

Exploring the Intersection between Circular Economy, Gastronomy, and Sustainability: A Review of Current Discourse

Explorando a Intersecção entre **Economia Circular**, **Gastronomia** e **Sustentabilidade**: Uma Revisão do Discurso Atual

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Abstract | The purpose of this research is to examine the scientific production and international trends and recommendations on circular economy, gastronomy, and sustainability concepts. A bibliometric analysis was carried out in the SCOPUS and Web of Science (WOS) databases, and the extracted results considered relevant were processed in the VOSviewer software. In a total of four hundred articles considered, Italian, Spanish and American authors are responsible for most of the research carried out. There has been a growing evolution in scientific production in the last decade, due to the contribution of three hundred authors to the theme, and the main agencies that financially support research are of European origin. Findings uncover eight crucial areas that emphasize the intricate relationship among these concepts. While the circular economy is inherently connected to sustainability, a noticeable disparity arises when compared to concepts like gastronomy and tourism. The association between the circular economy and the central tenet of sustainability, though present, seems somewhat distant, and also leaning closer to restaurants than encompassing the broader field of gastronomy. These results help to systematize the characteristics of the scientific literature produced on the theme and raise awareness to the importance of circular practices in the restaurant sector and serve as a guideline for entrepreneurs and managers in choosing more sustainable and eco-efficient operating alternatives. It is the first study that addresses the intersection of circular economy and local gastronomy as a contribution to a more sustainable restaurant sector.

Keywords | Bibliometric analysis, circular economy, gastronomy, sustainability

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Resumo | O objetivo desta investigação é examinar a produção científica, bem como as tendências e recomendações internacionais sobre economia circular, gastronomia e sustentabilidade. Foi realizada uma análise bibliométrica nas bases de dados SCOPUS e Web of Science (WOS), e os resultados extraídos considerados relevantes foram processados no software VOSviewer. Num total de quatrocentos artigos considerados, autores italianos, espanhóis e americanos são responsáveis pela maior parte da investigação efetuada. Verifica-se uma evolução crescente na produção científica na última década, com o contributo de trezentos estudos sobre o tema, sendo que as principais agências que apoiam financeiramente esta investigação são europeias. Os resultados revelam oito áreas cruciais que enfatizam a intrincada relação entre estes conceitos. Embora a economia circular esteja intrinsecamente ligada à sustentabilidade, surge uma disparidade notória quando comparada com conceitos como a gastronomia e o turismo. A associação entre economia circular e sustentabilidade, embora presente, parece algo distante, e também mais próxima dos restaurantes do que do campo mais alargado da gastronomia. Estes resultados ajudam a sistematizar as características da literatura científica produzida sobre o tema e a sensibilizar para a importância das práticas circulares no sector da restauração e a servir de orientação para empreendedores e gestores na escolha de alternativas operacionais mais sustentáveis e eco-eficientes. É o primeiro estudo que aborda a intersecção da economia circular e a gastronomia local como contributo para uma restauração mais sustentável.

Palavras-chave | Análise bibliométrica, economia circular, gastronomia, sustentabilidade

1. Introduction

In recent years, there has been growing concern with the overuse of resources and food waste, due to their harmful effects along the entire production chain for current and future generations (Lemos et al., 2018). The circular economy plays an important role in this new state of affairs by transforming goods that are at the end of their useful life into resources for other purposes, where they are kept in the cycle for as long as possible (Muranko et al., 2018).

In the tourism context, current development models need to be rethought, advocating more responsible enjoyment of territories by tourists and helping to create and promote more sustainable and efficient gastronomic products that minimize the negative impacts of food waste (Thyberg & Tonjes, 2016). It is because of the need for change that gastronomy, added to tourism and based on the principles of the circular economy, assumes a role that potentially generates positive impacts in

terms of sustainability, through the strengthening of relationships with local producers and suppliers.

In this sense, the main objective of this study is to understand how the circular economy principles applied to local gastronomy have been incorporated and how they relate to sustainable tourism development models. To this end, a bibliometric analysis was used to systematize scientific production on the subject. Bibliometrics consists of a set of tools that researchers can use to analyze published data, highlight new configurations between concepts, apply mathematical and statistical techniques to study publication patterns in the distribution of information, and give meaning to themes that have not yet been explored (Diodato & Gelatly, 1994; Herrera-Franco et al., 2021).

It was decided to use scientific and reviewing articles published in journals because they are considered “certified knowledge” and because they go through an evaluation process, giving reliability to the results (Ramos-Rodríguez & Ruíz-Navarro, 2004). Therefore, conference proceedings, news,

and other types of documents found in the databases were not considered. Data was collected and then applied to perform bibliometric mapping using VOSviewer, which is particularly important when dealing with sources from multidisciplinary fields (Börner et al., 2003).

