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Review

A Bibliometric Review of Willingness to Pay for and Consume Sustainably Produced Beers

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Abstract

This study conducts a systematic literature review and bibliometric analysis of scientific publications examining the relationship between consumer behaviour toward sustainably produced beer and the consumption and production context of their countries. Based on a sample of 112 articles (1991–2025) indexed in the Web of Science database, the main research lines, influential authors, applied methodologies, and emerging trends are identified. The analysis shows a growing interest in understanding how sustainable beer attributes influence consumer purchasing decisions, alongside notable thematic and methodological dispersion. Using tools such as VOSviewer 1.16.19 and SciMAT 1.1.06, the study maps the driving themes in the field, highlighting the centrality of concepts such as preferences and consumer behaviour. The results reveal both recent advances and existing gaps in the literature, especially with regard to beer in comparison to other beverages. This work contributes to the existing body of research and proposes future directions to enhance sustainability in the brewing sector from a consumer perspective, adding value to the beer industry and paving the way for more sustainable consumption.

Keywords: beer; sustainability; consumers; behaviour; literature review

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1. Introduction

At present, the brewing industry is facing the need to transform in response to the growing demand for sustainable business practices. This transformation is closely linked to the values of consumers and regulators, who place considerable importance on social responsibility and environmental sustainability. Widespread concern about the environmental impact of beverage production has intensified pressure on the sector to adopt more sustainable approaches [1].

Against the backdrop of a growing concern for sustainability in the food sector, which calls for a profound transformation of production processes, the case of beer stands out as a particularly illustrative example. As one of the most widely consumed beverages globally, beer production involves environmental challenges related to its water and carbon footprint, the responsible sourcing of ingredients, and the sustainable management of packaging and waste. Understanding consumer behaviour towards sustainably produced beer becomes especially relevant, as it reveals how ecological values are increasingly shaping purchasing decisions within a more environmentally aware market.

Beer production is generally considered to have a high water and carbon footprint [2]. The introduction of the concept of sustainability in the brewing sector encompasses a range

of dimensions, including carbon footprint reduction, responsible water management, the use of eco-friendly packaging [3], socially responsible practices [4], and environmental protection [5]. Consumers, for their part, are increasingly aware and informed about these issues, leading them to choose products that not only meet their needs but also reflect their values and align with sustainable principles [6].

In this context, the need for reliable analytical data on consumer preferences for sustainable beer is evident, particularly regarding willingness to pay (WTP)—a concept that companies must consider in order to understand consumer preferences and guide their strategic decisions accordingly [5]. Greater awareness of sustainability leads consumers to seek products that go beyond merely satisfying their needs, aiming instead for consumer habits that reflect their values and contribute to a more sustainable future [6]. This new consumption pattern encourages companies to produce goods using local and organic ingredients, promoting community development and ensuring fair working conditions for their employees [7].

From an economic perspective, analysing consumer preferences makes it possible to assess their level of commitment and willingness to purchase products identified as sustainable. In this way, firms can offer more competitive products in a mature and saturated market [8] and develop more effective marketing strategies that communicate their distinctive value to consumers [9].

Moreover, research into consumer preferences in the context of sustainability within the food industry has grown steadily across various contexts [8]. The existing literature includes contributions such as reviews of craft beer focusing on sustainability and marketing strategies aimed at strengthening brand identity [10], studies on the determinants of WTP in the wine sector [11], research on the adoption of sustainable practices in the coffee industry, highlighting the importance of a clear and credible sustainability strategy [12], as well as works that examine the influence of consumer values [13] and the effectiveness of marketing plans through well-defined corporate strategies [14].

To gain a global perspective of the scientific literature on consumer preferences for sustainable beer, the present bibliometric study analyses the published literature on the subject between 1991 and 2025. Specifically, it focuses on a selection of 112 academic articles with the aim of identifying the main preferences, research areas, and most influential authors in this field.

This study, which centres on consumer interest in sustainable beer, explores the literature on the reasons and mechanisms behind sustainability-oriented consumption decisions, as well as the characteristics of such behaviours and consumers' willingness to pay a premium for sustainable attributes. Firstly, it is noted that many studies address sustainability in food products in general, encompassing various categories of food and beverages. In the specific case of beverages, research has mainly focused on products such as water, wine, non-alcoholic drinks, or spirits, whereas studies exclusively focused on sustainable beer are significantly less common [13]. The available literature tends to explore attributes related to ingredient origin and sustainable production practices. Furthermore, no bibliometric mappings have been found that examine consumer interest in sustainable and craft beer. Although the previous literature has discussed sustainability across general food and beverage categories, no bibliometric study to date has specifically focused on beer. This lack of targeted research underscores the originality of the present study, which fills a critical gap by mapping the scientific output surrounding sustainably produced beer and its reception among consumers. Therefore, this analysis adds significant value to the state of the research by systematising and examining the existing literature to provide a broad and structured overview of the field. In addition, the review has revealed several

research gaps, allowing for the proposal of new avenues of study for researchers interested in willingness to pay for sustainable beer.

The bibliometric analysis was carried out in three stages, following the approach of Tranfield et al. [15]:

1. Literature search: Relevant studies were identified in the Web of Science database, focusing on sustainability within the brewing industry and consumer behaviour. Keywords such as beer, sustainability, consumer, and behaviour were used. Inclusion and exclusion criteria were applied to refine the results and ensure relevance to sustainable beer consumption.
2. Selection of key studies: A screening process was conducted to select the most pertinent articles related to environmental, social, and economic aspects of sustainability. Special attention was given to attributes such as packaging, product quality, and consumer preferences for sustainably produced beer.
3. Descriptive analysis: The selected articles were examined to identify central research themes, influential authors, and commonly used methodologies. Visual mapping tools such as VOSviewer and SciMAT were applied to detect emerging trends and thematic clusters within the field.

2. Materials and Methods

The process undertaken to analyse the existing research on sustainable beer has been based on structured and transparent methods that allow for a comprehensive examination of the topic, following a three-stage process [15].

Firstly, the focus is placed on the literature search, which involves examining existing research related to sustainability in the beverage industry—particularly the brewing, wine, and coffee sectors—as well as studies on consumer behaviour. The objective at this stage is to gain an understanding of the field and to identify the main research lines. An in-depth search was conducted to identify the most relevant studies within the scope of this research. This was achieved using the Web of Science (WoS) database, a widely recognised academic resource. Inclusion and exclusion criteria were applied, focusing on key search terms such as beer, sustainability, consumers, and behaviour. The search criteria and specific details are summarised in Table 1.

Table 1. Bibliographic search criteria and results obtained.

Database	**Web of Science**
Search fields	Topic
Research areas	All
Query	(“beer”) AND (“sustainab*”) AND (“consumer*”) AND (“behavio*”)
Languages	English
Document types	Articles and review articles
Publications years	All
Search date	February 2025
Number of documents in the bibliometric analysis	112

As a result, a total of 112 articles were retrieved, all published in English and covering the period from 1991 to 2025. A bibliometric analysis of these results was then conducted in order to identify the main areas of research, track their evolution over time, determine the most influential authors and institutions, and assess the methodologies most commonly employed.

The second step following Tranfield et al. [15] involves selecting the most relevant studies in order to conduct a detailed literature review. This stage includes a screening process that considers only those articles most pertinent to the focus on sustainability—environmental, social, and economic—as well as aspects such as packaging and product quality, specifically in relation to consumer preferences for sustainable beer.

Finally, to complete the study, the last stage, according to Tranfield et al. [15], consists of a descriptive analysis of these most relevant articles.

To carry out a visual analysis of the bibliometric study, we employed the software VOSviewer [16]. To identify driving and emerging themes, we used the SciMAT software [17].

3. Results

3.1. Bibliometric Analysis Using VOSviewer

Firstly, as described in Table 1, the process opens with a literature search that provides an overview of how the field has developed. Figure 1 shows a co-occurrence graph of keywords.

