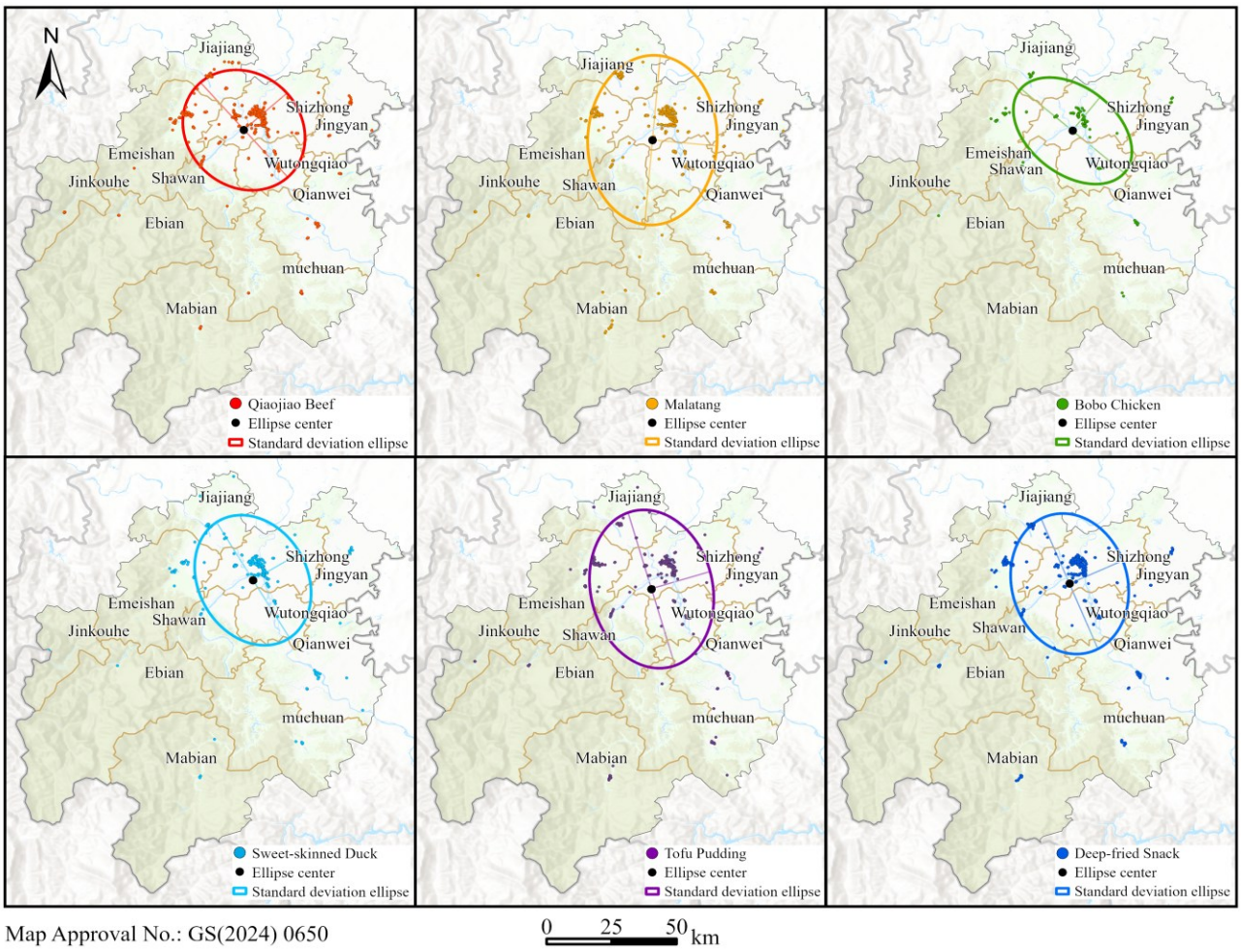


Figure 2. Spatial distribution and standard deviational ellipses of the six local culinary POI categories.