The study will contribute to a more solid knowledge about the appreciation of the gastronomic heritage of the territories under study and will allow an understanding of the fundamental role of the circular economy in the shift to a more sustainable paradigm of gastronomy in the restaurant sector. In practical terms, since it is the first study to relate these three concepts, it could serve as a starting point for future studies by other researchers in this area of knowledge.

This article is divided into four parts. First, a brief scientific review of the literature on the circular economy, gastronomy, and sustainability is advanced, as well as a link between these different dimensions. Then, the methodological process of data collection on the SCOPUS and WOS platforms is shown along with the techniques used for the analysis of the information. In third place, the results of the research are presented along with a discussion of the data obtained. And finally, recommendations for future studies are suggested, considering the limitations that emerged in undertaking this study.

2. Literature Review

Circular economy has emerged as a new paradigm of sustainability, revealing new opportunities for added value to organizations and their customers. This model makes it possible to rethink the economic practices of today's society, taking inspiration from nature itself and emerging as an alternative to the linear "take-make-dispose" economic model. (Ellen MacArthur Foundation, 2015). In this way, the traditional economic logic is changing, replacing mass production with sufficiency,

reusing what is possible, recycling what cannot be reused, repairing what is broken and restoring what cannot be fixed. However, circular economy principles are not based exclusively on reducing and reusing the raw materials used in the production system, but should, at the same time, encourage opportunities for sustainable consumption, waste management and innovation, as well as human development and global well-being (Lakatos et al., 2021).

In 2015 the United Nations (UN) defined the 2030 Agenda in the new global model to end poverty, promote prosperity and well-being for all, protect the environment, and combat climate change. Seventeen Sustainable Development Goals (SDG) were developed to achieve sustainable, regenerative, and inclusive growth (UN, 2015). Under the second SDG for zero hunger, food is recognized as a limited resource and the circular economy is expected to enhance food production processes (Del-Aguila-Arcenales et al., 2022).

Food elevated and celebrated as a rich and multifaceted cultural expression becomes gastronomy. And, gastronomy taken in its broad and absolute sense, undoubtedly needs to be appreciated in the discussion and formulation of circular models (Nyberg et al., 2022). Whether by conveying intangible domains, such as culture and identity (Holtzman, 2006; Lee, 2023, Montanari, 2006), or by its materialization in delicacies, fostering an entire intrinsic economy, it can represent a very important field of action in the search for a sustainable balance between the social, environmental, and economic levels (Nyberg et al., 2022). In this context, the concept of circular gastronomy arises, being defined by the same authors as the knowledge and skills in food and meal design, with a focus on recreation and re-design, to stimulate gastronomic development for a sustainable future.

Food consumption evokes positive sensations of enjoyment, sensory stimulation, and fulfillment, indicating that gastronomy, especially in restaurants, can significantly amplify pleasurable experi-

ences (Dias et al., 2023) In fact, traditional delicacies are emotive and experiential products which are central to tourism, hospitality, and gastronomic experiences that, in addition to nourishing the body and transferring pleasure, connect those who eat them to the places and spaces of origin. From a cultural point of view, they offer a means of common understanding of cultures that simultaneously serves as an invitation to travel to the place of origin and the respective way of life (Lee, 2023).

For the European Commission (EC), these delicacies are simultaneously part of what differentiates and unites Europeans, as they are natural and healthy, respect the environment, possess pleasant organoleptic characteristics and intrinsic cultural values, and are therefore increasingly attractive to consumers. Thus, they will be part of the future knowledge-based bioeconomy (EC, 2007, p. 6) and, if well supervised, can help maintain jobs and contribute to the development of rural areas, both in developed and developing countries (FAO, 2004). However, to produce traditional foods, it is crucial to improve their competitiveness vis-à-vis other food products, developing innovations that not only meet the general demand of consumers and their expectations but also ensure the food security of consumer products, improve their nutritional values and maintain or improve their sensory qualities (EC, 2007, p. 6).

Gastronomic tourism can then leverage local development in rural regions with less population density, if well managed through governance models that find a symbiosis between the needs and well-being of tourists and the local population (Hall et al., 2003; Rodrigues et al., 2022; Visković & Komac, 2021; World Tourism Organization & Basque Culinary Center, 2019). Destinations will thus be able to present their distinctive characteristics and cultural diversity, particularly gastronomic, as a competitive advantage in a globalized world (Visković & Komac, 2021).

Contrary to the trend of homogenization driven by globalization and urbanization, gastronomy

is actively re-evaluating and reclaiming traditional knowledge and flavors (Araújo, 2021). This resurgence aligns with the principles of the circular economy. The revitalization of old traditions serves as the guiding principle for the resurgence and defense of local products (Araújo, 2021), promoting more sustainable cooking techniques and procedures, namely at local restaurants.

