Research article

Visitor preferences in rural gastronomic tourism environment and the related design implications

Mian Yang [a,b], Jian Qiu [a,*], Keying Ding [c], Sining Zhang [a], Wenjie Fan [b]

[a] Southwest Jiaotong University, 610000, Chengdu, China
[b] Sichuan Tourism University, 610000, Chengdu, China
[c] Sichuan Agricultural University, 610000, Chengdu, China

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ABSTRACT

Since COVID-19, people have suffered tremendous impacts in all aspects of their lives and work, with subtle changes in their environment preferences. The rural areas, with their natural green space, low density, and leisurely habitat, have played an important role after the pandemic and are widely favored by people. Research on rural environments after COVID-19 has received much attention. In the wake of the pandemic, people's needs for the environment have changed not only in terms of physical space, but also in terms of psychological needs. To address the issue of adaptability and resiliency of the future tourism development of the rural areas, this study takes the real subjective feelings of rural visitors as the evaluation standard, and takes the rural gastronomic tourism environment as the research object. We analyzed a sample of 14,373 images and 324,676 comments in Chinese posted by 3484 visitors on social media to explore whether and how people's preferences for rural environments have changed since the pandemic. Findings revealed significant differences in preference for the rural gastronomic tourism environment factors before and after the pandemic. There is variability in environment preferences depending on different gender, environment flexibility and the region. From the perspective of the rural gastronomic tourism environment, the research results provide suggestions for rural planning and rural tourism sustainability, and provide feasible paths for sustainable development and conservation of rural landscapes oriented to human needs, to enhance the resilience and sustainability of rural environments in the future.

1. Introduction

With the decline of the traditional agricultural industry, rural tourism has become one of the most popular rural development strategies [1]. Rural tourism can be a very effective tool for rural development and for strengthening the image and local identity of a destination [2], and has been considered as an important tool for cultural preservation, economic development and sustainable development in rural areas [3].

As global participation and interest in gastronomic tourism grows, more studies have noted that unique local food traditions (e.g., rural gastronomic heritage) can help make the rural villages more appealing [4]. Rural development, rural tourism and gastronomic tourism are increasingly linked [5], and the perceptions of tourists are important factors in determining the success of gastronomic

tourism [6]. Therefore, it is necessary for rural gastronomic tourism to be rationally planned according to the tourists' motivation for travelling.

Gastronomic tourism encompasses a wide variety of experiences, including aspects such as food tours, cooking classes, wine tastings, market experiences, cookery competitions, food festivals, visits to producers, farms, factories and gardens, and more recently, the introduction of culinary holidays [7]. There is a large amount of literature studying the relationship between gastronomic tourism and food, and it has become a dominant area of research. Gastronomic tourism also is inevitably linked to rural landscapes and together they convey the concept of the rural "idyll" as a magnet for urban tourists [4]. It shows the importance of the gastronomic tourism environment. To our knowledge, there is very little existing literature that studies the landscape environments of rural gastronomic tourism [5]. Multi-disciplinary research avoids presenting an inward-looking field of study that ignores relevant debate and dialog [8]. Therefore, it is necessary to understand the environment preferences of tourists in rural gastronomic tourism.

Since COVID-19, all aspects of human life have been greatly affected [9]. Tourist preferences have changed due to the psychological paradigm shift in tourists' perceptions of safety, health and tourism risks [10]. One result is a growing demand for rural destination experiences among city dwellers [11]. The crisis is an opportunity to rethink existing rural tourism policies and redefine tourism development paths.

Despite the fact that the pandemic has been studied from different perspectives, there is still a paucity of research on the effects of tourists' food-related behaviors [12]. We need to focus not only on how to reshape our existing environment to cope with future virus attacks after a pandemic, but also to conduct a more detailed analysis of who are the real "visitors" and understand the differences in the needs of these "visitors" for green space before and after the pandemic. Changes in tourists' food motivations and consumption behavior have been identified [13], but most of the research has been on the effects of preference for the food itself. In looking at popular destinations after the pandemic, whether and how tourists' preferences in rural gastronomic tourism environments have changed is the concern of this study.

Using the example of a tourist destination that enjoys local food and leisure in a rural natural environment, we have analyzed what specific changes occurred in tourists' environmental preferences before and after the pandemic. The theoretical and practical value of this is as follows.

a) What are the changes in environment preferences for rural gastronomic tourism after a pandemic and the possible reasons for them to provide a refined reference for rural planning and design post-pandemic.
b) Based on tourists' rural gastronomic environment preferences, to provide recommendations for landscape design and planning in rural villages, in order to enhance the resilience of rural landscapes after the pandemic.
c) To make conservation and planning recommendations for rural landscape factors that are in need of tourists after the pandemic.
d) To provide managers with approaches to environment satisfaction enhancement after the pandemic in order to improve the competitiveness of rural gastronomic tourism destinations.

2. Literature review

2.1. Rural gastronomic tourism environment

Food has always been an integral part of tourism. Its importance has increased in recent years, especially in rural areas. It can play an important role in rural tourism and appeals to the desire for authenticity among tourists [14]. Gastronomic tourism, with its unpredictable appeal, is so prominent in contemporary tourism that it has become the basis of many policy and industry strategies and agendas [5].

'Gastronomic', 'culinary', 'cuisine' or 'food' tourism all refer to the same type of tourism. Some authors define gastronomic tourism as the type of tourism "where the main purpose of the trip is food". Others define it as "visits to primary and secondary food producers, food festivals, restaurants and specific locations, where tasting food and/or experiencing the attributes of specialized food-producing areas are the main motivation for travel" [13]. This study adopts the latter definition, focusing on the 'location'.