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5.2. Density patterns of local culinary POIs

Point Density analysis was performed using the Point Density tool in ArcGIS Pro 2.5, with a cell size of 100 m and a search radius of 300 m. The 300 m search radius was selected to balance the representation of local culinary concentrations and the spatial continuity of density patterns. Density values were classified into five classes using the Jenks natural breaks method (Figure 3a). These parameters were used to visualize local spatial concentrations and the overall distribution patterns of culinary POIs, rather than to estimate precise density values or define statistically significant cluster boundaries. The very high-density clusters occurred in central Leshan, particularly around Dongda Street, Shangzhongshun, Zhanggong Bridge, and Suji Town (Figure 3b). Emeishan formed another major high-density cluster (Figure 3c). Medium-density clusters were identified around Niuhua Town in Wutongqiao, Qianwei, and Jiajiang. Relatively low POI densities were observed in Jingyan, Shawan, Muchuan, and Mabian, with particularly sparse distributions in Ebian and Jinkouhe. Extensive rural areas contained few or no sampled food establishments. Overall, the density surface reinforces the core–periphery pattern observed in Section 5.1: strong concentration in Shizhong and Emeishan, intermediate clustering in adjacent counties, and sparse distribution across the southwestern mountainous counties.

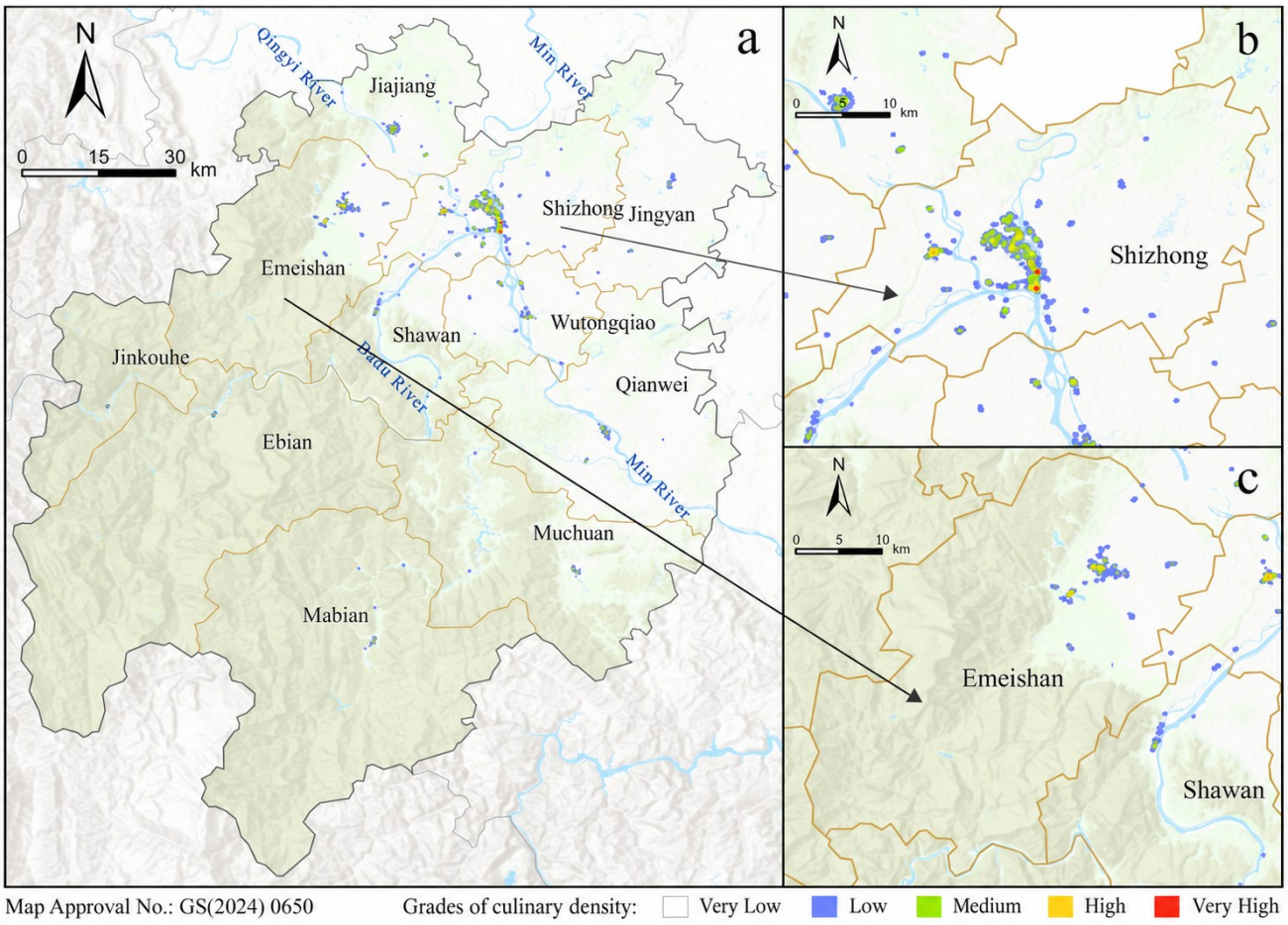


Figure 3. Spatial density patterns of local culinary POIs in Leshan.

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5.3. Spatial planning implications for local culinary tourism

5.3.1. Dual-core, One Ring, and Three Belts

Based on the spatial distribution and density patterns identified above, together with the distribution of rated scenic areas and the regional road network, a “Dual-core, One Ring, and Three Belts” spatial planning framework is proposed to organize Leshan's local culinary tourism resources (Figure 4). This framework represents a planning interpretation informed by the observed spatial patterns rather than a quantitatively derived or empirically validated spatial model.

The proposed framework considers three main spatial elements: the concentration of local culinary POIs, the distribution of rated scenic areas, and the regional road network. The two cores are identified based on the major concentrations of culinary establishments and tourism attractions. The ring is proposed to coordinate the county-level areas surrounding the central core, while the three belts are organized along major road corridors to connect the central culinary clusters with peripheral counties and tourism resources. These components reflect spatial planning considerations rather than predefined quantitative thresholds. The five ring areas were selected based on their geographic positions surrounding the two cores. The ring and three belts shown in Figure 4 are schematic planning elements informed by the locations of county seats, major road corridors, and rated scenic areas, rather than routes derived through network analysis.

