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Spatial distribution of sustainable gastronomy criteria in Michelin green star restaurants

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ABSTRACT

This research aims to determine the sustainable gastronomy criteria applied by Michelin Green Star restaurants and to investigate the spatial distribution of these criteria worldwide. For this purpose, content analysis was conducted on the texts of chefs/managers/owners of Michelin Green Star restaurants in the Michelin Guide regarding sustainable gastronomy practices using the MAXQDA program. According to the Michelin Guide, there are 541 Michelin Green Star restaurants in 41 countries. In addition, the restaurants with the most Michelin-Green Stars in the world are in France, Germany, Italy, and Spain (July 3, 2024). According to the results of the research, the Michelin Guide takes many different criteria into consideration when awarding green stars to restaurants. On the other hand, it was determined that the sustainable gastronomy criteria that the Michelin Green Star restaurants analyzed in the research attach the most importance to are "Awareness of Product Origins" and "Waste and Resource Management in Restaurants", while the least important sustainable gastronomy criterion is "Staff's Ability to Draw Customers' Attention to the Sustainable Approach". Based on the study findings, recommendations were made to practitioners and researchers.

1. Introduction

The relationship between gastronomy and different branches of science is pointed out (Sarıışık & Özbay, 2015, p.265; Ağcakaya & Can, 2019, p.789). In parallel with this situation, sustainable gastronomy practices are also examined within the scope of different branches of science. For example, in sustainable gastronomy and nutrition/dietetics, the effects of eating habits on carbon footprint (González-García et al., 2018; Hurtado-Bermudez & Montoya-Diaz, 2021), water footprint (Vanham et al., 2013; Miglietta, 2015), and ecological footprint (Song et al., 2015; Da Silva et al., 2023) are examined. In these studies, the effects of individuals' eating habits on world resources are better understood (Vanham et al., 2013; Miglietta, 2015; Song et al., 2015; González-García et al., 2018; Hurtado-Bermudez & Montoya-Diaz, 2021; Da Silva et al., 2023). A group of studies in literature focuses on food storage conditions (Hammond et al., 2015; Ocampo et al., 2021; Marshall, 2022), packaging (Zheldybayeva et al., 2024), and food safety (Ceylan & Meral, 2023) within the scope of sustainable gastronomy and food science/technology research. In addition, research that links sustainable gastronomy and biology/microbiology focuses on preventing food spoilage (Ibrahim et al., 2021; Omotosho et al., 2024), hygiene conditions (Pendergast, 2021; Rodríguez & Samaniego-Puertas, 2023), and fermented foods (Borrego-Ruiz et al., 2024; Razar, 2024).

In another group of studies in the relevant literature, sustainable gastronomy practices are associated with agriculture and farming. Research on geographically indicated products stands out (Durlu-Özkaya et al., 2013; Çavuş & Eker, 2022; Arslan, 2023; Atak & Bucak, 2024). Moreover, there are findings regarding the geographical indication system supporting local producers (Teuber, 2011; Özkan & Dilay, 2019), informing consumers (Calboli, 2015; Mayasari, 2020), and supporting traditional production methods (Dagne, 2010; Gocci et al., 2020). Moreover, studies focusing on sustainable gastronomy practices from a sociological perspective and the Slow Food culinary movement have an essential place in literature (Tencati & Zsolnai, 2012; Lin, 2020; Aliyeva & Kurgun, 2021; Çelebi & Genç, 2021; Cheng, 2023). In addition, studies on the culinary culture of past civilizations (Parsa, 1998; Haley, 2012; Peres, 2017; Batu & Batu, 2018; Şensoy & Tiritoğlu, 2018; Dilmeç & Koç, 2023) prove the relationship between sustainable gastronomy and history/archaeology sciences.

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Finally, there are studies about green restaurants in the context of sustainable gastronomy in business (Liu & Yu, 2012; Tan & Yeap, 2012; Kurnaz & Özdoğan, 2018; Akar Şahingöz & Güleç, 2019; Jo et al., 2020; Keşkekci & Gençer, 2023; Pradnyan et al., 2024; Yong et al., 2024). Some of the organizations that encourage restaurants to be sustainable are the Green Restaurants Association (1990), the Sustainable Restaurants Association (2008), Leaders in Environmentally Accountable Foodservice (2009), and Michelin Green Star (2020). The Michelin Green Star is the newest rating in the field of sustainability. Depending on this situation, research on the Michelin Green Star has begun in the relevant literature in recent years (Marquez Garat, 2022; Akay et al., 2023; Noguer-Juncà & Fusté-Forné, 2024; Saklı, 2024; Wang & Zhang, 2024; Bonfanti et al., 2025; Demir, 2025; Huang et al., 2025). In this context, there is a significant gap in the literature regarding the Michelin Green Star. This research aims to determine the criteria for sustainable gastronomy practices implemented by Michelin Green Star restaurant chefs/managers/owners in their businesses and to reveal the distribution of these criteria on the world map through spatial distribution analysis. This aims to understand how chefs/managers/owners of Michelin Green Star Restaurants position and express themselves in the context of sustainability practices.