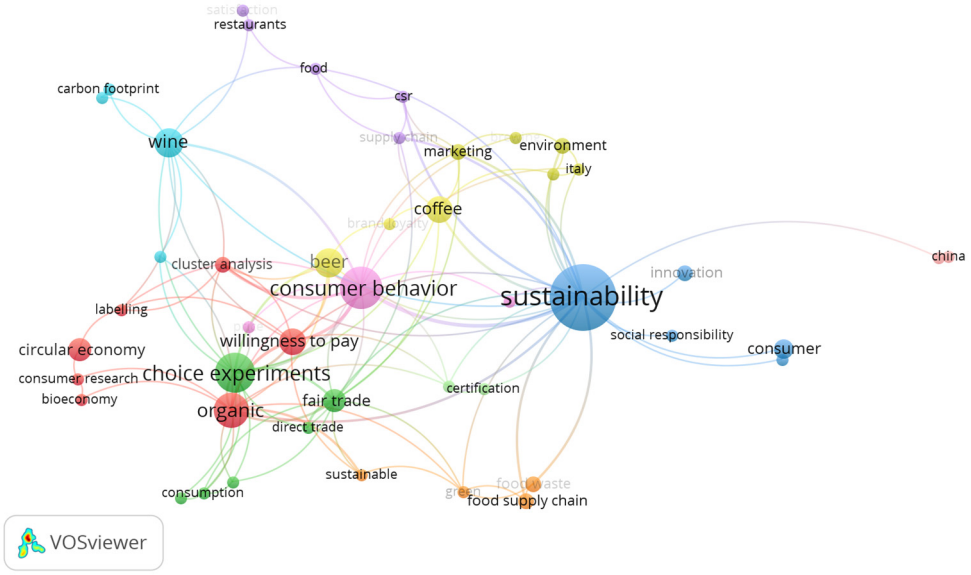


Figure 1. Keyword co-occurrence map based on the bibliographic search using the query ("beer") AND ("sustainab*") AND ("consumer") AND ("behavio*").

This graph shows, through the size of each sphere, the number of times each keyword appears. The links between the circles represent the simultaneous occurrence of two keywords within the same article. Keywords that frequently appear together are grouped into clusters, each represented by a different colour. Topics with a higher number of connections are positioned closer to the centre, while those with fewer links are located further from the core.

The analysis of Figure 1 reveals that, as expected, "sustainability" is the most frequently occurring keyword across the studies. Furthermore, within the field of consumer preference research for sustainable products in the beverage sector, beer, wine, and coffee-related products are the most studied in the literature.

From a methodological perspective, again as expected, "consumer behaviour" is the most commonly used keyword. Notably, the choice experiment technique and the estimation of WTP emerge as the most prominent theoretical approaches in this field.

The analysis of Figure 1 already allows us to draw a first conclusion: in the field of consumer preferences for sustainable products, beer appears to be relatively under-researched. It is worth noting that the keyword "beer" was explicitly included in the search

strategy; however, keywords such as "wine" and "coffee" appear almost as frequently as "beer" itself. This suggests that there are relatively few studies focused exclusively on the beer sector. As a result, most of the articles retrieved in the search are not centred solely on beer but rather address the broader category of beverages, and often fall within the wider scope of the food and drink industry.

To further contextualise this point, we conducted an additional literature search in which the term "beverag*" was used instead of "beer", allowing for a clearer comparison between research developments on beer and other related fields. Figure 2 shows a co-occurrence map similar to the previous one, but covering the broader domain of beverages. The area of the map where "beer" appears as a keyword is highlighted with a red circle.

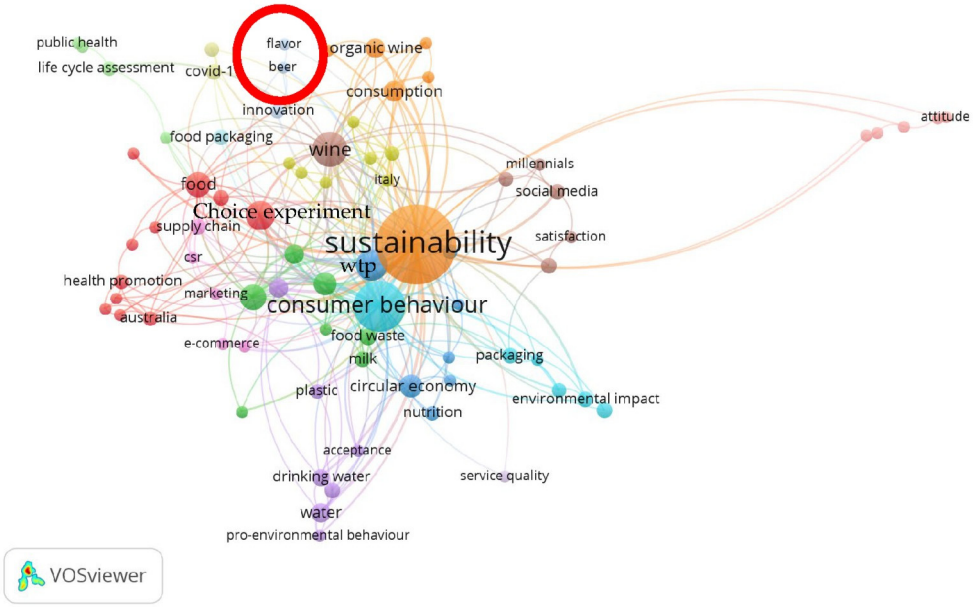


Figure 2. Keyword co-occurrence map based on the bibliographic search using the query ("beverage*") AND ("sustainab*") AND ("consumer") AND ("behavio*").

Figure 2 shows that wine- and water-related products are the most extensively studied in the literature. Dairy and beer products also receive a certain degree of attention, although to a much lesser extent. Packaging and its sustainability also emerge as a noteworthy area of focus.

Therefore, it is clear that research on consumer interest in sustainable beer represents a gap within the broader field of beverage studies. This highlights the need to expand research in this area, with a recommendation to adopt choice experiment methodologies and WTP estimations, as has been performed in studies of other beverages.

Focusing once again on the 112 studies identified in the literature search, it is worth noting that these articles are published in 37 different academic journals (Table 2). Of these, *Sustainability* stands out with 34 articles (30.36%), followed by the *British Food Journal* with 17 articles (15.18%), and the *Journal of Cleaner Production* with 14 articles (12.50%). The full list is presented in Table 2.

Thus, although more than half of the articles are published in just three journals, the diversity of published papers spanning different disciplines is considerable. This indicates that the topic addressed in this research is approached from multiple perspectives. This is further evidenced by the wide range of leading research areas, as shown in Figure 3, where the main fields include "Green and Sustainable Science and Technology" and "Environmental Sciences".

Table 2. Journals where the 112 studies identified in the Web of Science search were published.

Journal	Documents	Percentage
Sustainability	34	30.36%
British Food Journal	17	15.18%
Journal of Cleaner Production	14	12.50%
International Journal of Wine Business Research	4	3.57%
Agribusiness	3	2.68%
Beverages	2	1.79%
Journal of Food Science	2	1.79%
Sustainable Production and Consumption	2	1.79%
Agricultural and Food Economics	1	0.89%
Agricultural Economics	1	0.89%
Applied Geography	1	0.89%
Biofuels Bioproducts and Biorefining	1	0.89%
Biomass Bioenergy	1	0.89%
China Agricultural Economic Review	1	0.89%
Comprehensive Reviews in Food Science and Food Safety	1	0.89%
Corporate Social Responsibility and Environmental Management	1	0.89%
European Journal of Marketing	1	0.89%
European Review of Agricultural Economics	1	0.89%
Fermentation	1	0.89%
Food Quality and Preference	1	0.89%
Food Research International	1	0.89%
Food Science and Biotechnology	1	0.89%
Foods	1	0.89%
International Journal of Production Research	1	0.89%
Italian Journal of Animal Science	1	0.89%
Journal of Food Products Marketing	1	0.89%
Journal of Sustainable Tourism	1	0.89%
Journal of the Science of Food and Agriculture	1	0.89%
Marketing Intelligence Planning	1	0.89%
Network	1	0.89%
Packaging Technology and Science	1	0.89%
Plos One	1	0.89%
Qualitative Market Research	1	0.89%
Resources Conservation and Recycling	1	0.89%
Strategic Change Briefings in Entrepreneurial Finance	1	0.89%
TQM Journal	1	0.89%
Waste Management	1	0.89%

To analyse the current relevance of the topic under study, Figure 4 shows the temporal evolution of the number of articles and citations. As can be observed, the number of publications has increased significantly over the past decade, as has their impact, as reflected in the number of citations. The number of documents reached two notable peaks in 2019, the year before the pandemic, and in 2022, while the number of citations has risen steadily throughout the period.