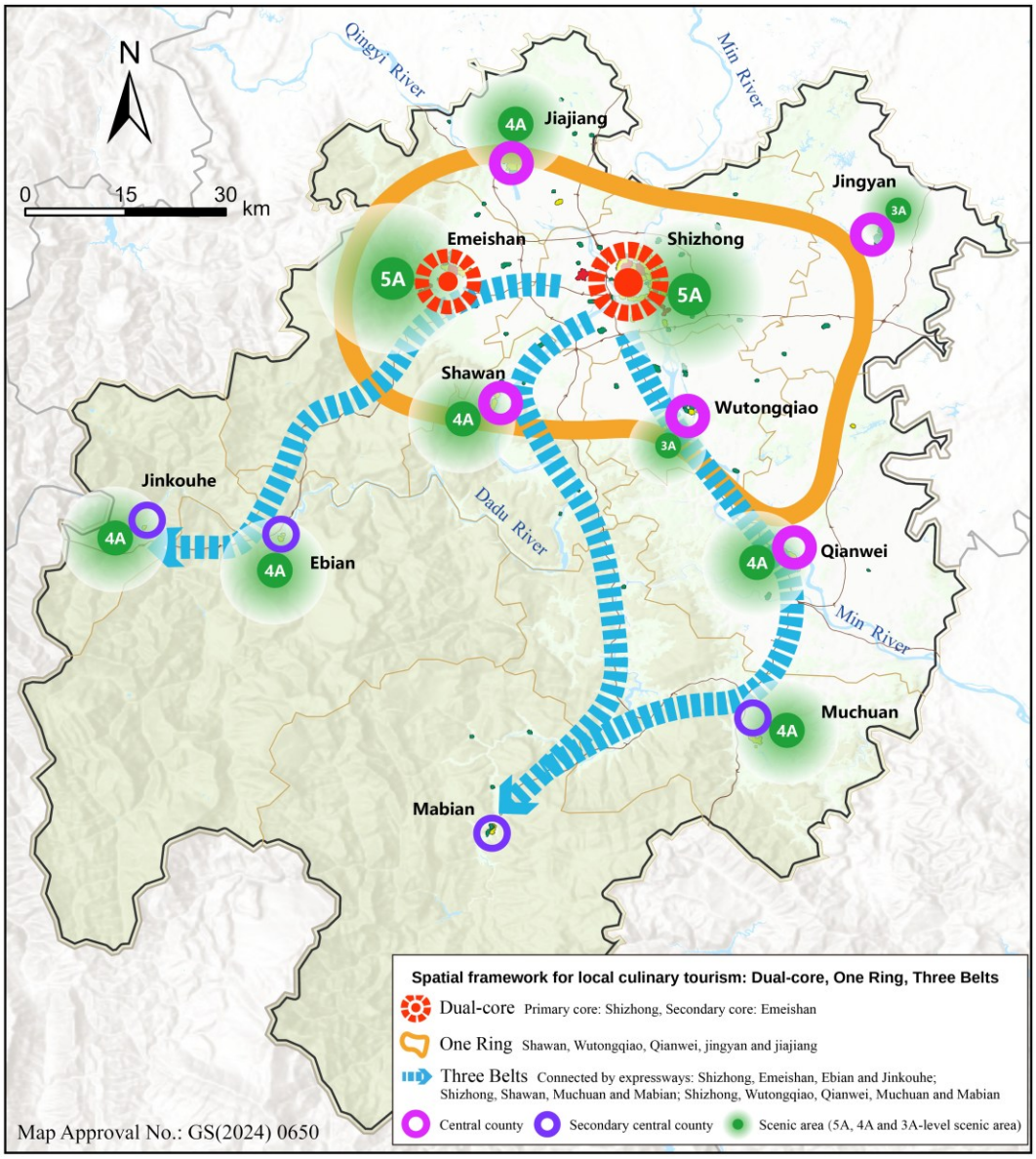


Figure 4. Proposed spatial framework for local culinary tourism in Leshan.

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The "Dual-core" consists of Shizhong as the primary core and Emeishan as the secondary core. These two areas contain the strongest concentrations of local culinary POIs and also host Leshan's two 5A-rated scenic areas, the Leshan Giant Buddha and Mount Emei. The "One Ring" links the five county-level areas surrounding the central core—Shawan, Wutongqiao, Qianwei, Jingyan, and Jiajiang—and functions as a near-core coordination zone. The "Three Belts" extend southwestward along major expressway corridors: (1) Shizhong-Emeishan-Ebian-Jinkouhe; (2) Shizhong-Shawan-Muchuan-Mabian; and (3) Shizhong-Wutongqiao-Qianwei-Muchuan-Mabian. Together, these corridors provide a spatial structure for linking the central culinary clusters with scenic areas, county seats, and town-level food resources in the mountainous southwest.

5.3.2. Differentiated planning priorities

The two core areas should prioritize the integration of local food experiences with established tourism

itineraries. In Shizhong and Emeishan, planning should strengthen connections among high-density culinary clusters, major scenic areas, public transport, parking, and pedestrian spaces, while encouraging the preservation and presentation of locally distinctive food culture. Because these areas already concentrate both culinary POIs and high-level attractions, the emphasis should be on improving the quality, diversity, and spatial connectivity of existing offerings rather than simply expanding the number of establishments.

Within the One Ring, development priorities should differ according to each county's existing tourism base and culinary-resource density. Wutongqiao, Qianwei, and Jiajiang can use their existing local food clusters as intermediate nodes between the two cores and surrounding counties. Wutongqiao and Jingyan, which lack 4A-rated scenic areas in the dataset used here, should place greater emphasis on local cultural attractions, town-level food streets, and short-distance itineraries that combine dining with nearby leisure activities. Improved road connections and coordinated promotion with the core tourism areas could help distribute visitor activity more widely across the ring.

The Three Belts should focus on corridor-based development linking peripheral counties with the central urban area. In Ebian, Jinkouhe, Muchuan, and Mabian, existing local culinary establishments may complement tourism experiences, while scenic areas and county or town centers can serve as corridor nodes. Transport improvements should prioritize connections from expressways to county seats, towns, scenic areas, and food clusters.