Understanding tourists' preferences is a key to improving the competitiveness of tourism [15]. Different gastronomic destinations have their own unique culinary cultures and environments. Henderson et al. [16] suggested that food can be a major attraction and even a major motivator for travelling. Dimitrovski [17] found four determinants of gastronomic tourism in Spain: interaction with local producers and suppliers, sensory attraction, local food experiences, and concern for healthy eating. Kim [18] analyzed British tourists' motivations for Korean food, including cultural experience, excitement, sensory attraction, interpersonal relationships, and health issues. Popular gastronomic tourism studies such as wine (Italy, Portugal, New Zealand), champagne, cheese (France, Italy, Spain) and beer (Germany, Czech Republic) have differences in tourists' motivations for travelling. The attraction for tourists to visit rural areas to experience gastronomic tourism is not only the food itself, but also the rural environment. Blekesaune [19] found that the main motivation for tourists in Norway is to get in touch with nature and enjoy the countryside and the environment. Fountain's [13] research in New Zealand has also identified the need to integrate gastronomic tourism more broadly in terms of its role in culture, lifestyle and environment, so that people can 'taste place'. It can be seen that different rural gastronomic tourism environments may have their own unique tourism attractions.

In the study of gastronomic environment, Mehta et al. [20] found that the physical environment and the quality of service are important factors in customers' decision to visit a restaurant. Comfortable physical environment largely determines overall customer satisfaction and generated loyalty [21]. Ryu et al. [22] categorized DINESCAPE into six dimensions: facility aesthetics, lighting, ambiance, layout, table settings, and service staff. Luo et al. [23] divided the environment into three dimensions (quality and distance,

image and atmosphere, landscape elements) and concluded that the landscape elements dimension has the greatest impact on consumer satisfaction.

Gastronomic tourism research is growing exponentially, but there is a large variation between the different disciplinary areas of focus, with little dialog in the landscape disciplinary areas [8]. The six focus areas are gastronomic heritage, gastronomic experiences, wine tourism, cultural tourism, rural tourism and tourism destinations and economics, with a major concentration in the disciplines of tourism marketing and business management [5]. It is only by identifying trends and relationships between different subject areas and thematic focuses that we can understand what gastronomic tourism research is and why it has taken the current direction it has. This study is based on the professional background of landscape design combined with tourism planning, thinking about the needs of human-oriented gastronomic tourism environment and the resilience and sustainability of rural gastronomic tourism from the perspective of refinement.

2.2. Impact of the pandemic on rural gastronomic tourism

The pandemic has revealed the vulnerability of the global tourism system [24]. Meanwhile, the pandemic also offers new opportunities to reset the general tourism industry. The structure of rural tourism, in particular, should open up new and more sustainable pathways, strengthening the resilience of rural tourism in terms of sustainable development [25]. The crisis has already led to changes in the demand for green space in the short and long term [26,27]. At this point, we not only need to focus on how to reshape our existing environment after the pandemic to cope with future virus outbreaks, but also need to analyze in more detail who are the real "visitors" [28], and to understand the differences in the demand for green space before and after the pandemic.

During the pandemic, people were accustomed to engaging in recreational activities in greener, more remote areas due to the increased emphasis on physical and mental health from natural activities [27]. Here, rural destinations stand out because they offer quiet and high-quality natural life, healthy and safe products, low population density and lower risk of infection, and the opposite of the previously hectic lifestyles. Rural areas play an important role as "spaces of wellness", both in terms of physical activity and psychological healing [29]. Wojcieszak [30] points out that despite the strong impact of the pandemic on the tourism market, the solution for the restoration of tourism in certain countries lies in rural tourism, where natural values will attract tourists more strongly than before. According to Cvijanoviic et al. [31], most respondents would like to visit rural destinations. Zhu [32] compared risk knowledge, risk perception, risk averse attitudes and behavioral intentions in rural tourism in China and found that rural tourism during the pandemic had a positive impact on people's health. Rural tourism not only brings a healthy place for people's activities after the pandemic, but also brings a new opportunity for sustainable rural development.

Catering was also one of the worst affected industries, with customer satisfaction declining. Observing and interpreting the evolution of dining patterns and satisfaction of restaurant patrons during a pandemic is critical to the development of a sustainable culinary industry [33]. As the root of gastronomic tourism [34], and the core of the rural tourism structure [19], it is reasonable to assume that gastronomic tourism is the key to further enhance the competitiveness of rural tourism after the pandemic.

Sigala [35] found that the COVID-19 pandemic is not only unique compared to previous crises, but also has the potential to have far-reaching structural impacts on the tourism industry. Janssen [36] found changes in the motivations, travel behavior and patterns of gastronomic tourists. Gastronomic attractions are not able to attract as many tourists as they used to Ref. [37]. Durmaz [38] found that crowded social distances are the main reason for decreasing people's interest. In terms of the gastronomic tourism environment, Kim and Lee [39] found that due to the threat of a pandemic, there is an increasing tendency to eat in private restaurants with private tables. Honey-Rosés [40] found restaurants may need to be reorganized to accommodate more open-air spaces in order to reduce the risk of transmission or to place fewer tables further away from each other. However, global research on the impact of COVID-19 on tourists' food-related behaviors remains scarce [12], and to the best of our knowledge there are few studies examining exactly how tourists' environmental preferences for rural gastronomic tourism have changed in the wake of the pandemic.

Chinese rural gastronomic tourism (农家乐*Nongjiale*) is a form of rural tourism reflecting Chinese characteristics. Tourists use the rural open-air environment as the main recreation and eating environment [23], enjoying the rural food and the rural landscapes. Not only does it fulfil people's desire to go green during a pandemic, but it also meets the need for an eating environment with low risk of transmission. Managers and planners must set new goals, develop alternative forms of sustainability-based products and services, and generally adopt new perspectives to meet future challenges [12]. Therefore, our study considered the changing environmental needs of tourists for rural gastronomic tourism from the perspective of landscape design and tourism planning expertise, which can help to improve the adaptability of rural tourism environments in the post-pandemic era, and enhance the resilience and vitality of the rural villages.