Numerous studies highlight the importance of clear and effective communication as an essential condition for promoting consumer acceptance of sustainable products. In this regard, refs. [18,19] conclude that communication efforts must be intensified in order to exert greater influence over purchasing decisions. The lack of specific and comprehensible information remains one of the principal barriers to encouraging responsible consumer behaviour.

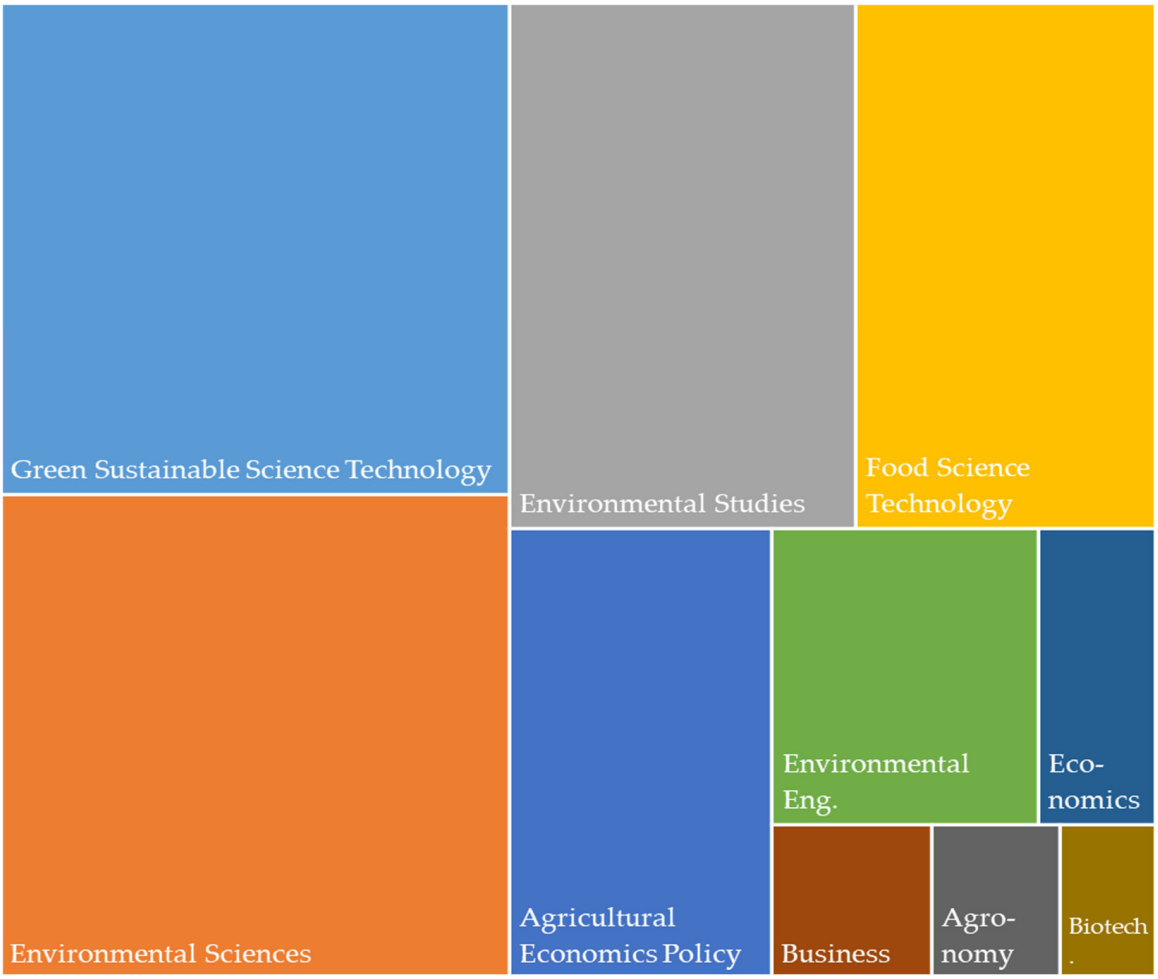


Figure 3. Treemap of the research areas as classified by Web of Science.

In the specific context of sustainable wine, several studies similarly identify this deficiency. Ref. [20] analyses the environmental impact of different types of packaging, focusing in particular on recycling, while excluding phases such as production and transportation. The authors conclude that there are significant discrepancies between consumer perceptions and scientific findings, largely attributable to poor communication regarding the environmental impacts of products. These discrepancies hinder consumers' ability to make informed decisions.

Other studies examine consumer preferences concerning natural wines. Galati et al. [10] show that the lack of clear and precise information on labelling and product characteristics constitutes a barrier to consumers incorporating environmental criteria into their purchasing decisions. In a similar vein, the authors of ref. [21] identify in their analysis of consumer preferences for Californian Sauvignon Blanc a lack of accessible and detailed information regarding key sustainability aspects—specifically water management and organic production methods. This informational gap hinders consumers' ability to recognise and appreciate the added value associated with sustainable practices, thereby reducing their influence on purchasing decisions.

Ref. [22] explores the relationship between sustainability orientation and the adoption of innovative tools in the wine sector. This study indicates that organic certifications and the efficient use of water resources are factors that consumers consider important. Nevertheless, the failure to integrate these attributes into marketing strategies limits their potential to improve the competitive positioning of sustainable wineries in the market.

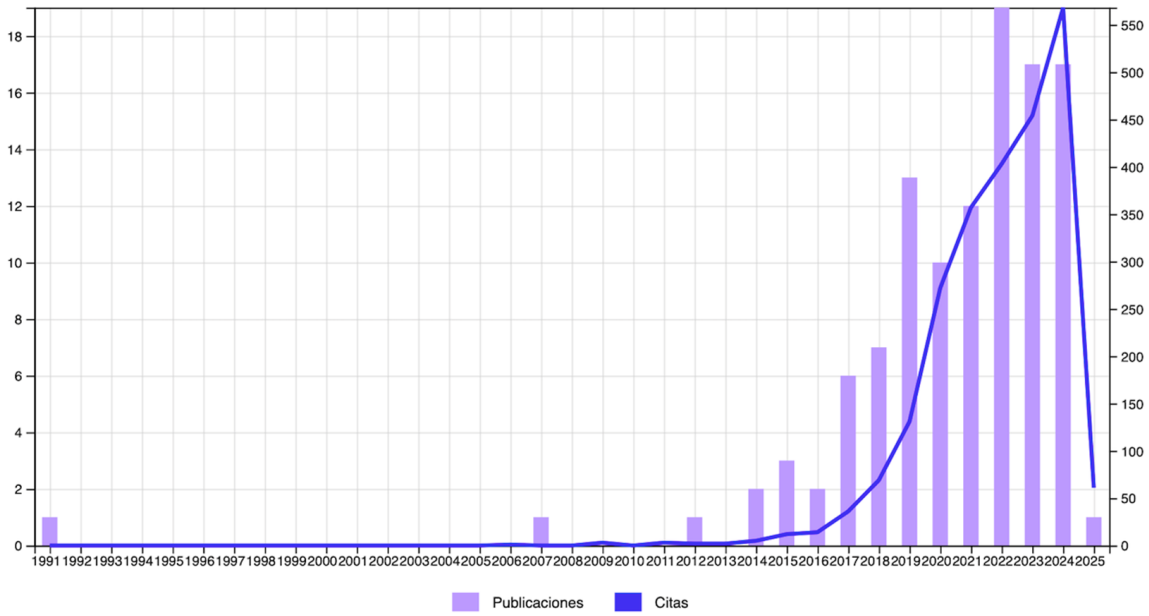


Figure 4. Temporal distribution of articles and citations in the Web of Science database.

Ref. [23], meanwhile, focuses on the segmentation of sustainable wine consumers based on their environmental beliefs and knowledge of sustainability certifications. The findings confirm that the absence of effective communication regarding the environmental benefits of such products hinders consumers' willingness to pay and reduces the positive environmental impact that could result from their purchasing decisions.

In the same line, ref. [24] examines the factors influencing consumers' WTP for natural wines, including product characteristics, personal attitudes, and sociodemographic variables. For product characteristics, these include the use of local or organic ingredients [7], sustainable packaging such as low-carbon cans [3], and environmental certifications like "eco-friendly" labels [5]. Sensory attributes such as taste and perceived quality also reinforce product authenticity [8].