2. Literature Review

It is emphasized that increasing concerns about environmental issues in recent years have led some consumers to attach importance to subjects such as recycling, energy, and water saving (Tan & Yeap, 2012). It is claimed that this situation causes consumers to demand environmentally friendly goods and services (İpar et al., 2020). In other words, it is claimed that consumers exhibit green purchasing behavior (Tan & Yeap, 2012).

Arun et al. (2021) convey that green restaurants are established and operated in an environmentally friendly and energy-efficient manner. Some institutions and associations standardize environmentally friendly products and services for restaurants through certification programs. The “Green Restaurant Association” is a non-profit organization founded in 1990. The environmental categories that this association considers are “Energy”, “Water”, “Waste”, “Reusability and Disposable Materials”, “Chemicals and Pollution”, “Food”, “Construction and Furniture”, and “Education and Transparency”. It is seen that the Green Restaurant Association (GRA) provides training and certification on sustainability for restaurants as well as other stakeholders through its website (Demir & Bertan, 2023; Green Restaurant Association, 1990). Another organization that certifies restaurants for their sustainable operations is the Green Table Network. To receive Green Table Network certification, restaurants must eliminate Styrofoam and non-recyclable plastics, implement comprehensive recycling programs, reduce their water footprint, add at least one sustainable protein item to their menu (such as purchasing hormone-free meat from a local farmer), use efficient lighting, and adopt a sustainability philosophy (Green Table Network). The Sustainable Restaurant Association states that restaurants should focus on sustainable production in their production operations with a holistic perspective in the areas of resource use (celebrate provenance, support farmers and fishermen, more plants, better meat, source seafood sustainably), society (treat staff fairly, feed people well, support the community) and the environment (reduce your footprint, waste no food, reduce, reuse and recycle) (Sustainable Restaurant Association, 2024).

In 2020, the Michelin Guide introduced the Green Star application to encourage restaurant producers and consumers in their sustainability activities (Michelin Guide, 2021). It is emphasized that Michelin inspectors inspect chefs and businesses within the scope of themes related to sustainable gastronomy (*products and ingredients used, composition of the menu, the chef's ability to raise customer awareness of his/her philosophy, initiatives to reduce and recycle food waste, and management of the organization's resources*) (Demir & Bertan, 2023; Michelin Guide, 2021). According to data from the Michelin Guide, on July 3, 2024, 541 restaurants worldwide were rated as Michelin Green Star (Michelin Guide, 2024). In recent years, research has begun on the Michelin Green Star. In these studies, there are studies on the contribution of the Michelin Green Star to sustainability in the restaurant industry from the perspective of different actors (Marquez Garat, 2022), applicability of Michelin Green Star Criteria by chain businesses (Akay et al., 2023), chefs' services, business characteristics and sustainable, original and creative elements (Saklı, 2024), consumer intentions (Wang & Zhang, 2024), menu analysis (Noguer-Juncà & Fusté-Forné, 2024), sustainability criteria (Huang et al., 2025), consumer experience (Bonfanti et al., 2025) and consumer perceptions and experiences (Demir, 2025). Huang et al. (2025) emphasize that Michelin Green Star restaurants are modest in encouraging customers towards sustainability on their websites. In the study conducted by Demir (2025) in which she analyzed Google Form customer reviews of Michelin Green Star restaurants in Türkiye, it was found that the sustainable gastronomy experience was one of the categories with the lowest frequency. In this context, the research aims to determine the sustainability criteria used by Michelin Green Star restaurant chefs/managers/owners for their businesses in the Michelin Guide. This aims to understand how chefs/managers/owners of Michelin Green Star Restaurants position and express themselves in the context of sustainability practices.