Furthermore, the escalating trend of sustainability and the pressing requirement for differentiation within the restaurant industry are becoming increasingly significant factors (Mendes et al., 2021). Above and beyond a structuring service for gastronomic tourism (World Tourism Organization & Basque Culinary Center, 2019) restaurants can act as a lever for an economy based on traditional local delicacies if they model their offer on these delicacies. Using local products, they can counter the classic industrial food supply model, adopting models that bring the final consumer closer to the producers (Hall et al., 2003). This greater proximity between producer and consumer and the use of local products can bring important benefits to food sustainability, although a focus on ways of producing and consuming food, rather than on the place of origin, may be more effective and appropriate (Schmitt et al., 2017).

As a guideline for future development along the entire supply chain, the circular economy aims to safeguard sustainable service measures in restaurants as a way to minimize food waste, due to the inseparable relationship between these two concepts (Borrello et al., 2016; Chuang et al., 2010; Thyberg & Tonjes, 2016; Vilariño et al., 2017). In the field of food waste, there are already various organizations such as Re-Food and the Zero Waste movement, which collect meals or food (that would otherwise become waste) from restaurants, supermarkets, bakeries and pastry shops. They then distribute these rescued items to families identified as being in need (Lemos et al., 2018).

The development of sustainable models and innovation in services like these, based on the princi-

ples of prevention and regeneration, is imperative not only in the search for a balance between the three basic dimensions of sustainable development – economic, social, and environmental – but also in outlining a goal that the current restaurant industry must strive to develop (Chuang et al., 2010).

Indeed, ecological practices are becoming a trend in restaurants and have been expanded on by various entities in the area (European Parliament, 2012; Ellen MacArthur Foundation, 2013; FAO, 2013; National Commission to Combat Food Waste, 2017; World Economic Fund, 2023). This arises not only from the excessive consumption of water, energy, and disposable products in this industry but also from the image that restaurant companies intend to convey to their customers. In this way, they lead them to opt for a form of business that benefits environmental performance (Revell & Blackburn, 2007).

Schanes et al. (2018) advocate that intervention policies need to be expanded and multiplied to maximize the prevention of food waste, combating undesirable surplus food, and preventing overproduction and oversupply of food (Papargyropoulou et al., 2014; Smil, 2004). Factors such as individual consumer choices, namely eating habits, traditions and practices, cultural aspects, structures of distribution channels and behavior when buying, are seen as possible relevant causes of this phenomenon (Cicatiello et al., 2016; Muranko et al., 2018).

Thus, the circular economy applied to gastronomy, known as circular gastronomy, could be one of the multiple vectors of efforts that should be taken globally and diagonally to mitigate climate collapse, especially in the restaurant sector.

3. Methods

The full bibliometric analysis was carried out in the SCOPUS and WOS databases on February 28,

2023, following a mixed methodological approach. The results obtained for performing bibliometric mapping were then processed in VOSviewer, which is particularly important when dealing with sources from multidisciplinary fields (Börner et al., 2003).

3.1. Data Collection

Data was collected from the Scopus and Web of Science (WOS) bibliometric databases using the following searches of descriptors included in the title, abstract or keywords of the articles: (1) ["circular economy" AND "local food"] OR ["circular economy" AND "traditional food"] OR ["circular economy" AND "heritage food"] OR ["circular economy" AND "ethnic food"]; (2) ["circular economy" AND gastronomy] OR ["circular economy" AND gastronomic]; (3) ["circular economy" AND restaurant] OR ["circular economy" AND restaurants]; (4) ["circular economy" AND sustainability] AND ["circular economy" AND "local food"]; (5) [gastronomy OR gastronomic] AND [sustainability OR sustainable]; (6) ["local food"] AND [sustainability OR sustainable] AND [restaurant OR restaurants]; (7) [gastronomy OR gastronomic] AND [sustainability OR sustainable] AND [restaurant OR restaurants].

Subsequently, in each search, the initial documentary sample (of 1082 documents) was limited by applying the following criteria (Table 1):

- (i) article or review document typology;
- (ii) application of mandatory integrated scientific domains (social sciences; agricultural and biological sciences; business, management and accounting; economics, econometrics and finance and multidisciplinary in the case of Scopus, and agriculture, multidisciplinary, multidisciplinary sciences, economics, business, management, social interdisciplinary sciences, multidisciplinary humanities and food science technology in the case

of WOS) whenever the sample per survey exceeds fifty documents;

(iii) documents that were not repeated in each database; iv. documents that were not repeated between the databases;

Table 1 | Total publications on SCOPUS and WOS databases and exclusion of documents

SCOPUS				
Search	Total results	With filters (if applied)	Without repeated documents	
1	33	28	NA	
2	7	5	NA	
3	46	35	NA	
4	11	9	NA	
5	398	255	NA	
6	50	40	NA	
7	55	42	NA	
Total	600	414	359	
WOS				
Search	Total results	With Filters (if applied)	Without repeated documents	Without SCOPUS repeated documents
1	23	23	NA	NA
2	5	5	NA	NA
3	41	40	NA	NA
4	9	9	NA	NA
5	312	77	NA	NA
6	49	18	NA	NA
7	43	38	NA	NA
Total	482	210	183	41

Source: Original compilation based on SCOPUS and WOS

3.2. Data Analysis

It was decided to treat the bibliometric data from the two databases together to obtain an integrated and holistic perspective. Thus, having applied the criteria set out previously, four hundred documents were considered.