For personal attitudes, environmental commitment and ethical values play a key role in purchase decisions [25]. Consumers who favour artisanal and local products show greater willingness to pay for sustainable options [13]. Price sensitivity is moderated by perceived added value [14].

For sociodemographic variables, age (with greater sensitivity among younger generations such as millennials and Gen Z) [10], education level [6], and income [26] are positively correlated with willingness to pay for sustainable products. Geographic location also plays a role, with urban consumers showing greater proactivity and access to such products [9]. The study concludes that the lack of communication regarding health and environmental aspects again prevents consumers from adequately valuing the attributes of natural wine. It also notes that product quality is not always associated with the presence of certifications, thereby reinforcing the need to enhance the information provided to end consumers.

Ref. [27] investigates the effect of sustainability messages on consumer behaviour, concluding that a greater amount of information on sustainability is positively associated with a higher WTP. The study highlights the importance of clear and comprehensive communication in promoting sustainable products, as it demonstrates that consumer knowledge directly influences their willingness to support environmentally responsible initiatives through their purchasing decisions.

Similarly, ref. [28] analyses consumer preferences for wine in relation to innovation and sustainability. The results show that consumers place greater value on traditional

attributes such as grape variety, certifications, or protected geographical indications, over more innovative characteristics like alcohol-free or vegan wines. This prioritisation suggests that although there is growing interest in sustainability, traditional factors continue to play a decisive role in consumer choice.

Likewise, although in a different sector, Kolk's study on coffee producers [11] raises similar challenges. Despite the coffee analysed being certified by Utz, the absence of Fairtrade certification limits its competitiveness. This case illustrates the need to align corporate sustainability strategies with regulatory requirements and evolving market expectations, where recognised labels still play a decisive role in shaping consumer perception.

Various studies focused on the wine sector have examined the influence of social factors on consumers' willingness to pay more for sustainable products. Galati et al. [10] investigate which consumer profiles are more inclined to pay for natural wines and find that millennials show a higher WTP when provided with clear information through labelling. This finding reinforces the idea that informational transparency in labelling may play a key role in fostering sustainable consumption among younger segments.

In a complementary approach, ref. [25] examines factors influencing brand loyalty in local beer products, observing a strong emotional connection between consumers and unique products, particularly among local residents and tourists. The perception of authenticity and the sense of community emerge as key elements in generating loyalty, suggesting the importance of incorporating social and cultural values into the positioning strategies of sustainable products.

The impact of social media marketing is the focus of the study by the authors of [29]. Their findings indicate that companies can significantly enhance marketing strategies through more transparent communication of sustainable practices. This line of research not only increases credibility among consumers but may also strengthen the positioning of sustainability-committed brands in an increasingly environmentally demanding market.

Lastly, ref. [30] examines the impact of the COVID-19 pandemic on sustainability in the supply chains of organic restaurants and local businesses in the United States. The results suggest that despite the crisis, the perception of sustainability had a positive effect on both tourists and the destination's brand image. However, the authors note that it is necessary to reinforce local communication on sustainability to consolidate this perception and encourage deeper consumer engagement.

The following section analyses the citation metrics for each article. Figure 5 shows a graphical analysis of citations. In the map generated by VOSviewer, the nodes represent documents, while the size of each node reflects its number of citations within the set. The connections between nodes indicate direct citation relationships, and the colours group the documents into thematic clusters that are closely related through common citation patterns. The most cited articles are shown in Table 3.

The review on wine in [19] stands out as the most central and cited node, acting as a conceptual pivot between different research areas. Its position on the map and its connections with multiple clusters suggest that it serves as a transversal reference work. In contrast, the study by the authors of [20], although belonging to the same thematic cluster (yellow), appears more isolated, as it represents a more specialised contribution focused on packaging.

The red cluster, comprising documents such as those in refs. [10,21,23,28], focuses on the acceptance of sustainable wine and the factors influencing consumers' willingness to pay. The proximity of these studies is due to the strong thematic coherence within this well-established research line.

Finally, the blue cluster, led by [25], is the most relevant to our focus, as it specifically analyses beer. The link to the central node is established through works such as the WTP analyses in [5,13], as well as the literature review on craft beer in [8]. Also included are the study by the authors of [26] on WTP among Italian consumers and the recent work in [31] on beer consumer preferences in Italy. The findings of the studies in this cluster are summarised in Table 4.

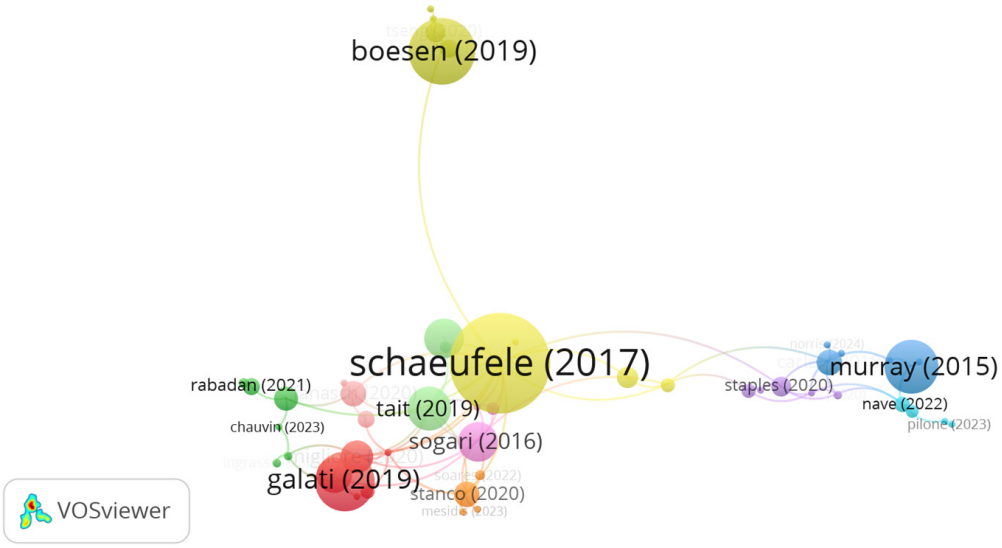


Figure 5. Citation network map of articles retrieved from Web of Science. Articles represented in the network include: Staples (2020) [5], Nave (2022) [8], Galati (2019) [10], Schaeufele (2017) [19], Boesen (2019) [20], Tait (2019) [21], Sogari (2016) [23], Murray (2015) [25], Pilone (2023) [26], Stanco (2020) [28], Mesidis (2023) [32], Chauvin (2023) [33], and Rabadan (2021) [34].

Table 3. Most cited articles, according to the Web of Science.

Authors	Title	Citations
Schäufele & Hamm [19]	Consumers' perceptions, preferences and willingness-to-pay for wine with sustainability characteristics: A review	295
Boesen, et al. [20]	Environmental sustainability of liquid food packaging: Is there a gap between Danish consumers' perception and learnings from life cycle assessment?	161
Galati et al. [10]	"Natural wine" consumers and interest in label information: An analysis of willingness to pay in a new Italian wine market segment	139
Murray & Kline [25]	Rural tourism and the craft beer experience: factors influencing brand loyalty in rural North Carolina, USA	120
Tait et al. [21]	Estimating wine consumer preferences for sustainability attributes: A discrete choice experiment of Californian Sauvignon Blanc purchasers	87
Fiore et al. [22]	Understanding the relationship between green approach and marketing innovations tools in the wine sector	76

The country distribution of the published studies is shown in Figure 6. It highlights the high volume of articles of institutions from countries with strong scientific output, such as the United States and China, but also from others where overall scientific production is comparatively lower, such as South Africa, Australia, and especially Italy, which accounts for 31 documents. This pattern reflects the correlation with the significance of the beer industry and, in particular, the wine industry in Italy.

Table 4. Summary of articles on sustainable beer consumption.