3. Method

The texts shared by chefs/managers/owners of restaurants awarded a Green Star in the Michelin Guide regarding sustainable gastronomy practices in their restaurants were

examined through content analysis. Validity and reliability in the research were ensured through consistency (Filiz & Tuğrul, 2024, p. 981), transferability (Tutar, 2022, p. 125; Filiz & Tuğrul, 2024, p. 981), and external reliability (Eroğlu & Bektaş, 2016, pp.48; Kayhan et al., 2022, p.1280; Önel & Konu Kadirhanoğulları, 2024, p.143). Filiz & Tuğrul (2024, p. 981) state that consistency is assessed through the reliability among different coders. In this context, the texts shared by the chefs, managers, and owners of restaurants that received a Green Star in the Michelin Guide on July 3, 2024, regarding the sustainable practices they implement in their restaurants, were recorded by the researcher and an independent expert, and the texts were compared. Altıntaş & Tofur (2023, p.3188) state that in open coding, statements are divided into codes that are less similar to each other, and in the axial coding stage, the codes obtained through open coding are grouped and categorized according to their similarities. In this context, the texts were first open coded by both researchers, codes and subcategories were determined, and then in the axial coding, the subcategories were collected under categories. The categories in this research were derived from the Michelin Guide (Michelin Guide, 2021). The coding analysis conducted by the two researchers was compared, and a consensus was reached on the data. Transferability is also expressed as external validity (Tutar, 2022, p. 125; Filiz & Tuğrul, 2024, p.981). It is stated that to ensure external validity in the study, detailed information should be given about the research process and the procedures applied (Karakartal, 2018, p.51; Çullu and Güleç, 2019, p.766). Accordingly, comprehensive information about the research model, study group, data collection tool, data collection, data analysis, and findings was presented (Karakartal, 2018, p.51; Şimşek et al., 2021, p.196; Çullu & Güleç, 2019, p.766). The relevant literature states that external reliability can be achieved by verifying the consistency between the data and discussing the findings appropriately in the results section (Eroğlu & Bektaş, 2016, pp.48-49; Kayhan et al., 2022, p.1280; Önel & Konu Kadirhanoğulları, 2024, p.143). In this context, the research findings were thoroughly discussed in the conclusion section, and a consensus was reached among the researchers regarding the conclusions.

4. Findings

According to data from the Michelin Guide as of July 3, 2024, 541 restaurants in 41 countries worldwide have received the Michelin Green Star. Table 1 represents the total number of restaurants in countries that have received the Michelin-Green Star. Accordingly, the restaurants with the highest Michelin Green Stars in the world are in France (17.19%), Germany (14.23%), Italy (10.72%), and Spain (9.06%), respectively.

Table 1: Number of restaurants with Michelin Green Stars in the world

Country	Number of Restaurants	%
France	93	17,19
Germany	77	14,23
Italy	58	10,72
Spain	49	9,06
Switzerland	31	5,73
United Kingdom	31	5,73
USA	29	5,36
Japan	28	5,17
Denmark	17	3,14
Netherlands	15	2,77
Belgium	11	2,03
Slovenia	8	1,48
Argentina	7	1,29
Sweden	7	1,29
Mexico	6	1,11
Norway	6	1,11
Taiwan	6	1,11
Finland	5	0,92
Portugal	5	0,92
Türkiye	5	0,92
Hong Kong	4	0,74
Hungary	4	0,74
Thailand	4	0,74
Brazil	3	0,55
China Mainland	3	0,55
Croatia	3	0,55
Dubai	3	0,55
Estonia	3	0,55
Greece	3	0,55
South Korea	3	0,55
Austria	2	0,37
Canada	2	0,37
Singapore	2	0,37
Ireland	1	0,18
Iceland	1	0,18
Latvia	1	0,18
Lithuania	1	0,18
Luxembourg	1	0,18
Macau	1	0,18
Poland	1	0,18
Vietnam	1	0,18
Total Country=41	**Total Restaurant Number 541**	**Total %= 100**

Source: Authors' own elaboration

Figure 1 shows the spatial distribution of the sustainable gastronomy criteria for Michelin-Green Star restaurants. According to this distribution, the rankings are France (437), Germany (353), Spain (194), Italy (182), Switzerland (150), America (132), United Kingdom (103), Japan (101), Netherlands (56), and Denmark (50). According to the distribution in Figure 1, France and Germany are the two leading countries in Michelin's sustainability criteria. However, Spain and Italy have an average value in these criteria. Switzerland, America, the United Kingdom, and Japan are below average. Finally, it was determined that the Netherlands and Denmark received the lowest value in the Michelin sustainability criteria.