Mabian, which has no scenic area rated 3A or above in the current dataset, requires particular attention to local attraction development and promotion. Yanfengzhai Scenic Area and the Dafengding National Nature Reserve may serve as potential anchors, provided that tourism use remains compatible with conservation requirements. Across the southwestern counties, dispersed town-level food establishments should function as complementary nodes; improved signage, parking, service quality, and visitor facilities would strengthen their accessibility within regional routes.

Overall, the proposed framework emphasizes differentiated spatial organization: consolidating high-density cores, coordinating near-core counties, and improving corridor connections to peripheral mountainous areas. Its purpose is to support a more balanced and connected distribution of local culinary tourism resources across Leshan.

6. Discussion

The spatial distribution of local culinary resources in Leshan exhibits a pronounced core–periphery structure. Most culinary POIs are concentrated in the northeastern plain and hilly areas, particularly in Shizhong and Emeishan, whereas the southwestern mountainous counties contain substantially fewer establishments. This pattern may reflect the broader spatial organization of population, commercial activities, tourism, and transport networks. Urban centers and county seats may provide more concentrated consumer markets and commercial services, while mountainous areas may face greater spatial constraints and longer travel costs. The observed distribution should therefore be understood not simply as the geographic pattern of individual food establishments, but as part of the wider urban–tourism spatial structure of Leshan.

This finding is broadly consistent with previous POI-based studies showing the spatial agglomeration of restaurants and food services within urban functional structures (Hu et al., 2025; Tan & Bu, 2025; Wang et al., 2025). However, whereas these studies primarily examined restaurants or food services as general functional categories, the present study focuses on locally distinctive culinary categories within a tourism destination, providing a more differentiated perspective on their spatial organization.

Tourism resources appear to reinforce this spatial concentration. Shizhong and Emeishan contain both the highest concentrations of culinary POIs and Leshan's two 5A-rated scenic areas, indicating substantial spatial proximity between major tourism attractions and local food clusters. Culinary experiences can complement sightseeing by extending tourist activities beyond scenic areas into surrounding commercial districts and urban spaces. At the same time, the presence of medium-density clusters in Wutongqiao, Qianwei, and Jiajiang indicates that culinary tourism is not restricted to the two principal tourism centers. These secondary clusters may function as intermediate nodes connecting established destinations with surrounding counties, providing a spatial basis for a more distributed culinary tourism network. Previous culinary tourism studies have emphasized the importance of memorable food experiences and their relationships with destination image and tourist behavior (Eviana & Yusrini, 2025; García-Pérez & Castillo-Ortiz, 2024). Complementing this experience-oriented perspective, the present study examines the spatial distribution of local culinary establishments, providing a supply-side understanding

of how culinary resources are organized within a tourism destination.

The directional and density patterns further highlight the importance of spatial connectivity. Five of the six culinary categories show a broadly northwest–southeast orientation, and the overall distribution extends outward from the central urban area along major river and road corridors. This correspondence suggests that transport corridors facilitate the spatial connection between culinary-resource concentrations, tourist attractions, and peripheral destinations.

From this perspective, the proposed "Dual-core, One Ring, and Three Belts" framework translates the observed core–periphery pattern into a regional spatial structure: the two cores consolidate existing concentrations, the ring strengthens coordination among near-core counties, and the three corridors improve connections with the southwestern mountainous areas. Rather than promoting uniform expansion, culinary tourism planning should therefore respond to differences in resource concentration, tourism conditions, and accessibility among different parts of Leshan. Previous research on culinary walking tours has highlighted the importance of spatial connections among food establishments in tourism route planning (Fukuda et al., 2026). Building on this spatial planning perspective, the present study considers culinary resource concentrations, scenic attractions, and transport corridors at the regional scale, offering a broader planning interpretation rather than an empirically validated route-optimization model.

For Leshan, the concentration of culinary establishments in Shizhong and Emeishan suggests that culinary tourism development should prioritize integrating existing food clusters with major tourist attractions, while the more dispersed resources in peripheral mountainous counties call for improved connections between smaller culinary nodes and regional tourism routes. Although the specific "Dual-core, One Ring, and Three Belts" framework reflects Leshan's particular spatial characteristics, the broader planning approach may offer insights for other culinary tourism destinations. In particular, identifying differences in culinary resource concentration and considering their spatial relationships with tourist attractions and road networks can help inform differentiated culinary tourism planning. However, these implications should be understood as planning considerations rather than empirically demonstrated tourism development outcomes.