Authors	Summary	Methods	Core Objective
Cascone et al. [31]	Italian consumer preferences for craft beer	Conjoint analysis on attributes and preferences of Italian consumers	WTP
Cela et al. [7]	Perceptions of local fruit use and by-products	Survey on sustainability, taste, and materials used	Purchase intention
Lourenço & Piotto [9]	Environmental attributes and consumer behaviour	Survey with structural modelling on sustainable attitudes	Purchase intention
Norris et al. [3]	Sustainable secondary packaging and consumer perception	Experiment on packaging innovation and sustainability	Indirect effects on purchase
Pilone et al. [26]	Determinants of consumption of craft beer and WTP in Italy	Survey and machine learning to estimate consumer profiles	WTP
Nave et al. [8]	Systematic literature review on craft beer	Bibliometric analysis of academic articles	Bibliographic revision
Lee et al. [35]	Water conservation practices in brewing and their effect on purchase intention	Online experiment on macro and craft beer practices	Purchase intention
Staples et al. [5]	WTP for specific sustainable practices on brewing	Choice experiment with concrete environmental attributes	WTP
Carley & Yahng [13]	Factors predicting WTP for sustainable beer	Survey with analysis of individual predictors	WTP
Poelmans & Rousseau [2]	Preferences for organic beer	Choice experiment in Belgium on eco-labels	WTP
Murray & Kline [25]	Brand loyalty in rural beer tourism	Survey on branding and community connection	Branding

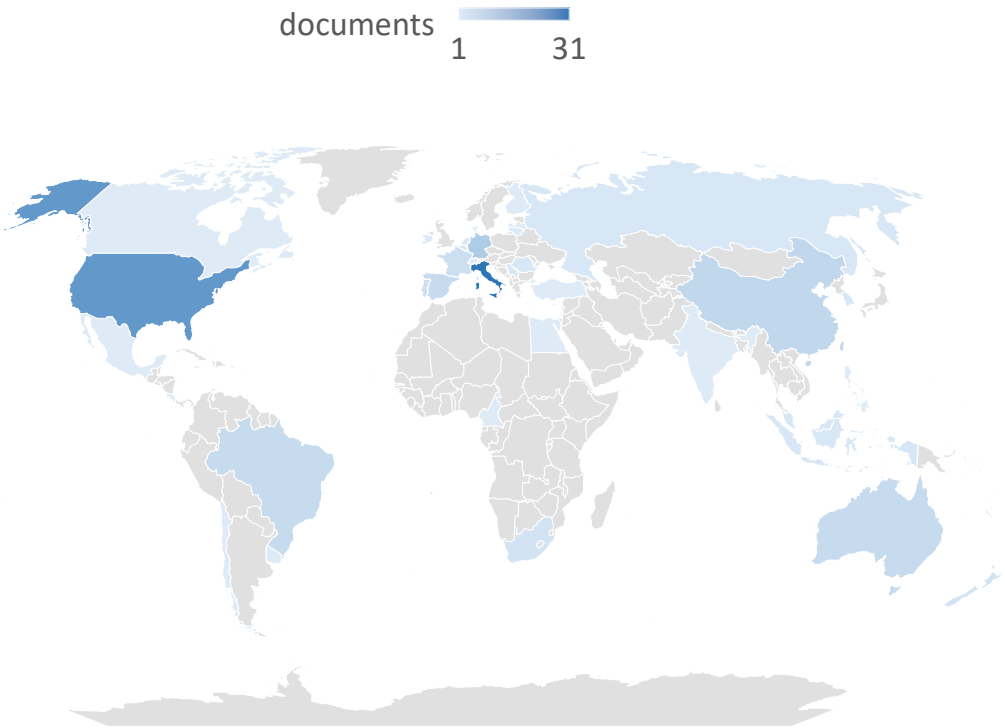


Figure 6. Regional distribution of publications retrieved from Web of Science.

3.2. Thematic Analysis with SciMAT

Bibliometric techniques contribute to assessing both scientific activity and the impact of research [36,37]. Numerous studies have applied such methods in the context of systematic literature reviews across various scientific domains [36,38–45].

To analyse the studies on sustainable beer production and consumption, a thematic analysis was conducted using the SciMAT software [17]. This analysis reinforces the relevance of the topic under investigation. Scientific mapping aims to illustrate both the structural and dynamic aspects of scientific research, as well as to represent the cognitive structure of a research field. Following ref. [46], several techniques have been developed to construct bibliometric maps, the most commonly employed being document co-citation analysis and co-word analysis.

As in other bibliometric studies by various authors [37,47,48], the SciMAT software was used in conjunction with data retrieved from the Web of Science database to analyse the research dynamics surrounding the key themes and trends in sustainable beer production, as well as the broader relationship between sustainability and consumer behaviour across a range of products [49–52]. As this analysis is based on the same Web of Science search used for the VOSviewer analysis, no further explanation of the searching method is provided here.

By applying co-word analysis to construct the scientific map, clusters of keywords and their interconnections are progressively identified—these clusters are hereafter referred to as themes. Each research theme generated through this process is characterised by two parameters: density and centrality [53,54]. Based on these parameters, four types of themes may be distinguished: motor, emerging, specialised, and transversal.

According to the strategic diagram generated by SciMAT—results of which are shown in Figure 7 and detailed in Table 5—the motor themes in research concerning consumer preferences for sustainably produced beer are "preferences" and "food". These are the most prominent themes in the field, appearing in the highest number of publications. "Preferences" is both highly central and dense, whereas "food" shows greater density than centrality. These two themes are well-developed and integral to the structure of this research field, being strongly interconnected with each other and with other themes.

Table 5. Centrality and density of thematic clusters.

Cluster	Centrality	Centrality Range	Density	Density Range
Preferences	62.28	1.0	22.83	1.0
Food	21.2	0.6	12.14	0.8
Behaviour	22.59	0.8	6.9	0.2
Quality	13.28	0.4	7.53	0.4
Perceptions	12.87	0.2	8.33	0.6

Additionally, the theme "quality" may be considered an emerging area, showing greater centrality than density. "Behaviour" appears as a basic or transversal theme, with internal potential for further development. Finally, "perceptions" emerges as a highly developed theme that may currently be in decline or less actively explored.

These clusters, in turn, are composed of various subthemes or nodes. The composition of the "preferences" cluster is detailed in Table 6 and Figure 8, where it can be observed that the "sustainability" node contains the highest number of publications, followed by "willingness to pay" and "consumption". Their strong interconnections suggest that the theme of consumer preferences serves as a conceptual bridge between "sustainability", "consumption", and "willingness to pay". "Price" analysis emerges as a less-explored topic, although it is relatively well-connected within the thematic network.

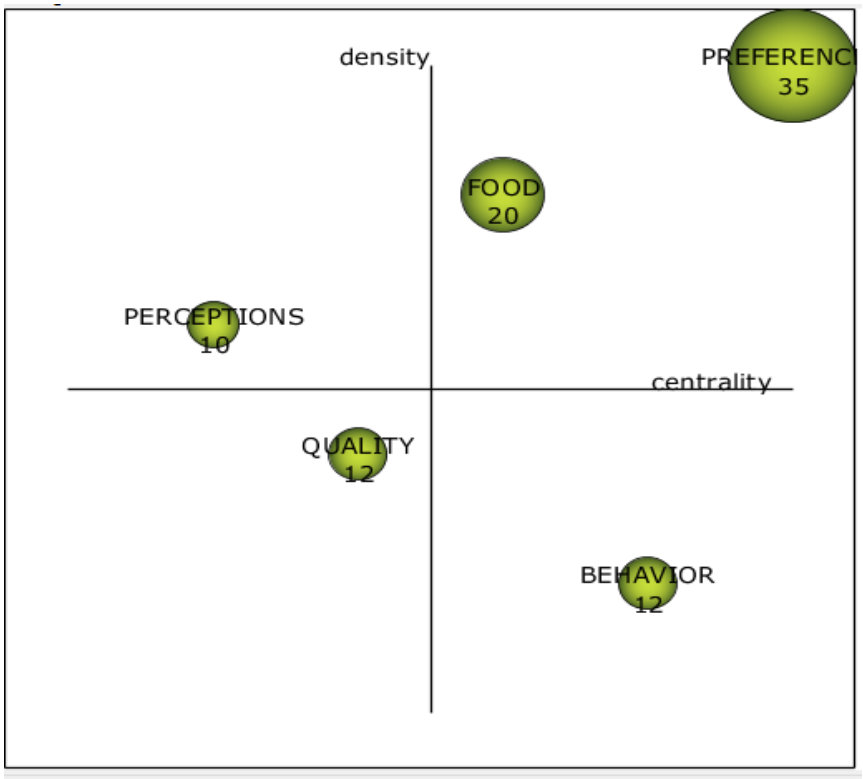


Figure 7. Strategic diagram of themes.

Table 6. Keywords included in the "preferences" cluster.