3. Materials and methods

3.1. Research methods

Governments around the world are relying on big data-based decision making to effectively address the unprecedented problems caused by pandemics [41], and the rational use of these data benefits public health. During the pandemic, social media were used extensively and for a variety of purposes, and they have proven to be an extremely effective and important means of communication. Social media already plays an important role in the promotion of rural tourism destinations [42,43]. The role of social media in promoting tourism destinations has been strengthened as tourists use social media to get real feedback from other consumers about their experiences. Compared to traditional models, government statistics lack disaggregated information on travel behavior and

questionnaire surveys generally have smaller sample sizes. Social media data provide insight into popular spatial choices and preferences without experimental or survey bias, avoiding subjective influences from the researcher while having a larger sample size. Social media data are now widely used in tourism studies. Social media data includes images, text, and geographic information data, and contains important information about visitor satisfaction as well as root causes. The effective value of studying visitor preferences through social media data can improve service quality and predict future demand [44,45]. The research value of analyzing visitor behavior through social media data has been applied to the conservation and use of landscape resources [46]. Jia [33] suggested the need to observe and explain the evolution of customer dining patterns and satisfaction during the pandemic through social media data. Image analysis can analyze physical spatial scenes from the perspective of visitors' preferences and explore visitors' environment preferences at a micro level, and attractive images can evoke a high level of visitor interest [47]. Meanwhile text analysis can analyze visitors' emotions, understand visitors' perception of the environment's sense of place in general [48], and identify key factors affecting the perception of the environment's merits and demerits that cannot be clearly fed back from images. Therefore, our study aims to explore more comprehensively the environment preferences of tourists in the rural areas and the reasons for changes through a combination of picture information and textual content posted on social media, complementing the shortcomings of each method, in order to promote the sustainable development of the rural areas after the pandemic. As far as we know, the combination of these two research methods is the first attempt in tourist preference research and has some innovative value.

3.2. Data collection

Nongjiale is one of the characteristic rural gastronomic tourism modes in China, which focuses on leisure and enjoyment of food in the natural scenery of rural open-air areas. As the birthplace of Chinese *Nongjiale*, Chengdu is one of the representative cities for the development of rural tourism in China. Sansheng Township, as a famous rural tourism area in Chengdu, became the specific area for our study. Dianping is a Chinese online review app from which many important studies collect data [49]. Based on the popularity and environmental favorable ranking on Dianping, we selected the image and text comments posted by the visitors of six rural gastronomic tourism destinations as specific data, and the data were collected from January 2018 to December 2021. The principles for selecting comments from social media users were as follows: 1) only comments posted by self-help visitors are adopted to reflect true consumer perceptions. 2) The image sample must have a positive emotional expression and evaluation of the travel behavior, and the selecting standards are the comments with an environment rating over 4 points (the criteria of Dianping is 1 point = very poor, 2 points = poor, 3 points = average, 4 points = recommended, 5 points = highly recommended), are used to analyze the positive environment preferences of visitors. 3) The text content contains both positive and negative reviews, excluding only incomplete information and invalid reviews (e.g. good/bad/fair/blank). After selection, 14,373 images and 324,676 text comments in Chinese posted by 3484 users (954 male and 2530 female) were finally chosen as the study sample.

3.3. Data statistics

We selected 11 students (4 graduate students and 7 undergraduate students) with backgrounds in landscape architecture to conduct the statistical analysis. We identified the demographic characteristics of the sample artificially through the publicly available information of users in Dianping and counted the following types of information: Gender (male/female), region (local/out-of-town), posting time, environment flexibility (tourists with environment rating < 4 are defined as people with low environment flexibility and tourists with environment rating≥4 are defined as people with high environment flexibility).

Text analysis is a process of qualitative and exploratory analysis of texts by analyzing the weights and repetitions of texts in a given sample to determine their key factors, and NVivo is one of the most relevant software in this research category [50]. In this study, word

Table 1
High frequency word classification of text content.

	Category	High-frequency Words
1	Food	food, taste, portion, fresh, delicious, set meal, dining, dish, hard to eat, pot roast, good taste, rich dish, texture, home cooked, greasy, drink, exquisite dish, tasty, innovative, authentic, dessert, fruit, meat, vegetable, special dish, main course
2	Environment	ambience, outdoor, space, beautiful setting, quaint, night scene, plants, flowers, yard, season, unique, landscape, open-air, fairyland, literary, spacious, courtyard, vintage, nature, bridges and streams, scenery, style, seclusion, beauty, garden, tree-lined, atmosphere, architecture, greenery, fish pond, paradise, idyllic, farmland, rural, stylish, lawn, ecology, sunset, orchard, wilderness
3	Service	service, attitude, waiter, rush, clerk, owner, warm, cold, meticulous, patient, straightforward, quick, on-call, speed of serving, indifferent, diligent, attentive, careful, kind, impatient, polite
4	Activity	activity, entertainment, ping pong, photography, mahjong, badminton, tea, tea tasting, parties, chatting, drinking, Chinese chess, sunbathing, playing cards, singing, fishing, KTV, hosting weddings
5	Facility	decoration, equipment, repairs, air conditioning, chairs, tables, lighting, sofas, objects, accessories, serving trays, plates, tea cups, tablecloths, doorstops, sockets, cafes, fans, pavilions, slides
6	Traffic	location, parking, distance, isolated, parking space, taxi, traffic, mud, road repair, road, dirt road, convenience, easy to find, traffic jam, bicycle, navigation, cycling, easy to access
7	Feeling	feel, experience, poor, disappoint, lack, noisy, cluttered, crowded, tired, like, relax, comfortable, leisure, quiet, loud, disappointed, suitable, chic, cozy, warm, moody, romantic, elegant, dislike, a mess, content, surprise, chaos
8	Price	consumption, charge, price, unit price, discount, cheap, bargain, free, value for money, expensive
9	Hygiene	hygiene, clean, tidy, bathroom, orderly, dust, faeces, flies, rags, odor