Several limitations should be acknowledged. First, POI data represent registered food establishments and may not fully capture informal vendors, temporary businesses, or changes in business operation over time. Second, this study primarily identifies spatial distribution and density patterns; although scenic areas and road networks were incorporated as supporting spatial information, their effects on culinary POI distribution were not statistically tested. Consequently, the relationships discussed above should be interpreted as spatial associations rather than causal effects. County-level POI counts were not normalized by population or area and therefore reflect concentrations in the absolute number of establishments rather than relative levels of culinary provision.

As the operating status of individual establishments was not independently verified, some POI records may represent businesses that were no longer operating at the time of data collection. In addition, uneven coverage of the Amap platform may lead to the underrepresentation of culinary establishments in rural and remote areas. As the Point Density analysis was intended primarily for descriptive visualization, comparisons using search radii of 200, 300, and 500 m showed similar overall spatial patterns despite differences in density values. Future research could incorporate population, tourist flows, commercial activity, transport accessibility, and temporal POI data into spatial regression or other explanatory models to examine the mechanisms underlying culinary-resource agglomeration and their evolution over time.

7. Conclusion

This study examined the spatial distribution of six representative local culinary POI categories in Leshan using Standard Deviational Ellipse and Point Density analyses. The results reveal a pronounced spatial imbalance, with culinary POIs mainly concentrated in the northeastern plain and hilly areas and relatively sparse distributions in the southwestern mountainous region. Shizhong and Emeishan form the dominant culinary cores, together accounting for 68.9% of all POIs. Five of the six food categories exhibit a broadly northwest–southeast distribution, whereas Malatang shows an approximately north–south orientation. Density analysis further confirms a clear core–periphery pattern, with strong clustering in central Leshan and Emeishan, intermediate concentrations in adjacent counties, and sparse distributions in the southwestern mountainous areas.

Based on these spatial characteristics, this study proposes a "Dual-core, One Ring, and Three Belts" framework for the spatial organization of culinary tourism in Leshan. Shizhong and Emeishan serve as the two principal cores, the surrounding counties form a near-core coordination ring, and three transport-oriented corridors extend toward the southwestern mountainous counties. This framework emphasizes differentiated development rather than uniform expansion: consolidating existing high-density clusters, strengthening coordination among near-core counties, and improving connections between peripheral food resources, scenic areas, and transport corridors.

By integrating fine-scale culinary POI analysis with destination-scale spatial planning, this study provides a geographic perspective on the organization of local food resources within a regional tourism system. The findings highlight the importance of considering spatial concentration, tourism-resource distribution, and accessibility when planning culinary tourism. Future studies should incorporate temporal POI data, tourist flows, population, commercial activity, and quantitative accessibility indicators to further examine the mechanisms underlying culinary-resource agglomeration and spatial change.

Acknowledgements

The authors would like to acknowledge the support provided by the Leshan Flavor Culinary Culture Inheritance and Innovation Research Center and the Sichuan Tourism Development Research Center.

Declarations

Competing Interests

The authors declare that they have no financial or non-financial competing interests.

Funding

This work was supported by the Leshan Flavor Culinary Culture Inheritance and Innovation Research Center under the Key Research Project (Grant No. LSWD-ZD-001) and by the Sichuan Tourism Development Research Center, Key Research Base of Philosophy and Social Sciences of Sichuan Province, under the General Research Project (Grant No. LY25-13).

Ethics Statement

This study was conducted following the principles of ethical research.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to applicable third-party licensing and data-sharing restrictions.

AI statement

The generative AI tool (ChatGPT) was used only in a limited and controlled manner for language editing. All content was reviewed and approved by the authors.

Author Contributions

J. Xia: Project Administration, Supervision, Funding Acquisition, Methodology, Formal Analysis, Writing–original draft, Writing–review & editing.
Y. Wang: Investigation, Conceptualization.
L. Zhu: Data Curation, Visualization, Software.
K. Wei: Resources, Validation.

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