Nodes	Documents
Consumption	22
Sustainability	46
Preferences	19
Green	10
Price	8
Willingness to pay	27

The composition of the "food" cluster is shown in Table 7, with its structure illustrated in Figure 9. The dominant node within this cluster is "attitudes", with "information" also playing a relevant role. However, this theme appears to be less dense and central than "preferences". The interconnections are not particularly strong, although the presence of the term "wine"—as previously discussed—confirms its status as a well-studied topic in this field.

Table 7. Keywords included in the "food" cluster.

Nodes	Documents
Cluster analysis	4
Food	20
Attributes	9
Wine	13
Attitudes	21
Information	13

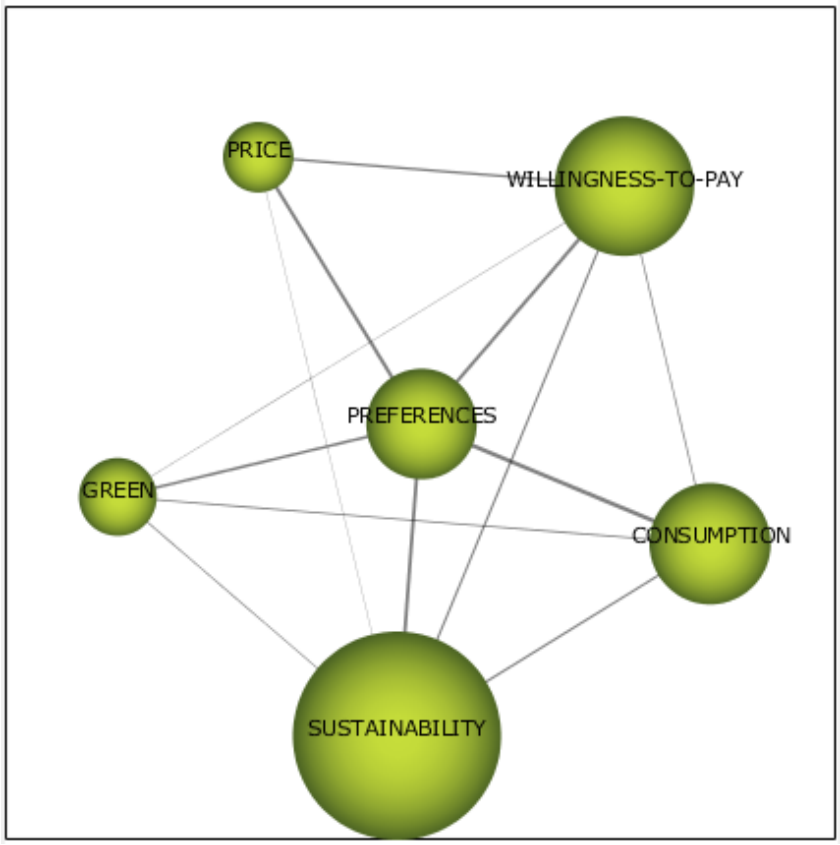


Figure 8. Internal structure of the "preferences" node.



Figure 9. Internal structure of the "food" node.

4. Discussion

4.1. Willingness to Pay as an Indicator of Consumer Demand

WTP constitutes a fundamental tool for analysing the demand for sustainable products, such as beer. From an economic perspective, this indicator enables the estimation of how much consumers are willing to pay additionally for attributes associated with sustainability [5]. It is not a fixed value, as it may vary depending on multiple interrelated factors [13], including product attributes (ingredients, packaging, certifications), consumer characteristics (personal values, income level), and the purchasing context (availability of information, social influence, distribution channel).

In recent years, the academic literature has shown increasing interest in the study of the factors influencing WTP. Ref. [10] emphasise the role of specific product attributes, while ref. [6] highlights the importance of individual consumer characteristics. Ref. [11], meanwhile, underscores the relevance of the purchasing context in consumer decision-making.

Marketing has also been proven to play a significant role in fostering a positive WTP. Brewing companies must set fair prices but also communicate effectively the added value of their sustainable products [9]. The use of strategies such as eco-friendly packaging, environmental labels, symbols, or visual messages that reinforce the brand's sustainability commitment may encourage consumers to pay a premium [14].

In addition, consumer personality [52], emotions, and values [13] exert considerable influence. Consumers whose personal convictions align with sustainability values and who experience positive emotions when consuming such products tend to exhibit a higher propensity to pay more for them. Fuller et al. [55] support this view, noting that feelings of satisfaction, pride, and joy associated with the consumption of sustainable products are closely linked to WTP.

4.2. The Role of Marketing Strategies: Communication and Transparency

The literature review has overwhelmingly demonstrated that effective and transparent communication of sustainable practices constitutes a key factor in building consumer trust. The demand for clear, concise, and credible information reflects consumers' need to understand the environmental and social benefits associated with the consumption of sustainable products [12]. Providing information on aspects such as water usage reduction, carbon footprint mitigation, or the use of renewable energy sources can have a direct impact on willingness to pay [5].

In this regard, communicative transparency not only reinforces product credibility but also enhances its appeal to consumers [35]. Among the most effective channels for communicating such information are eco-labels, advertising via social media or television, and other informational tools capable of conveying a company's sustainability commitment in a persuasive manner [29].

Furthermore, certifications such as Fair Trade or organic agriculture play a fundamental role in the identification of sustainable products, improving consumer understanding and perceived value [56]. These certifications lend credibility to sustainability claims and help counteract greenwashing, i.e., the practice of presenting false or exaggerated environmental claims.

Emotions also influence the perception of sustainability and purchase decisions. Ref. [55] notes that positive emotions, such as satisfaction and joy, are associated with higher willingness to pay. Conversely, the absence of positive emotions may weaken this relationship [13]. Aware of this link, companies implement narrative and visual strategies designed to appeal to consumer emotions, such as using real-life testimonials or emotionally charged advertising campaigns, thereby fostering a deeper connection with the sustainable product.

For this reason, the design and implementation of appropriate marketing strategies are crucial in communicating the value of sustainability, thus enhancing consumers' willingness to pay for products such as sustainable beer. These strategies may include advertising, public relations, social media engagement, and the generation of fact-based informational content [35]. All such efforts are aimed at generating trust, an essential component in consumer perception of added value and justification for price premiums.

A key tool in this communicative process is the use of eco-labels and sustainability certifications, which allow consumers to easily identify products committed to responsible practices [56]. The presence of such elements not only increases product visibility but also enhances its perceived value.

Another strategic aspect is the construction of a brand image associated with sustainability. This association enables companies to build stronger relationships with consumers and encourage long-term loyalty [25]. Moreover, factors such as the information available at the point of sale, the physical retail environment, or the atmosphere created by the presence of other sustainable products can influence consumer perception and their willingness to pay more [20,57].

Lastly, the role of social influence should not be underestimated. Opinions and recommendations from friends, family, or trusted individuals also affect willingness to pay, as does the context in which the purchase takes place [11,58]. Companies must, therefore, adopt a comprehensive approach to their marketing strategies, incorporating rational and emotional elements, as well as contextual factors, with the aim of increasing acceptance and demand for their sustainable products.

Lastly, the results allow for a broader discussion of key aspects of consumer behaviour regarding sustainable beer.

Millennials show higher willingness to pay (WTP) for sustainable products, motivated by ethical, social, and environmental values [10,13,25]. They favour authenticity, transparency, and environmental commitment, which explains their affinity for artisanal and locally brewed beers. Generation Z, while highly eco-conscious, tends to consume less alcohol and opts for alternative beverages such as hard seltzers. This generational shift shows new strategic challenges for the brewing industry.

Since 1991, the focus of research has evolved from primarily considering taste and price to more complex models that incorporate ingredient origin, packaging type, certifications, and personal values [5,6,13]. Methodologies such as choice experiments and WTP estimation have gained prominence, reflecting changes in consumer perception that now consider social and ecological impact [8,14,26].

As for the geographic correlation between publications and consumption patterns, there is a correlation between countries with high research output and developed consumption patterns. Italy leads in studies on consumer preferences and WTP [26,31], aligned with its emerging craft beer culture. The United States and the United Kingdom also show strong academic production tied to mature and informed consumer markets [5,13], suggesting a relationship between cultural–economic contexts and research agendas.

As for the main gaps in the existing literature, key gaps include the predominance of research on wine and coffee over beer [13]; limited studies focused on Spanish-speaking consumers; a lack of emotional or social variables in WTP models; and scarce longitudinal studies that track behavioural changes over time.