frequency analysis was performed on text files using NVivo12 Plus, with the minimum length of word segments set to 2, automatic categorization of synonyms. The collected text content is quantitatively counted and word frequency analyzed to obtain the high frequency words that appear in the user comment content. After eliminating common adjectives with no expressive meaning, such as "generally", "perhaps", "as if", etc., the words were then manually classified according to their high-frequency meaning in order to analyze user preferences and, ultimately, into 9 categories, details are shown in Table 1. To further analyze the relationship between gender, region and environment flexibility and each category, we also divided the high-frequency words into positive and negative ratings by manually identifying their semantics and context before and after the pandemic.
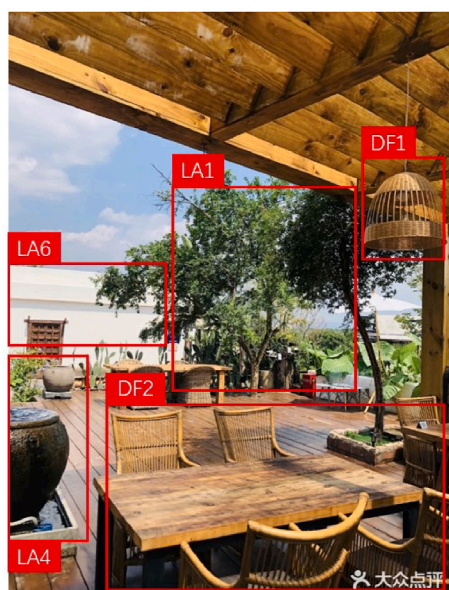
We counted the frequency of environment factors appearing in images posted by visitors by manual identification, the identification is shown in Fig. 1. The types of environment factors we counted were classified into 19 factors by referring to Yang et al.'s [23] classification of rural outdoor dining environment factors. After consultation with four experts (one professor specialized in rural landscape planning, one professor specialized in rural tourism, one professor specialized in post-disaster urban and rural planning, and one manager of rural gastronomic tourism destination), the final environment factors of image analysis were identified as 16 factors including plant, stonescape, waterscape, artistic facility (facility intended for visual enjoyment), path, building, scenic wall, agriculture, lighting, table setting (layout of each table), plating (food decoration), table decoration (decorative furnishings on the table), tableware (cutlery), entrance design, name and entertainment facility (facility intended for participation) in five categories, as shown in Table 2.

IBM-SPSS20 was used to analyze the text and picture data of visitors by gender, before and after the pandemic, region and environment flexibility. The image analysis was based on the above coded content statistics sample and the Kruskal-Wallis rank sum test was used to explain the differences in visitor preferences for different specific environment factors. Specifically, to further investigate whether there were differences in gender and region among visitors before and after the pandemic, we used Bonferroni adjustment for post hoc multiple testing with nonparametric tests, with confidence intervals set at 95 %, and differences were considered statistically significant at $p < 0.05$. Correspondence analysis was used to explain the relevance of the textual data to the 9 types of rural environment experiences by gender, before and after the pandemic, and region to explore visitors' preference to each rural environment through word frequency statistics.

4. Results

4.1. Statistical characteristics of visitors before and after the pandemic

The overall sample contained data posted by 3484 visitors, including 954 men (27.4 %) and 2530 women (72.6 %), which may be related to the study that women are more eager to share on social media [51] and that women prefer shorter trips [52]. The ratio of the number of men and women who visited the rural areas by visitors dropped from 0.45 before the pandemic to 0.31 after the pandemic. In addition, the ratio of local visitors to out-of-town visitors fell from 3.36 before the pandemic to 0.55 after the pandemic. There was a significant decrease in local visitors and a significant increase in out-of-town visitors after the pandemic. See Table 3 for specific information.

	Environmental factor	n
LA1	Plant	1
LA2	Stonescape	0
LA3	Waterscape	0
LA4	Artistic facility	1
LA5	Path	0
LA6	Building	1
LA7	Scenic wall	0
AG	Agriculture	0
DF1	Lighting	1
DF2	Table setting	1
DF3	Plating	0
DF4	Table decoration	0
DF5	Tableware	0
IS1	Entrance design	0
IS2	Name	0
EF	Entertainment facility	0

Fig. 1. Method of manual identification process.

Table 2
Rural gastronomic tourism environment factors classification of image analysis.

	Category		Factor	n	%
LA	Landscape	LA1	Plant	1294	3.15
		LA2	Stonescape	143	0.35
		LA3	Waterscape	155	0.38
		LA4	Artistic facility	854	2.08
		LA5	Path	2397	5.83
		LA6	Building	6580	15.99
		LA7	Scenic wall	4948	12.03
AG	Agriculture	AG	Agriculture	717	1.74
DF	Dining facility	DF1	Lighting	3021	7.34
		DF2	Table setting	5688	13.82
		DF3	Plating	2835	6.89
		DF4	Table decoration	3569	8.67
		DF5	Tableware	1793	4.36
IS	Image sign	IS1	Entrance design	4127	10.03
		IS2	Name	1420	3.45
EF	Entertainment facility	EF	Entertainment facility	1603	3.9

Table 3
Demographic characteristics of the sample.

		General sample (N = 3484)		Pre-pandemic Sample (N = 1649)		Post-pandemic Sample (N = 1835)	
		n	%	n	%	n	%
Gender	male	954	27.4	515	31.2	439	23.9
	female	2530	72.6	1134	68.8	1396	76.1
Region	local	1924	55.2	1271	77.1	653	35.6
	out-of-town	1560	44.8	378	22.9	1182	64.4
Environment flexibility	< 4	294	8.44	164	9.95	130	7.08
	≥ 4	3190	91.56	1485	90.05	1705	92.92

4.2. Differences in visitor environment preferences before and after the pandemic

Firstly, we analyzed the correlation between 3484 ratings from consumers on taste, environment and service and the results are shown in Table 4. A significant correlation was found between all three of these experiences of rural gastronomic destinations. It is evident that in terms of consumption experience in rural gastronomic destinations, tourists do not expect less from rural cuisine and services due to the unique geographical environment of the rural area.

In particular, we conducted an analysis of environment variability between pre- and post-pandemic points based on tourists' environment rating by Mann-Whitney *U* test, with a significant difference ($p < 0.05$), the results are shown in Fig. 2. Post-pandemic rural gastronomic tourism destination environment ratings were significantly higher than pre-pandemic, and the number of negative ratings was also lower post-pandemic than pre-pandemic. It is evident that there is a greater preference for rural gastronomic destinations in the wake of the pandemic.

In terms of specific environment preference analysis, analysis of the image samples counted before and after the pandemic shows that most of the environment factors present significant differences in preference, as shown in Table 5. Among them, visitors' preference for table decoration and tableware in the dining facility category, plant and artistic facility in the landscape category, these 4 environment factors showed significant growth after the pandemic. Meanwhile the preference for 8 environment factors, including road, building, and scenic wall in the landscape category, plating and lighting in the dining facility category, entrance design and name in the image sign category and entertainment facility category, showed a significant decrease after the pandemic.

We counted data from 1705 samples after the pandemic. Factors that were significantly different before and after the pandemic were further analyzed to explore whether gender and region affect these differences in visitor preferences, as shown in Table 6. Among

Table 4
The relevance of taste, environment and service in rural gastronomic tourism destinations.