In summary, Table 2 presents the number of publications, by document type, considered in each of the databases and the total considered for this study. The results indicate that articles are the main form of publication in all the researches carried out, representing 364 of the 400 total documents under analysis. Reviews have a much smaller number of publications, representing only 36 documents. Overall, the results suggest that research in this area is predominantly based on scientific articles and that reviews are a less common form of publication.

Table 2 | Considered publications by document type

Document Type	SCOPUS	WOS	Total SCOPUS+WOS
Article	324	40	364
Review	35	1	36
Total documents per data base	359	41	400

Source: Original compilation based on SCOPUS and WOS

Initially, these documents were analyzed regarding their year of publication, associated countries, affiliations, type of document, funding agencies, research areas and authors.

Secondly, data was computerized using the VOSviewer software, applying the mapping of VOS concepts. This technique was adopted, given that science mapping is particularly suitable for analyzing a large volume of documents, from which it is intended to extract measures of semantic similarity between authors, documents, scientific journals, or citations (Aria & Cuccurullo, 2017).

4. Findings and Discussion

According to the data available in the SCOPUS and WOS databases regarding the distribution of scientific production in recent years, with the main focus on the last 10 years, there is an upward trend. The total number of articles published in all surveys is 400. Figure 1 shows the number of articles published in each year. Most articles were published in the most recent years (2020, 2021 and 2022), representing more than half of total publications ($\approx 59\%$). There is a considerable increase in the number of publications over the years, start-

ing in 2014, with a constant increase until 2022, which had the highest number of publications ($n = 108$). Previous years, such as 1996 to 2010, had fewer publications, indicating an increase in scientific production in recent years, which is in line with the growing current of thought that involves ecological practices associated with the circular economy, as a new paradigm of sustainability (Revell & Blackburn, 2007; Ellen MacArthur Foundation, 2015). The year 2023 already presents many studies carried out on the themes under investigation ($n = 22$), which imply a growth trend in this scientific field.

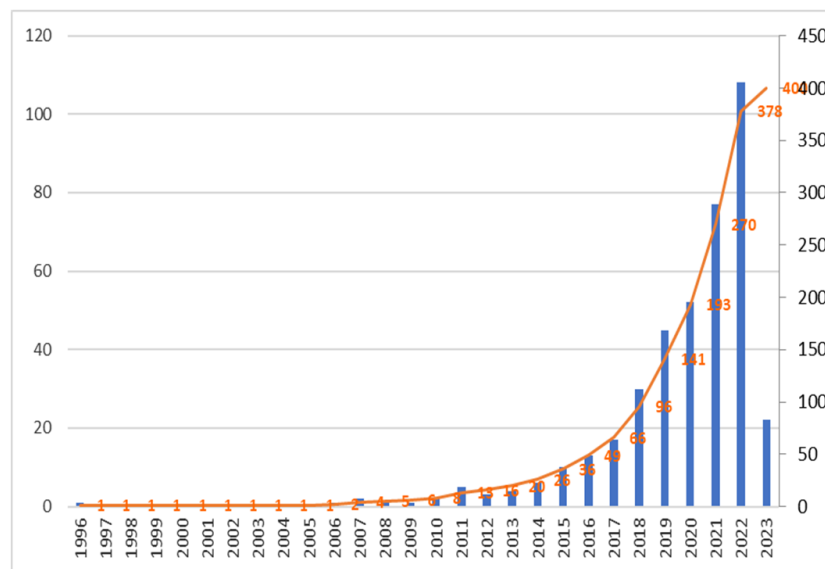


Figure 1 | Distribution of papers by year
Source: Original compilation based on SCOPUS and WOS

Regarding scientific publication by country, the number of publications varies greatly between the 86 countries considered, with Italy and Spain having the highest number of publications (69 and 68, respectively). It can be noticed that Italian, Spanish and American authors are responsible for most of the published articles. Together, these three countries represent practically a third of the total number of articles published (28%). Portugal stands out, ranking fourth out of a total of 25 countries considered for the analysis, with a total

of 19 publications (Figure 2).