Figure 1: Sustainable gastronomy criteria for Michelin-Green Star restaurants

Findings by Category

The distribution of countries according to Michelin Green Star categories is shown in Table 2. It was determined that the category order was awareness of product origins (648), waste and resource management in restaurants (438), entrepreneurship (259), contributions to the local economy (138), food experiences (123), respect for seasonality (75), balance and composition of menus (59) and sustainable approach to customer attention by staff (18). It has been determined that the awareness of the product origins category has the highest value in countries other than Italy and Japan. The waste and resource management in restaurants category ranks first for Italy (60) and Japan (41), second for France (112), Spain (45), Switzerland (33), the America (42), the United Kingdom (26), and Denmark (10), and third for Germany (64). Regarding the Entrepreneurship category, Germany (85), France (39), and Spain (34) stand out. The values of other Michelin sustainable gastronomy categories were found to be low. However, France (42) stands out in the contributions to the local economy category, Germany (37) and France (36) in the food experience category, France (28) in the respect for seasonality category, and France (17) in the balance and composition of menus category. The category staff's ability to draw customers' attention to the sustainable approach has the lowest score.

As a result of the examinations, it was found that France, Germany, Italy, and Spain are the countries that have received the most Michelin Green Star restaurants. Accordingly, it was understood that these four countries are ahead in Michelin's sustainable gastronomy criteria. Although the Michelin Green Star has various sustainable gastronomy criteria, it can be said that the sustainable gastronomy criteria that stand out in the countries are "Awareness of Product Origins" and "Waste and Resource Management in Restaurants".

Table 2: Categories of sustainable gastronomy criteria for Michelin-Green Star restaurants

Country	Awareness of Product Origins	Waste and Resource Management in Restaurants	Entrepreneurship	Contributions to the Local Economy	Food Experience	Respect for Seasonality	Balance and Composition of Menus	Staff's Ability to Draw Customers' Attention to the Sustainable Approach	Total
France	161	112	39	42	36	28	17	2	437
Germany	127	64	85	16	37	13	8	3	353
Spain	72	45	34	21	12	7	2	1	194
Italy	57	60	28	14	8	10	2	3	182
Switzerland	62	33	18	6	13	5	11	2	150
America	52	42	8	18	1	3	7	1	132
United Kingdom	41	26	21	5	2	2	2	4	103
Japan	35	41	10	5	6	1	2	1	101
Netherlands	24	5	9	6	4	2	6	0	56
Denmark	17	10	7	5	4	4	2	1	50
Total	**648**	**438**	**259**	**138**	**123**	**75**	**59**	**18**	**1758**

Source: Authors' own elaboration

5. Discussion and Conclusion

According to the data from the Michelin Guide on 3.7.2024, 541 restaurants in 41 countries worldwide received the Michelin Green Star. The most Michelin Green Star restaurants are in France, Germany, Italy, and Spain. According to the practical results of this research, although the Michelin Guide considers many different criteria to give green stars to restaurants, almost all Michelin Green Star restaurants in the world are aware of the origin of the products they use in their restaurants, that is, they have information about the source of the products they use for cooking. Bonfanti et al. (2025) state that collaborations developed between local suppliers, chefs, staff, and customers in Michelin Green Star restaurants play a key role in creating a memorable customer experience.

In addition, it has been understood that another criterion that these restaurants attach importance to is the recycling of waste produced in their restaurants, and their focus on the sustainable use of resources in their restaurants. Marquez Garat (2022) states that the meaning of recycling in Michelin Green Star restaurants is to make the world a better place to work sustainably; it is necessary to have more staff, and it is related to the economic dimension.

The gastronomy criterion that Michelin Green Star restaurants worldwide pay the least attention to is that staff should draw customers' attention to a sustainable approach. Other studies in the relevant literature also presented results parallel to this finding (Demir, 2025; Huang et al., 2025). However, today Michelin Green Star restaurants need to give more importance to representing sustainable gastronomy. According to Demir (2025), customers should first be informed about the differences between the Michelin Green Star and the Michelin Star. Demir (2025) suggests that customers' awareness of sustainable gastronomy practices in Michelin Green Star restaurants in Türkiye can be increased through the menu and staff.

The other lowest criterion in this study is the balance and composition of the menus. This criterion was the lowest in Spain, Italy, the United Kingdom, Japan, and Denmark. Noguer-Juncà and Fusté-Forné (2024) conducted a study on the menus of 8 restaurants in Catalonia that were awarded the Michelin Green Star, revealing that the menus showed the central role of locally sourced products and that the narratives derived from the menus exhibited significant relationships between local-global and old-new culinary techniques. According to the results obtained from this research, Michelin Green Star chefs/managers/restaurant owners should make more statements in the Michelin Guide regarding the balance and composition of the menus in their restaurants.