		Taste			Environment			Service		
		Overall	Pre-pandemic	Post-pandemic	Overall	Pre-pandemic	Post-pandemic	Overall	Pre-pandemic	Post-pandemic
Taste	Pearson	1	1	1						
Environment	correlation	.648**	.652**	.720**	1	1	1			
Service		.710**	.696**	.640**	.673**	.695**	.653**	1	1	1
	N	3484	1649	1835	3484	1649	1835	3484	1649	1835

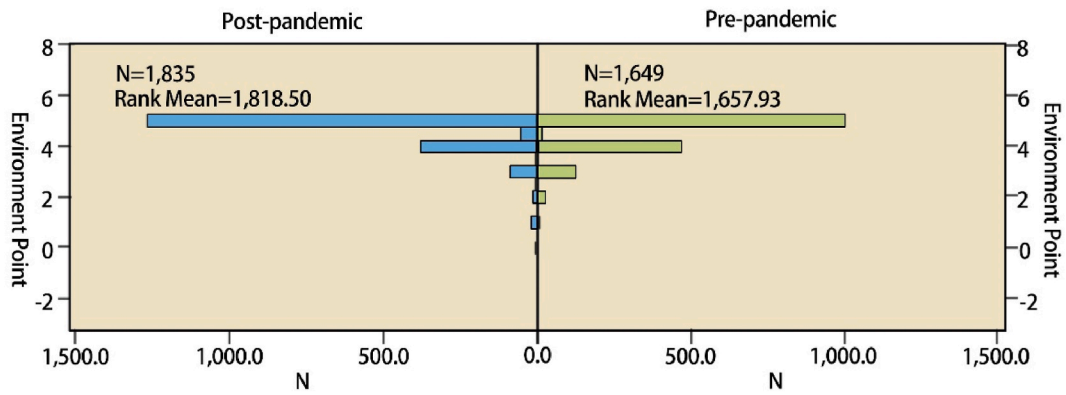Note: **. Significantly correlated at 0.01 level (bilaterally).

Fig. 2. Differences in environment points before and after the pandemic.

Table 5
Differences in visitor environment preferences before and after the pandemic.

Factor	Rank mean		Chi-square	Sig
	Pre-pandemic	Post-pandemic		
Table setting	1565.17	1621.91	3.21	.073
Plating	1827.9	1393.09	232.61	**.000**
Lighting	1653.7	1544.81	13.86	**.000**
Table decoration	1545.46	1639.09	10.35	**.001**
Tableware	1402.56	1763.55	164.47	**.000**
Name	1690.36	1512.88	42.71	**.000**
Entrance design	1695.67	1508.25	36.76	**.000**
Path	1640.66	1556.17	8.77	**.003**
Artistic facility	1563.08	1623.74	7.57	**.006**
Entertainment facility	1726.86	1481.09	88.37	**.000**
Scenic wall	1725.35	1482.4	59.87	**.000**
Building	1705.97	1499.28	42.18	**.000**
Plant	1482.57	1693.86	100.74	**.000**
Stonescape	1594.66	1596.23	0.03	.860
Agriculture	1602.88	1589.07	0.45	.501
Waterscape	1593.78	1596.99	0.12	.728

Note: The bold figures represent significant differences ($p < 0.05$).

Table 6
Differences in visitor preferences after the pandemic.

Factor	Gender				Region			
	Rank mean		Chi-square	Sig.	Rank mean		Chi-square	Sig.
	Male	Female			Local	Out-of-town		
Plating	873.86	846.71	1.49	.222	845.45	857.23	.36	.548
Lighting	760.98	880.75	23.23	**.000**	739.97	916.29	65.1	**.000**
Table decoration	769.12	878.29	18.37	**.000**	736.46	918.25	65.73	**.000**
Tableware	771.66	877.53	16.7	**.000**	713.67	931.02	92.62	**.000**
Name	787.96	872.61	14.67	**.000**	734.59	919.30	90.35	**.000**
Entrance design	739.02	887.37	32.27	**.000**	692.60	942.81	118.65	**.000**
Path	754.82	882.60	28.31	**.000**	741.93	915.19	67.27	**.000**
Artistic facility	837.54	857.66	1.05	.306	806.59	878.99	17.54	**.000**
Entertainment facility	795.19	870.43	13.52	**.000**	829.95	865.91	3.99	**.046**
Scenic wall	696.15	900.29	58.27	**.000**	672.11	954.29	143.93	**.000**
Building	749.66	884.16	24.33	**.000**	715.72	929.87	79.71	**.000**
Plant	805.34	867.37	9.11	**.003**	744.38	913.82	87.83	**.000**
Table setting								
Stonescape								
Agriculture								
Waterscape								

Note: The bold figures represent significant differences ($p < 0.05$). Table setting, stonescape, agriculture, waterscape show no significant differences in Table 3 and are not in the analysis.

the environment factors that already showed preference differences before and after the pandemic, most of them also showed significant differences in terms of gender and region. In terms of gender, lighting, table setting, tableware, name, entrance design, path, entertainment facility, scenic wall, building, and plant, 10 environment factors were preferred more by women than men. In terms of region, all environment factor preferences were higher for out-of-town visitors than for local visitors, except for plating, which did not show significant variability.

4.3. Key consumer concerns and changes before and after the pandemic

Based on the manually classified text content of the positive and negative evaluations, and the 9 categories divided by high-frequency words, we counted the word frequencies of environment flexibility, gender, and region before and after the pandemic, respectively, and the results are shown in Fig. 3. All 9 categories are factors that may influence consumers' overall perception of rural gastronomic tourism environment, with taste, environment and service being the most significant constituents of consumer perception. The comparison between negative and positive reviews reveals that a good environment and a wealth of activities are the elements that improve the positive perception of visitors. Negative reviews mention transport conditions such as accessibility, ease of parking and sanitary conditions more often than in positive reviews, showing that the level of hygiene and improvements in transport construction are key to reducing negative visitor experiences. Moreover, post-pandemic tourists are less concerned about price and more about overall quality.