Figure 3 presents a list of the top 17 authors, by surname, who have at least three articles related to sustainability and the circular economy in the restaurant field. Of the 400 published articles, there was a contribution of 300 authors. Of this total, six published more than four articles, followed by 11 authors who published three articles, 75 authors published two articles, and the remaining 201 published only one article. It is worth mentioning the two authors who published the most: Pieroni A.

with nine articles and Fusté-Forné with seven articles. These are followed by Fontefrancesco M.F. with six publications, Aguilera J.M., Fogarassy C

and Guiné R.P.F. with four publications, and all the others listed with three publications.

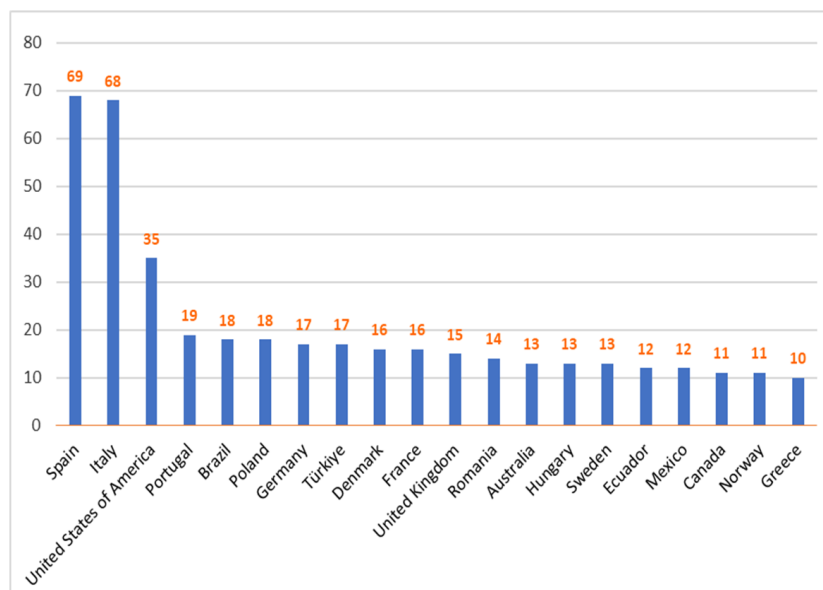


Figure 2 | Geographical distribution of publications
Source: Original compilation based on SCOPUS and WOS

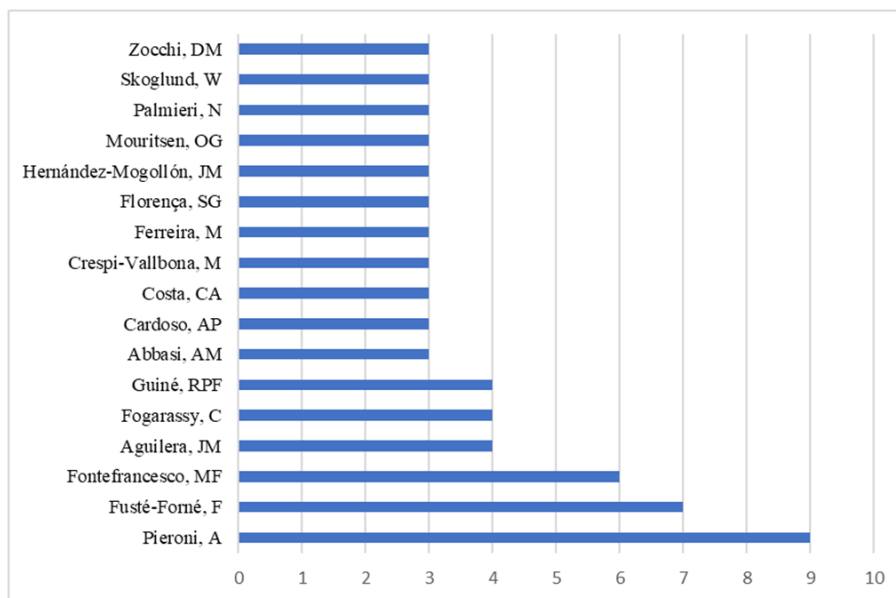


Figure 3 | Authors with the greatest production
Source: Original compilation based on SCOPUS and WOS

In a total of 230 affiliations resulting from the research carried out, the bibliometric analysis of the data presented shows that the affiliation with

the most published articles is the Università degli Studi di Scienze Gastronomiche, with 16 publications in total. It is significant to point out that this

institution's first place may be due to its exclusive focus on the study of gastronomic sciences. In second place is the Universidad de Córdoba, with 10 articles. Other prominent affiliations are the University of Extremadura (eight), the Københavns Universitet (seven), the Universitat de Girona (seven) and the University of Zagreb (seven). Table 3 presents the affiliations with the highest number of published articles, resulting from the seven bibliographic searches accomplished.