5. Conclusions

The aim of this study is to shed light on the important area of research on sustainable beer production, given the significant size of this industry at the global level, and to examine its thematic composition through a keyword co-occurrence analysis. The results

contribute to highlighting the research direction that should be pursued within this field, particularly through the identification of motor themes emerging from the SciMAT analysis, as discussed in the previous section.

The VOSviewer analysis reveals that "sustainability" is the most frequently occurring keyword across the reviewed studies. This finding is consistent with the SciMAT results, where "sustainability" also emerges as the central node within the principal motor theme, "preferences". Furthermore, within the broader research area of consumer preferences for sustainable beverage products, water-based drinks, beer, wine, and coffee appear most frequently in the academic literature.

From a methodological perspective, the analysis shows that "consumer behaviour" is the most recurrent keyword, with choice experiment and the calculation of WTP standing out as the most prominent techniques used in this field.

The literature review suggests that, within the broader domain of consumer preferences for sustainable products, the beer sector remains underexplored. It is important to note that the keyword "beer" was specifically included in the search; however, keywords such as "wine" and "coffee" appear almost as frequently, which indicates that relatively few studies focus exclusively on beer.

For these reasons, we conclude that the bibliometric approach proposed in this study demonstrates clear scientific potential for investigating consumer preferences specifically in the context of beer consumption. Understanding these preferences can guide the brewing industry in tailoring both production and marketing strategies. Indeed, this review highlights that current marketing efforts often fail to effectively convey relevant information to consumers that could enhance sustainable consumption preferences.

6. Limitations

This bibliometric analysis is limited to English-language articles indexed in Web of Science, potentially excluding works from other databases. While tools like VOSviewer and SciMAT offer useful thematic mapping, they do not provide in-depth qualitative evaluation of methodologies or conceptual nuances within the field. While Web of Science is a highly reputable source offering comprehensive and high-quality data, it may exclude relevant contributions from other databases such as Scopus or Google Scholar, as well as non-indexed literature, particularly grey literature. Considering the practical relevance of sustainability initiatives in the brewing sector, future research could expand the data sources to include professional reports, industry publications, and doctoral theses that may offer valuable insights into consumer behaviour and sustainable beer production.

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References

1. Rodríguez-Sánchez, C.; Sellers-Rubio, R. Sustainability in the beverage industry: A research agenda from the demand side. *Sustainability* **2021**, *13*, 186. [CrossRef]
2. Poelmans, E.; Rousseau, S. Beer and organic labels: Do belgian consumers care? *Sustainability* **2017**, *9*, 1509. [CrossRef]
3. Norris, C.L.; Orlowski, M.; Taylor, S. Hold my beer! Consumer perceptions of innovative and sustainable secondary packaging. *Int. J. Wine Bus. Res.* **2024**, *36*, 230–247. [CrossRef]
4. Smith, M.; Lal, P.; Oluoch, S.; Vedwan, N.; Smith, A. Valuation of sustainable attributes of hard apple cider: A best-worst choice approach. *J. Clean. Prod.* **2021**, *318*, 12878. [CrossRef]
5. Staples, A.J.; Reeling, C.J.; Widmar, N.J.O.; Lusk, J.L. Consumer willingness to pay for sustainability attributes in beer: A choice experiment using eco-labels. *Agribusiness* **2020**, *36*, 591–612. [CrossRef]
6. von Meyer-Höfer, M.; von der Wense, V.; Spiller, A. Characterising convinced sustainable food consumers. *Br. Food J.* **2015**, *117*, 1082–1104. [CrossRef]
7. Cela, N.; Fontefrancesco, M.F.; Torri, L. Fruitful Brewing: Exploring Consumers' and Producers' Attitudes towards Beer Produced with Local Fruit and Agroindustrial By-Products. *Foods* **2024**, *13*, 2674. [CrossRef]
8. Nave, E.; Duarte, P.; Rodrigues, R.G.; Paço, A.M.F.; Alves, H.; Oliveira, T. Craft Beer—A Systematic Literature Review and Research Agenda. *Int. J. Wine Bus. Res.* **2022**, *34*, 278–307. [CrossRef]
9. Lourenco, C.E.; Piotto, V. Brewing sustainability: Assessing environmental concerns and consumers' attitudes towards sustainable craft beer purchase intentions. *Int. J. Wine Bus. Res.* **2024**, *36*, 270–285. [CrossRef]
10. Galati, A.; Schifani, G.; Crescimanno, M.; Migliore, G. "Natural wine" consumers and interest in label information: An analysis of willingness to pay in a new Italian wine market segment. *J. Clean. Prod.* **2019**, *227*, 405–413. [CrossRef]
11. Kolk, A. Towards a Sustainable Coffee Market: Paradoxes Faced by a Multinational Company. *Corp. Soc. Responsib. Environ. Manag.* **2012**, *19*, 79–89. [CrossRef]
12. Tseng, M.L.; Sujanto, R.Y.; Iranmanesh, M.; Tan, K.; Chiu, A.S. Sustainable packaged food and beverage consumption transition in Indonesia: Persuasive communication to affect consumer behavior. *Resour. Conserv. Recycl.* **2020**, *161*, 104933. [CrossRef]
13. Carley, S.; Yahng, L. Willingness-To-pay for sustainable beer. *PLoS ONE* **2018**, *13*, e0204917. [CrossRef]
14. Santos Rodrigues, T.d.S. The Impact of Brand Coolness on the Consumption of Craft Beer: A Comparative Study of Generations Y and Z. Master's Thesis, University of Porto, Porto, Portugal, 2023. [CrossRef]
15. Tranfield, D.; Denyer, D.; Smart, P. Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *Br. J. Manag.* **2003**, *14*, 207–222. [CrossRef]
16. van Eck, N.J.; Waltman, L. Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics* **2010**, *84*, 523–538. [CrossRef]
17. Cobo, M.J.; Lõpez-Herrera, A.G.; Herrera-Viedma, E.; Herrera, F. SciMAT: A new science mapping analysis software tool. *J. Am. Soc. Inf. Sci. Technol.* **2012**, *63*, 1609–1630. [CrossRef]
18. Mauracher, C.; Procidano, I.; Valentini, M. How product attributes and consumer characteristics influence the WTP, resulting in a higher price premium for organic wine. *Sustainability* **2019**, *11*, 1428. [CrossRef]
19. Schäufele, I.; Hamm, U. Consumers' perceptions, preferences and willingness-to-pay for wine with sustainability characteristics: A review. *J. Clean. Prod.* **2017**, *147*, 379–394. [CrossRef]
20. Boesen, S.; Bey, N.; Niero, M. Environmental sustainability of liquid food packaging: Is there a gap between Danish consumers' perception and learnings from life cycle assessment? *J. Clean. Prod.* **2019**, *210*, 1193–1206. [CrossRef]
21. Tait, P.; Saunders, C.; Dalziel, P.; Rutherford, P.; Driver, T.; Guenther, M. Estimating wine consumer preferences for sustainability attributes: A discrete choice experiment of Californian Sauvignon blanc purchasers. *J. Clean. Prod.* **2019**, *233*, 412–420. [CrossRef]
22. Fiore, M.; Silvestri, R.; Contò, F.; Pellegrini, G. Understanding the relationship between green approach and marketing innovations tools in the wine sector. *J. Clean. Prod.* **2017**, *142*, 4085–4091. [CrossRef]
23. Sogari, G.; Mora, C.; Menozzi, D. Factors driving sustainable choice: The case of wine. *Br. Food J.* **2016**, *118*, 632–646. [CrossRef]
24. Migliore, G.; Thrassou, A.; Crescimanno, M.; Schifani, G.; Galati, A. Factors affecting consumer preferences for "natural wine": An exploratory study in the Italian market. *Br. Food J.* **2020**, *122*, 2463–2479. [CrossRef]
25. Murray, A.; Kline, C. Rural tourism and the craft beer experience: Factors influencing brand loyalty in rural North Carolina, USA. *J. Sustain. Tour.* **2015**, *23*, 1198–1216. [CrossRef]
26. Pilone, V.; Di Pasquale, A.; Stasi, A. Consumer Preferences for Craft Beer by Means of Artificial Intelligence: Are Italian Producers Doing Well? *Beverages* **2023**, *9*, 26. [CrossRef]
27. Stelick, A.; Sogari, G.; Rodolfi, M.; Dando, R.; Paciulli, M. Impact of sustainability and nutritional messaging on Italian consumers' purchase intent of cereal bars made with brewery spent grains. *J. Food Sci.* **2021**, *86*, 531–539. [CrossRef] [PubMed]
28. Stanco, M.; Lerro, M.; Marotta, G. Consumers' preferences for wine attributes: A best-worst scaling analysis. *Sustainability* **2020**, *12*, 2819. [CrossRef]