In an independent comparison of positive and negative reviews for each type of visitor before and after the pandemic (Fig. 4), it is noticed that a) after the pandemic, enrichment activities can increase the satisfaction of visitors with low environment flexibility. b) Males gradually shifted from a focus on value for money to hygiene conditions around the time of the pandemic. c) Locals are less concerned about price and more about the consumption experience, while out-of-towners are less concerned about the facilities and more about the quality of the landscape environment after the pandemic. A cross-sectional two-by-two comparison of visitors' reviews of the same character over the same period shows that a) Females have higher requirements for the general environment than males, especially in the two major areas of landscape environment and transportation conditions, while males are more concerned about food. b) Out-of-towners care more about food than locals, while locals care more about the consumption feelings.

Correspondence analysis (Fig. 5) revealed that the correlations between some of the evaluations and environment factors changed before and after the pandemic, or generated significant new associations. As can be seen from Fig. 5(a), hygiene conditions were the main reason for the negative reviews of visitors with low environment flexibility. This did not change due to the pandemic, but more preferences with facilities appeared. Visitors with high environment flexibility became more demanding in terms of transport conditions after the pandemic, and the main reason for positive reviews before the pandemic being gastronomy, shifting to the landscape environment after the pandemic. As can be seen from Fig. 5(b) mediocre and poor transportation conditions are the main cause of negative reviews in the comparison of genders, both before and after the pandemic. Enrichment activities are more favorably rated by females. From Fig. 5(c), it is found that the negative reviews of locals after the pandemic are mainly related to price and hygiene conditions, while those from out-of-town are mainly related to transportation conditions. The positive reviews from locals were mainly related to the landscape environment and did not change due to the pandemic, while the positive reviews from out-of-towners were mainly influenced by the food after the pandemic.
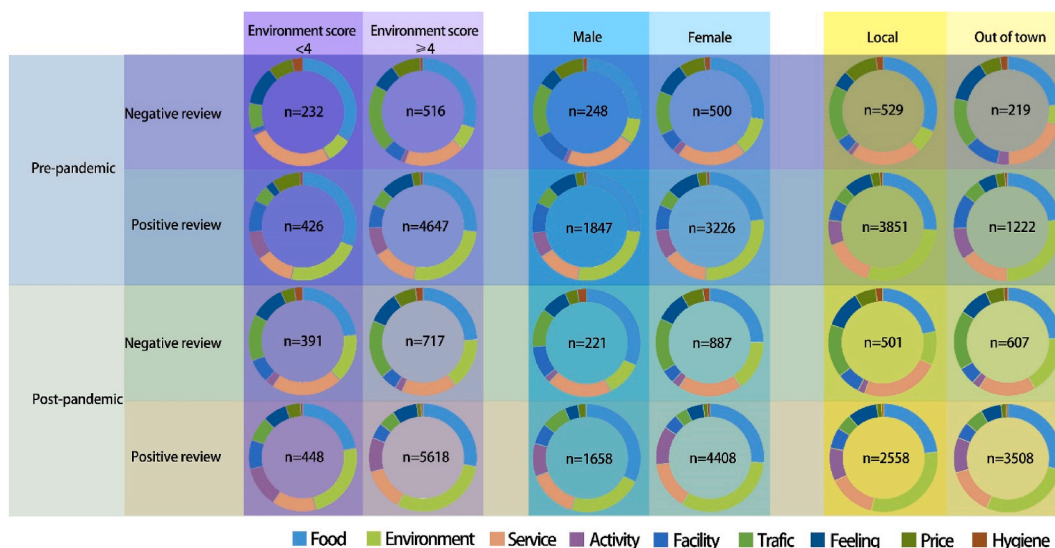

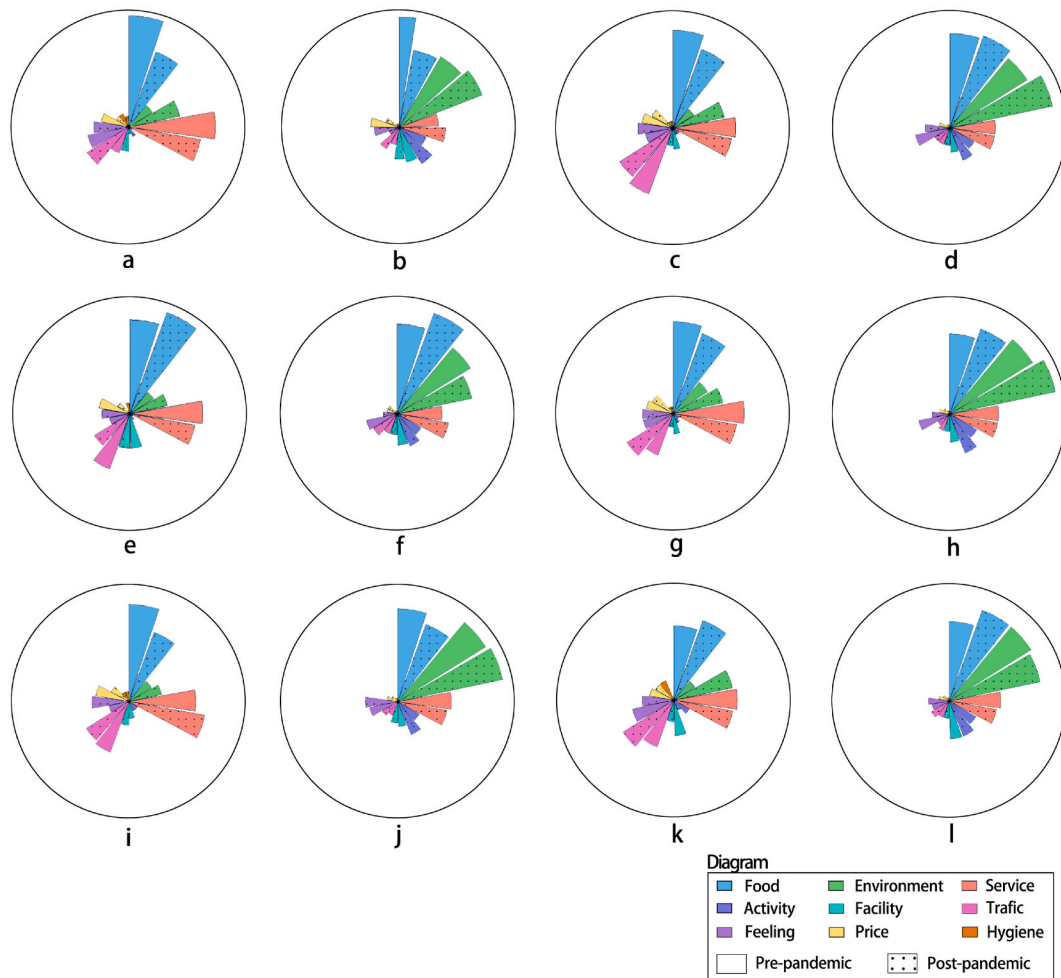**Fig. 3.** High frequency words for text analysis.