Table 3 | Institutions with publications on the circular economy, gastronomy or sustainability

Affiliation	Total
Università degli Studi di Scienze Gastronomiche	16
Universidad de Córdoba	10
Universidad de Extremadura	8
Københavns Universitet	7
Universitat de Girona	7
University of Zagreb	7
Hungarian University of Agriculture Life Sciences	6
Università Ca' Foscari Venezia	6
Università degli studi di Bari Aldo Moro	6
INRAE	5
Instituto Politécnico de Viseu	5
Universidade do Porto	5
Università degli Studi di Firenze	5

Source: Smart Community Ecosystem

These results suggest that there is a concentration of publications in some institutions, while others have a less notable presence in the scientific production in the area. Intuitively, this distribution aligns similarly to the countries of publication, i.e., in most cases the origin of the authors coincides with the institution where the publication was made. The strong presence in the study of these variables in European countries can be explained by the main foundations/entities that study and promote the global sustainability of resources and

the environment, based on the principles of the CE and the fight against food waste, are of European origin, or operate mainly in Europe. (European Parliament, 2012; Ellen MacArthur Foundation, 2013; FAO, 2013; National Commission to Combat Food Waste, 2017; World Economic Fund, 2023).

According to Table 4, the funding agency that contributed the most to the research carried out was the European Commission, with 10 funded projects. The “Fundação para a Ciência e a Tecnologia (FCT)” comes in second with nine funded projects. Due to its sustainable character, emphasized by its innovative expression about climate issues, the European Union funding program Horizon 2020 (Horizon2020, n.d.) appears in third place with eight funded projects. The same applies to the European Regional Development Fund, for its purpose of “reducing disparities between the levels of development of European regions and to improving living standards in the least-favored regions” (European Parliament, 2023, p. 1), which highlights the important role of these two initiatives in funding studies in this area of knowledge.

In addition to those already mentioned, the analysis reveals the presence of funding agencies from other countries, including China, Germany, Chile, Canada, Spain, and Japan, which suggests that research in this field is funded by several international sources. These also have their main focus in European countries, as they are agencies that promote international collaboration and mobility of researchers through the funding of research projects. The growth of European funding has led to more and more collaboration across national borders, especially in social sciences and humanities. Over time, the European research field has become more inclusive, dense, and centralized, which explains its expansion (Heilbron, 2012).

Table 4 | Total of publications by funding agencies

Funding Agency	Total
European Commission	10
Fundação para a Ciência e a Tecnologia	9
Horizon 2020	8
European Regional Development Fund	8
Bundesministerium für Bildung und Forschung	6
National Natural Science Foundation of China	4
Nordea-fonden	4
Coordenação de Aperfeiçoamento de Pessoal de Nível Superior	3
European Social Fund	3
Fondo Nacional de Desarrollo Científico y Tecnológico	3
Ministerio de Asuntos Económicos y Transformación Digital, Gobierno de España	3
Nemzeti Kutatási Fejlesztési és Innovációs Hivatal	3

Source: Original compilation based on SCOPUS and WOS

Table 5 | Research approach and areas

Research Areas	Approach	Total	Total by research areas
Social Sciences	Social Sciences	200	223
	Multidisciplinary	8	
	Social Sciences Other Topics	4	
Environmental Sciences	Sociology	11	159
	Environmental Science	129	
	Earth and Planetary Sciences	7	
	Food Science Technology	7	
Agriculture	Materials Sciences	16	123
	Agricultural and Biological Sciences	120	
	Agriculture	3	
Business, Economics, Management and Accounting	Business Economics	7	117
	Business, Management and Accounting	81	
	Economics, Econometrics and Finance	28	
	Operations Research Management Science	1	
Multidisciplinary Sciences	Biochemistry, Genetics and Molecular Biology	33	77
	Arts and Humanities	1	
	Chemistry	2	
	Computer Science	10	
	Decision Sciences	4	
	Geography	3	
	History Philosophy of Science	1	
	Mathematics	21	
	Theater	1	
Energy	Veterinary	1	67
	Energy	67	
Engineering	Chemical Engineering	49	56
	Engineering	7	
Health and Nutrition	Health Professions	3	33
	Immunology and Microbiology	3	
	Medicine	13	
	Nursing	9	
	Psychology	5	

Source: Original compilation based on SCOPUS and WOS

all, to promote better opportunities for sustainable consumption at the level of society and of your well-being. The inevitability of adopting a holistic and interdisciplinary approach to new economic thinking is reflected in the planning and organization of society. At this crossroads, there is a significant interest on the part of the authors in the study of social and environmental sciences, from an agricultural and economic perspective (Table 5).

Source: VOSviewer output

number of main links between concepts and total occurrences of keywords.

It is evident that, compared to other concepts such as gastronomy and tourism, there is some distance between the circular economy and the central concept of sustainability, even though the cir-

cular economy and its cluster is intrinsically related to sustainability.