29. Martínez-Navalón, J.G.; Gelashvili, V.; Debasa, F. The impact of restaurant social media on environmental sustainability: An empirical study. *Sustainability* **2019**, *11*, 6105. [CrossRef]
30. Alsetoohy, O.; Ayoun, B.; Abou-Kamar, M. COVID-19 pandemic is a wake-up call for sustainable local food supply chains: Evidence from green restaurants in the USA. *Sustainability* **2021**, *13*, 9234. [CrossRef]
31. Cascone, G.; Tuccio, G.; Timpanaro, G. Analysis of Italian Craft Beer Consumers: Preferences and Purchasing Behaviour. *Br. Food J.* **2025**, *127*, 914–935. [CrossRef]
32. Mesidis, J.; Lockshin, L.; Corsi, A.M.; Page, B.; Cohen, J. Measuring the effect of product and environmental messaging attributes on alternative wine packaging choices. *J. Clean. Prod.* **2023**, *431*, 139502. [CrossRef]
33. Chauvin, N.D.; Fernández-Olmos, M.; Hu, W.; Malorgio, G.A. A behavioural perspective of organic wine production decisions: An application to the Spanish wine industry. *Br. Food J.* **2023**, *125*, 4396–4414. [CrossRef]
34. Rabadán, A.; Bernabéu, R. An approach to eco-innovation in wine production from a consumer's perspective. *J. Clean. Prod.* **2021**, *310*, 127479. [CrossRef]
35. Lee, N.M.; Callison, C.; Seltzer, T. Sustainable Beer: Testing the Effects of Water Conservation Messages and Brewery Type on Consumer Perceptions. *J. Food Prod. Mark.* **2020**, *26*, 619–638. [CrossRef]
36. Mirón Sanguino, Á.S.; Crespo-Cebada, E.; Muñoz, E.M.; Caro, C.D. Working Capital: Development of the Field through Scientific Mapping: An Updated Review. *Adm. Sci.* **2024**, *14*, 67. [CrossRef]
37. Zambrano Farías, F.J.; Martínez, M.D.C.V.; Martín-Cervantes, P.A. Profitability determinants of the natural stone industry: Evidence from Spain and Italy. *PLoS ONE* **2022**, *17*, e0276885. [CrossRef]
38. Almeida, F.; Morais, J.; Santos, J.D. A Bibliometric Analysis of the Scientific Outcomes of European Projects on the Digital Transformation of SMEs. *Publications* **2022**, *10*, 34. [CrossRef]
39. Arik, B.T.; Arik, E. "Second language writing" publications in web of science: A bibliometric analysis. *Publications* **2017**, *5*, 4. [CrossRef]
40. Dardas, L.A.; Malkawi, A.M.A.; Sweis, S.; Sweis, N.; Al-Khayat, A.; Sawair, F.A. Mapping Two Decades of Research Productivity in the Middle Eastern and Arab Countries: A Comprehensive Bibliometric Analysis. *Publications* **2023**, *11*, 48. [CrossRef]
41. de Carlos Fraile, L.; Crespo-Cebada, E.; Mirón-Sanguino, Á.S.; Díaz-Caro, C. Heterogeneity in investment behavior in sustainable products: The case of thematic funds. *Econ. Bus. Lett.* **2023**, *12*, 115–120. [CrossRef]
42. Kirby, A. Exploratory Bibliometrics: Using VOSviewer as a Preliminary Research Tool. *Publications* **2023**, *11*, 10. [CrossRef]
43. Miguel, S.; de Oliveira, E.F.T.; Grácio, M.C.C. Scientific production on open access: A worldwide bibliometric analysis in the academic and scientific context. *Publications* **2016**, *4*, 1. [CrossRef]
44. Senarathne, C.W.; Malawana, V. Capital structure, working capital management and potential growth of a business: The case of the sri lankan stockbroking industry. *Asia-Pac. Manag. Account. J.* **2019**, *14*, 19–40. [CrossRef]
45. Vaccaro, G.; Sánchez-Núñez, P.; Witt-Rodríguez, P. Bibliometrics Evaluation of Scientific Journals and Country Research Output of Dental Research in Latin America Using Scimago Journal and Country Rank. *Publications* **2022**, *10*, 26. [CrossRef]
46. de Moya Anegón, F.; Chinchilla-Rodríguez, Z.; Corera-Álvarez, E.; González-Molina, A.; López-Illescas, C.; Vargas-Quesada, B. *Informe de Calidad y Datos de Producción Científica (2003–2009) en Nanociencia y Nanotecnología, Nuevos Materiales y Nuevos Procesos Industriales*; Fundación Española para la Ciencia y la Tecnología: Madrid, Spain, 2012.
47. Bach, M.P.; Krstič, Ž.; Seljan, S.; Turulja, L. Text mining for big data analysis in financial sector: A literature review. *Sustainability* **2019**, *11*, 1277. [CrossRef]
48. López Núñez, J.A.; López-Belmonte, J.; Moreno-Guerrero, A.J.; Navas-Parejo, M.R.; Hinojo-Lucena, F.J. Education and diet in the scientific literature: A study of the productive, structural, and dynamic development in web of science. *Sustainability* **2020**, *12*, 4838. [CrossRef]
49. Arias-Abelaira, A.; Díaz-Caro, C.; Mirón-Sanguino, A.; Rodríguez-Ariza, L. Current Perspectives on Responsible Digitalization: A Bibliometric Review of the Concept. *Sustainability* **2025**, *17*, 1915. [CrossRef]
50. Díaz-Caro, C.; Crespo-Cebada, E.; Goenechea, B.E.; Mirón Sanguino, Á.S. Trinomial: Return-Risk and Sustainability: Is Sustainability Valued by Investors? A Choice Experiment for Spanish Investors Applied to SDG 12. *Risks* **2023**, *11*, 149. [CrossRef]
51. Mirón-Sanguino, Á.S.; Díaz-Caro, C. The Agricultural Cooperative as an Instrument for Economic Development: An Approach from Spanish Investors' Preferences through a Choice Experiment. *Agronomy* **2022**, *12*, 560. [CrossRef]
52. Muñoz-Muñoz, E.; Crespo-Cebada, E.; Mirón-Sanguino, A.S.; Díaz-Caro, C. Investors personality correlates with sustainability preferences in investment—A choice experiment with Spanish investors. *J. Behav. Exp. Econ.* **2025**, *114*, 102332. [CrossRef]
53. Cahlik, T. Comparison of the Maps of Science. *Scientometrics* **2000**, *49*, 373–387. [CrossRef]
54. Callon, M.; Courtial, J.P.; Laville, F. Co-word analysis as a tool for describing the network of interactions between basic and technological research: The case of polymer chemistry. *Scientometrics* **1991**, *22*, 155–205. [CrossRef]
55. Fuller, K.; Grebitus, C.; Schmitz, T.G. The effects of values and information on the willingness to pay for sustainability credence attributes for coffee. *Agric. Econ.* **2022**, *53*, 775–791. [CrossRef]

56. Fuller, K.; Grebitus, C. Consumers' preferences and willingness to pay for coffee sustainability labels. *Agribusiness* **2023**, *39*, 1007–1025. [CrossRef]
57. Dlamini, N.N.; Mayhew, E.J.; Nolden, A.A. Unpacking Consumer Preferences: Perceptions and Sustainability of Packaging Material for Orange Juice. *Sustainability* **2024**, *16*, 6202. [CrossRef]
58. Gajić, T.; Raljić, J.P.; Blešić, I.; Aleksić, M.; Petrović, M.D.; Radovanović, M.M.; Vuković, D.B.; Sikimić, V.; Pivac, T.; Kostić, M.; et al. Factors That Influence Sustainable Selection and Reselection Intentions Regarding Soluble/Instant Coffee—The Case of Serbian Consumers. *Sustainability* **2022**, *14*, 10701. [CrossRef]

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