Fig. 4. Multiple comparisons of high frequency words for text analysis. A High frequency words for negative review of visitors with low environment flexibility. **b** High frequency words for positive review of visitors with low environment flexibility. **c** High frequency words for negative review of visitors with high environment flexibility. **d** High frequency words for positive review of visitors with high environment flexibility. **e** High frequency words for negative review of males. **f** High frequency words for positive review of males. **g** High frequency words for negative review of females. **h** High frequency words for positive review of females. **i** High frequency words for negative review of locals. **j** High frequency words for positive review of locals. **k** High frequency words for negative review of out-of-towners. **l** High frequency words for positive review of out-of-towners. Pure colored blocks represent pre-pandemic and blocks with dots represent post-pandemic.

5. Discussion

The evaluation of rural gastronomic destinations is influenced by a combination of factors. The three types of experience - environment, taste and service - interact with each other and are the three most important factors in the evaluation of rural gastronomic destinations. This finding is similar to that of Henderson [16], who suggested that food can be a major motivator for travelling. Moreover, our study also emphasizes the importance of the environment, as does the service. Agriculture has always been an important factor in the positive perception of the environment. A pleasant landscape environment and a variety of activities are important factors in enhancing positive tourist perceptions, while negative tourist experiences mainly stem from poor hygiene levels and inconvenient transport. In terms of specific environmental preferences, having more green [29], more cultural and artistic facilities [53], and more distinctive and upscale tableware and table settings [21] lead to better environmental perceptions for visitors. In contrast, more artificial aesthetics, such as pathways, plating, image displays, architecture, scenic walls, and lighting, which were prominently attractive environment factors in other pre-pandemic studies [54–56], showed a significant decline in preference after the pandemic.

Differences in preferences existed across gender, environment flexibility and regions, and changed before and after the pandemic. a) Tourists of different genders focus differently on rural gastronomic destinations. In comparison females care more than males about the physical spatial ambience of the landscape environment, transport and activities, while males care more about the food. It may be related to the fact that rural destinations are less risky, greener and healthier during the pandemic, so they are more favored by females. Our results are supported by the findings of Neuburger [57], who concluded that females are more cautious in making decisions
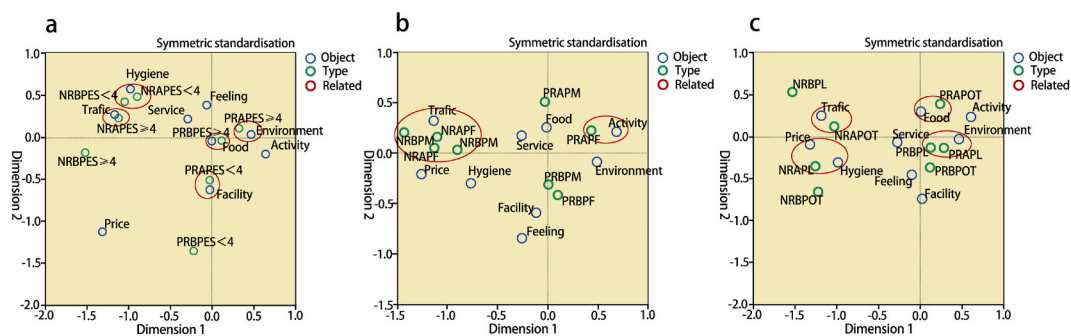
Fig. 5. Correspondence analysis of different types of visitor and environment factors. A Correspondence analysis of environment factors with tourists' environment flexibility. **b** Correspondence analysis of environment factors with gender. **c** Correspondence analysis of environment factors with region. NR is the abbreviation of negative review, PR is the abbreviation of positive review, AP is the abbreviation of after the pandemic, BP is the abbreviation of before the pandemic. ES is the abbreviation of environment score in Fig. 5(a). F is the abbreviation of female, M is the abbreviation of male in Fig. 5(b). L is the abbreviation of local, OT is the abbreviation of out-of-town in Fig. 5(c).

about the tourism environment and are more sensitive to environmental risks. We also found that male concerns shifted from price to hygiene after the pandemic. b) Among groups with different tourism flexibility. Visitors who gave the environment rating <4 in a popular rural gastronomic tourism destination with many positive reviews, we positioned them as a group with low environment flexibility. They cited hygiene conditions as a major influence on negative reviews both before and after the pandemic, while well organized activities and facilities became the main influencing factor for them to give a positive review after the pandemic. This finding responds to Giddy's [58] suggestion that there is increased demand for basic service provision and infrastructure provision in rural tourism in the post-pandemic era. Those visitors who gave a positive review were more concerned about the food before the pandemic and turned to the landscape environment after the pandemic, inconvenient access was a major factor affecting their experience. c) Taking locals and out-of-towners as variables, we found that locals were less concerned with price and more concerned with the consumer experience, and out-of-towners were more concerned with the rural environment and food. We noticed that in the environment factors of rural gastronomic tourism destinations where significant preference differences were found, all of them were preferred by out-of-town consumers over local ones. Evidence from urban-based studies suggests [59] that local visitors seek relaxation and shopping, short-haul visitors combine sightseeing with leisure, and long-haul visitors are primarily sightseeing tourists. Although the survey sites in this study were not rural tourism destinations where shopping is the dominant industry, the shopping environment was not used as a test factor. However, our findings are also consistent with this pattern of out-of-town visitor preferences with Xue et al.