In this cluster led by the circular economy, waste management and food waste stand out. It is also remarkable how close it is to restaurants, recycling, ecological footprint, and environmental impact. It is therefore suggested that the circular

economy can be useful in seeking to mitigate climate breakdown. As Lakatos et al. (2021) state, a framework for a circular economy should foster opportunities for sustainable consumption, waste management, and innovation in all fields, as well as human development and greater well-being for all.

Table 6. The main author's co-occurrence total link strength

Total link strength	Total
Sustainability	655
Circular economy	350
Food	288
Sustainable development	278
Food waste	276
Article	267
Gastronomy	266
Tourism	243
Waste management	231
Human	222
Local food	216
Environmental impact	194
Tourist destination	190
Restaurant	187

Table 7. The main author's co-occurrence

Occurrences	Total
Sustainability	109
Gastronomy	57
Circular economy	53
Food	40
Sustainable development	40
Tourism	38
Local food	38
Food waste	33
Tourist destination	26
Article	22
Waste management	22
Tourism development	22
Rural development	21
Human	20

Source: Original compilation based on VOSviewer

Consequently, it should close the cycles in industrial ecosystems, minimizing waste and optimizing the use of resources (Ellen MacArthur Foundation, 2013).

Concerning food waste, its close relationship with the circular economy once again demonstrates the usefulness of this model in reducing it, a goal that is present in the UN 2030 Agenda (UN, 2015).

Other relevant concepts in the circular economy constellation are the life cycle, composting, biomass and fertilizers. These are opposed to the take-make-dispose linear economic model (Ellen MacArthur Foundation, 2015), by transforming goods that are at the end of their useful life into resources for other purposes (Muranko et al., 2018), in this case, through the production of fertilizers, compost and energy resources from end-of-life food raw materials. In the same logic there is a very similar relationship between animal

oils and fats and biofuels. Despite being in a different cluster, there is a clear and strong relationship with the latter.

Then, in the graphic of Figure 5, considering a minimum of five occurrences, 134 of the 2789 words recorded in the VOSviewer software were contemplated, forming six clusters.

In the cluster led by the central keyword – sustainability – concepts such as gastronomy, tourism, and sustainable development stood out, showing proximity not only between them but also with the central theme. In a close orbit, concepts such as sustainable tourism, gastronomic tourism and rural development can be observed. This asserts the notion that gastronomic tourism can leverage the local development of rural regions with lower population density (Hall et al., 2003; Rodrigues et al., 2022; Visković & Komac, 2021; World Tourism Organization & Basque Culinary Center, 2019).



Source: VOSviewer output

Local food is also related to other notions through gastronomic tourism (food tourism, culinary tourism, gastronomic tourism), namely authenticity, identity, heritage, culture, and rural development. Traditional delicacies are emotive and expe-

Surprisingly, hospitality lies closer to the concept of local food than restaurants, which is believed to be due to the proximity of restaurants to the circular economy, being in turn shifted by the strength of this relationship.

In the cluster led by local food, restaurants stand out, being a structuring component of tourism, particularly gastronomic (World Tourism Or-

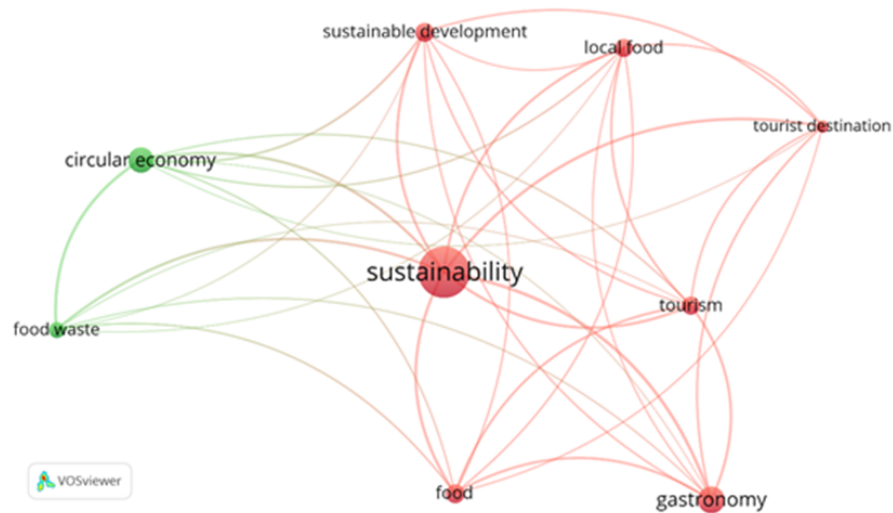


Figure 7 | Graphic illustration of authors' co-occurrence networks with a minimum of 25 occurrences