According to the theoretical results of this research, France and Germany are also pioneers in sustainability, as they received the highest scores in the category of sustainable gastronomy. Italy and Spain generally perform well in terms of sustainability. It is understood that Michelin Green Star restaurants in France, Germany, Spain, and Italy are most aware of the origin of the products they use in their restaurants within the scope of their sustainable gastronomy activities and pay attention to the management of waste and resources in the restaurants. It has been found that Green Star restaurants in other countries are generally aware of the origin of the products they use and pay attention to the management of waste and resources in the restaurant. This result is consistent with research examining the websites of Michelin Green Star restaurants (Huang et al., 2025). Huang et al. (2025) reviewed the websites of Michelin-Green Star restaurants and found that most restaurants emphasized local and organic food choices. This research reveals that a substantial majority of restaurants reported sourcing their products from (restaurant gardens, local producers, organic suppliers, etc.). It was found that the criterion for Michelin Green Star restaurant staff to attract customers' attention to their sustainable approach is the lowest sustainable gastronomy criterion. Huang et al. (2025) emphasize that Michelin-Green Star restaurants are modest in promoting sustainability.

The Michelin Guide awards Green Stars to restaurants based on various sustainable gastronomy criteria. In this research, according to the information received from the Michelin Guide, it has been understood that restaurants that have received the Michelin Green Star in the world are generally aware of the origin of the products they use in their restaurants and attach importance to the management of waste/resources in their restaurants. The criterion that Michelin Green Star restaurants worldwide attach the least importance to is the criterion that staff should draw customers' attention to a sustainable approach. In this research, it was determined that although the Michelin Guide has more than one criterion for giving Green Stars to restaurants, Michelin Green Star restaurants give more importance to some sustainable gastronomy criteria. In this context, Michelin Green Star restaurants can benefit the environment, local communities, and culture by expanding their sustainable gastronomy practices. In addition, more information should be included in the Michelin Guide regarding the sustainable gastronomy practices implemented by restaurants to inform consumers. Moreover, the scope of sustainable gastronomy is quite broad. Therefore, the Michelin Guide should also expand its sustainability criteria further.

The most important limitation of this research is that the sustainable gastronomy criteria applied by Michelin Green Star restaurants in the world are only the comments of the Michelin Green Star chefs/managers/restaurant owners in the Michelin Guide regarding the sustainable gastronomy activities they carry out in their restaurants, thus reflecting the perspective of the Michelin Green Star restaurant chefs/managers/owners. However, it is important because it is one of the first studies conducted directly on the

Michelin Green Star and a study that reveals the sustainable gastronomy criteria of Michelin Green Star restaurants worldwide. On the other hand, the research results contribute to the relevant literature in determining the gastronomy criteria applied by Michelin Green Star restaurants and comparing sustainable gastronomy criteria between countries. Researchers could conduct in-depth interviews with Michelin Green Star restaurant customers to examine their perceptions and experiences. In addition, the chefs' perspectives can be examined more deeply through in-depth interviews with Michelin Green Star restaurant chefs.

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Spatial Distribution of Sustainable Gastronomy Criteria in Michelin Green Star Restaurants

Abstract

This research aims to determine the sustainable gastronomy criteria applied by Michelin-Green Star restaurants and the spatial distribution of these sustainable criteria worldwide. For this purpose, content analysis was conducted using the MAXQDA program on the texts of Michelin-Green Star restaurant chefs/managers/owners regarding sustainable gastronomy practices in the Michelin Guide. According to the Michelin Guide, 541 Michelin Green Star restaurants exist in 41 countries. In addition, the restaurants with the most Michelin-Green Stars in the world are in France, Germany, Italy, and Spain. According to the results of the research, although the Michelin Guide considers many different criteria when giving green stars to restaurants, it has been observed that almost all the Michelin Green-Star restaurants in the world know the origin of the products they use in their restaurants and pay attention to waste and resource management On the other hand, it has been found that the lowest sustainable gastronomy criterion applied by Michelin Green Star restaurants worldwide is that restaurant employees draw the attention of their customers to a sustainable approach. Based on the study findings suggestions are given to practitioners and researchers.

Keywords: *Sustainability, Green Restaurants, Waste Management, Sustainable Menu, Energy Sources.*

Authors

Full Name	Author contribution roles	Contribution rate
Yeliz Demir:	*Conceptualism, Methodology, Validation, Resources, Data Curation, Writing - Original Draft, Writing - Review & Editing, Supervision*	*55%*
Serkan Bertan:	*Methodology, Software, Validation, Data Curation, Writing - Review & Editing, Visualization*	*45%*

Author statement: *Author(s) declare(s) that All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.* ***Declaration of Conflicting Interests:*** *The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article*

This paper does not required ethics committee report

Justification: The methodology of this study does not require an ethics committee report.