Food, service and environment are the three main drivers that together influence tourists' experience in rural gastronomic tourism. And tourists' environment preferences have changed significantly and need to be attended to in the future development. Agriculture, as the core competitiveness of rural areas, should be preserved and rationally utilized as a prerequisite for both planning, design and management. Rural tourism will be more favored in the development of a more natural environment that is safe, healthy, green and of high quality.

In tourism planning, attention should be paid to the protection and rational use of green resources in the rural areas, and consider the space capacity, in order to highlight the unique advantages of the rural areas themselves. The integration of rural culture has also become increasingly important, and the regional culture of rural areas should be deeply explored in order to enhance the quality of rural environment. Facing the tourism needs of different visitor segments, precise services should be targeted according to the objectives of the rural tourist destination in order to maintain tourist loyalty. For example, based on females' stronger preference for activities, as well as females' stronger activity in family bonds and nature exploration [60], more consideration can be given to family-friendly activities in the rural gastronomic tourism and categories of activities that females are more passionate about during the planning. Consideration should also be given to the updating and maintenance of facilities, planning and reservation of sites for recreational activities, convenient parking and transport accessibility in the planning to safeguard the supply demand in future development. It has been found that the location of toilets, basic service facilities, toilets design, and design of car parks in urban parks also affect tourist satisfaction [61,62]. We also found that a number of tourists commented on issues such as the cleanliness of the toilets, the distance and number of car parks, and the narrowness of the rural driveway. In rural gastronomic tourism planning, healthier, hygienic and convenient basic service facilities must be taken into account, and planning schemes should be assessed with accessibility, complete public facilities and cultural facilities. Overall, the material and spiritual needs of tourists are considered at two levels.

Tourist preferences for landscapes have also changed after the pandemic [63], and landscape design in future rural gastronomic tourism requires attention in the same way. It has been found that previously lighting landscapes, buildings, image, and plating are important factors that influence the visitor experience [22], which is a key to improving the grade of tourism environment and tourists' satisfaction, but we found that these environment preferences were significantly reduced after the pandemic. Plants, table settings, tableware, and art installations, which are greener and more reflective of hygiene and rural culture, are more preferred. Therefore, we suggest that in the future design of the rural areas, artificial intervention should be reduced and the landscape should be presented in a

more "rural" form with more regional cultural characteristics. Specifically, the physical space should be designed to make full use of the low-density characteristics of the rural space, and the space for leisure activities, eating and playing should be considered in an integrated way including both physical and psychological safety distances. Plant design should give full consideration to the rational use of native plants and the ornamental value of agriculture, highlighting the natural resource characteristics of the rural landscape and the characteristics of farming culture. Art installations may be an important medium that can effectively carry the cultural construction of the rural villages and satisfy the expression of people's cultural needs. The current activity facilities do not meet the needs of tourists, and the contact distance, health and greenery should be further considered in the design to enhance tourists' perception of safety and hygiene.

It is very important for managers engaged in gastronomic tourism places to be clear about tourist preferences [64]. The manager should make it clear that safety, health, green and high quality are the basis and highlights of the rural gastronomic tourism environment, and make precise environment creation and image publicity according to the target groups. Managers in business can make environment enhancements based on the changing needs of their positioning clientele. Destinations close to the city can focus on highlighting their transport advantages, while relatively remote destinations can highlight their hygienic conditions and environmental qualities, shopping activities and so on. Rural tourism where fishing and hunting [60] are the main activities can highlight local gastronomic features, whereas areas where parent-child activities are the main activity should highlight transport, landscape and the richness of activities.

6. Conclusions

Although the occurrence of COVID-19 has had a huge negative impact on tourism development, it also represents an opportunity for the development and transformation of tourism [25]. The rural areas are popular among visitors after the pandemic as a multifunctional visitor destination that is healthy, green, environmentally friendly and low-density at the same time. Pandemics lead to changes in our consumption behavior and environment preferences. This study takes rural gastronomic tourism destinations where eating and recreation are enjoyed in the open-air, as the research object to explore the changes and the reasons in visitor preferences for the rural tourism environment after COVID-19, and its findings can provide relevant suggestions for the planning, design and management of rural tourism destinations in order to enhance the attractiveness and resilience of rural tourism destinations and promote rural development.

a) Perceptions between cuisine, service and environment are mutually influential. In the sustainable development of rural gastronomic tourism, there should be more interactive research explorations between disciplines to better understand the future direction.
b) Rural gastronomic tourism is more popular after the pandemic, especially among female and out-of-town tourists. We should learn to make the advantages of the rural tourism environment better protected and utilized to face the preference changes.
c) Tourists environment preferences changed after the pandemic. More natural, rural and healthy environment factors are the main attraction of rural tourism, while the attraction of more artificial environment factors are decreasing.
d) There is variability in environment preferences between different types of tourists. More targeted planning, design, management and renovation of thematic tourist sites are possible.
e) Image analysis and text analysis methods are complementary. We suggest that future research using social media data analysis could try both methods out more, to form a complete methodology.

There are also limitations in our study. Our study, does not represent the full range of changes in environment preferences for rural tourism. For example, destinations with fishing and hunting activities [60] were not investigated in our study. Seasons have a strong impact on tourism [65], but considering the "segregation" policies in different regions during the pandemic, seasonal variations are not discussed. Furthermore, the information captured by the data is not subjective to the researcher, and whether there is variability in plant scent [64] and soundscape [66] cannot be fed back.

In future research, as people from different cultures have different preferences for gastronomic tourism [67], perhaps a comparison of environment preferences with different gastronomic cultures will reveal new insights. Although, we have found that tourists are willing to pay for better environment and quality, further investigation is needed into which elements of the environment can be improved to deliver greater business value.

We explored the differences in tourists' preferences for rural gastronomic tourism environments before and after the pandemic, using social media data to feed into tourists' most authentic experiences. The study aims to enhance the spatial adaptability, resilience and vitality of rural areas in the post-pandemic era.

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Data availability statement

The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy.

CRediT authorship contribution statement

Mian Yang: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Jian Qiu:** Writing – original draft, Supervision, Resources, Project administration, Methodology, Funding acquisition, Conceptualization. **Keying Ding:** Writing – review & editing, Visualization, Software, Data curation. **Sining Zhang:** Writing – original draft, Methodology, Formal analysis. **Wenjie Fan:** Validation, Investigation, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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