Lastly, based on the graphic in Figure 7 and considering a minimum of eight occurrences, nine of the 2789 words recorded in the VOSviewer software were considered, forming two clusters. This last illustration summarizes this analysis, portraying the core of this study – sustainability – and some concepts it is strongly related to in this scope. The words with the highest number of occurrences are detailed in Table 7

5. Conclusions

This study provided a bibliometric analysis (Del-Aguila-Arcentales et al., 2022) that enabled a systematization of the characteristics of the scientific literature produced on the relationship between the circular economy and gastronomy, mainly considering its sustainable character and as a sector enabler. Research in this field heavily relies on scientific articles, with reviews being less common. A majority of articles were published in recent years (2020-2022), showing consistent growth since 2014, in line with the increasing focus on ecological practices and the circular economy. Italian, Spanish, and American authors

dominate contributions, with the Università degli Studi di Scienze Gastronomiche leading in publications. This concentration suggests that certain institutions are more active, especially in European countries, which play an important role as a key foundation for global sustainability and environmental studies, especially in the field of circular economy and food waste reduction, with the European Commission being the main funding agency.

A total of 1082 documents containing references to the variables “Circular economy”, “Gastronomy/gastronomic”, “Restaurant”, “Local/traditional/heritage/ethnic food”, and “Sustainability/sustainable” were considered, following strict predefined criteria. It was found adequate to proceed with the analysis of data from the two bibliometric bases together, to take greater advantage of the complementarity of both for the study. The most pertinent results were obtained from processing in the VOSviewer software for the visualization of bibliometric relation networks. In this context, the study of the circular economy not only emphasises the efficient use of raw materials in production, but also seeks to increase opportunities for sustainable consumption that benefits societal well-being. Despite some apparent distance from concepts such as gastronomy and tou-

ism, the circular economy is intrinsically linked to sustainability. Within its cluster, waste management and food waste are prominent, closely linked to restaurants, recycling, ecological footprint and environmental impact, suggesting a potential role in mitigating climate change. Additional concepts such as life cycle, composting, biomass and fertiliser, although in a different cluster, show a clear and robust relationship.

In the sustainability-led cluster, gastronomy, tourism and sustainable development are highlighted, demonstrating their proximity not only to each other but also to the central theme of sustainability. Concepts such as sustainable tourism, gastronomic tourism and rural development are closely linked. The relationship between sustainability and the central theme of another cluster, 'local food', is noteworthy. Here, innovation, which belongs to the food cluster, acts as a mediator, underlining its importance for the sustainability of the sector.

Through gastronomic tourism, local food extends its links to authenticity, identity, heritage, culture and rural development. Traditional delicacies, at the heart of tourism, hospitality and gastronomy practices, create emotional and experiential links with places of origin. Surprisingly, hospitality is closer to the concept of local food than restaurants, possibly due to the latter's proximity to the circular economy. In the local food cluster, restaurants stand out as key components, particularly in gastronomic tourism, which supports the economy based on traditional local delicacies. In sum, eight main areas of research were found that mediate the relationship between sustainability, the circular economy, and gastronomy, namely: i) behavioral aspects of society, such as patterns of social relations, social interactions, and cultural issues of everyday life; ii) the multidisciplinary of environmental sciences, regarding the control and mitigation of food waste and the management of natural resources; iii) agricultural innovation through more organic farming systems; and iv) economic and management approaches.

As with any other study, there are some limitations. The complexity of collecting information and the need to explore various aspects of the research, due to their relevance, constituted the main obstacles. As a result, the export of data for processing via analysis tools entailed several constraints and did not always prove to be viable and reliable. Another limitation is that the circular economy is studied in several distinct areas, which leads to the intersection of a lot of unwanted information for our study.

The analysis carried out with the VOSviewer software supports the centrality of sustainability in this study and allows for the synthesis of the main concepts referenced in the literature. At the same time, it highlights the proximity between gastronomy, tourism, and local food and its reflection on the CE and food waste for the sustainable development of tourist destinations.

It is hoped that this paper will serve as a contribution to raising awareness and developing people's critical sense regarding the importance of circular practices in the restaurant trade. Concomitantly, it is intended to be used as a guideline for entrepreneurs and managers in the area for choosing more sustainable and eco-efficient operating alternatives for their operation, to the detriment of the overuse of resources and food waste. By being aware of these alternatives, businesses can achieve significant benefits, including cost savings through reduced resource use and minimised food waste. In essence, adopting more sustainable practices not only aligns with environmental goals, but also contributes to improved operational efficiency and financial gains for business owners.

For future investigations, research must continue to closely monitor ongoing changes, both in new circular and sustainable business models, but also concerning restaurant trends, especially gastronomic needs and new consumption patterns of tourists. Solid knowledge of these dimensions will be fundamental for the development of more sustainable and cooperative tourist destinations and,

inevitably, of the catering sector as well, always calling for the integration of the people involved in the whole process, from the host communities to tourists, to workers and entrepreneurs.

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