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RESEARCH ARTICLE

Sustainability trends in the wine industry: Cognitive biases and methodological insights from a PRISMA review

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Abstract – Sustainability—the characteristic, property, and goal of every responsible, mature, rational, and environmentally sensitive organization—has gained undeniable and incredible traction in the wine industry over the last few decades, influencing wine-making procedures and packaging. Determined actors inside and outside the industry have identified key environmental concerns, such as energy efficiency or recycling, that support promoting a sustainable industry. To explore how sustainability is implemented in the wine sector, we, the authors of this paper, conducted a systematic literature review methodology. The PRISMA model served as our primary criteria for focusing the literature search and was utilized in its execution. Our study analyses thirty scholarly publications, which are categorized according to three primary themes: (1) Wineries and Sustainability; (2) Wineries and Cognitive Biases; and (3) Wineries and Sustainability and Cognitive Biases. The novelty of the study lies in its use of a systematic literature review (SLR) to investigate the complex interaction between wine, cognitive biases, and sustainability with a combined focus. The findings point to the understudied domain of consumers' cognitive biases regarding alternate wine packaging. Our results show that there is potential for improvement in the wine sector in terms of sustainable packaging and the consumer behavior of accepting or rejecting specific packaging options. These areas are considered worthy of future holistic approach investigation because alternative packaging is critical to making the industry more environmentally friendly. Still, if consumers cannot accept and purchase wine thus packaged, such raises further questions. Our study may be helpful to stakeholders in the wine sector as practitioners increasingly seek to incorporate and promote sustainable practices in their operations.

Keywords – Alternative wine packaging, Cognitive biases, Sustainable, Wine, Systematic literature review

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INTRODUCTION

As the monstrous tides of culture and economics shift their monumental and fluid mass from tradition and expedience towards environmental responsibility, sustainable production

and packaging of wine has become the shore upon which the mighty waves of this industry will crash, without regard for individual will or whim (Forbes *et al.*, 2009; Ferrara & De Feo, 2020). Sustainability encompasses several areas of the wine industry, particularly packaging (Ponstein *et al.*, 2019).

The need to understand the complex interaction between sustainability and consumer behavior in the wine sector, which is related to the crucial role of cognitive biases in shaping consumer preferences and purchasing decisions, grows by the day (Tait *et al.*, 2019; Ruggeri *et al.*, 2022). Modern consumers are increasingly making informed choices based not only on taste and appearance but also on the environmental footprint of their choices (Schäufele & Hamm, 2017).

The wine sector has seen a seismic shift towards sustainable practices and packaging options and away from the damaging methods of old (Ferrara & De Feo, 2020; Gomes *et al.*, 2019). Sustainability is also at the forefront of the harvesting and wine-making processes, and traditional fermentation methods can help minimize the environmental impact (Bodor-Pesti *et al.*, 2023). However, in addition to the wine-making process, wine packaging significantly impacts consumer preferences and behavior and hides confusing choices for consumers and researchers alike (Schäufele & Hamm, 2017). Furthermore, the wine sector also has a major impact on the tourism sector, so appropriate action must be taken to minimize the adverse effects (Nemethy, 2021).

Alternative wine packaging—anything other than the traditional glass bottle—is becoming more widespread, as it is considered an environmentally sustainable alternative (Ponstein *et al.*, 2019), a belief supported by the research of Ferrara and De Feo (2020), who found that the most polluting type of packaging is the single-use glass bottle. If our world is to remain a habitable place for man and beast alike, greenhouse gas (GHG) emissions must be reduced, to which packaging is a major contributor (Hashim *et al.*, 2022; Gnansounou *et al.*, 2009).

The article aims to provide a comprehensive overview (systematic literature review) of the intersecting domains of sustainability, consumer behavior, and cognitive biases in the wine sector, drawing on insights from an extensive range of pertinent studies. The objective was to unmask, illuminate, and elucidate the cognitive processes that drive consumer decisions and preferences when choosing a wine to purchase and imbibe (Parr, 2019). Our analysis will provide insight into the influence of sustainability considerations on consumers' decision-making processes and how alternative packaging methods influence consumer perceptions and behavior (Ferrara & De Feo, 2020; Forbes *et al.*, 2009). The following section of the paper details the methodology and provides a descriptive analysis and exhaustive analysis of the studies reviewed, a discussion of the results, and a reflection on the limitations and implications of this research.

METHODOLOGY AND DATA

In the present research, a systematic literature review was conducted to explore the linkages between sustainability, wine, and consumer behavior and to identify the research gap in this area, which will determine future research directions. The SLR is a reproducible, structured, and accurate methodology to identify, integrate, and evaluate research and studies on the topic. This method is free of bias and can highlight gaps in the literature (Fink, 2019). A four-step methodology has been adopted in the SLR to identify relevant studies (Figure 1).

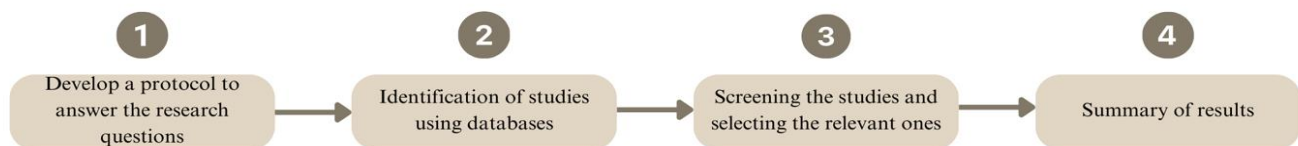


Fig. 1. Four steps of the methodology

The systematic literature review was conducted using the PRISMA model. The PRISMA model is a defined framework that sets out the steps of a literature search and is the accepted method for conducting SLR in the academic world. It allows the results to be reproducible, including the criteria for narrowing down. The model was used to easily identify factors that did not meet expectations so that the studies most closely related to the topic searched were used at the end of the screening process. The search was performed using two scientific databases, Web of Science and Scopus in the first quarter of 2023. The search terms were the following: "wine AND (packaging OR bottling) AND (alternative OR sustainable OR green) AND (consumer OR customer) AND (preference OR behavior OR attitude OR perception OR bias)". The articles selected using the snowball method were used to define the search terms. The selected articles were

published in high-quality journals and are free of potential bias, with limitations noted by the researchers in the studies. Life cycle assessment (LCA) methodology was most often used in sustainability-related research, and in consumer behavior research, questionnaires and experiments were used to assess attitudes. The number of participants varied quite a lot, with experiments having an average of 150-200 participants. The PRISMA model is illustrated in Figure 2.

Specific inclusion and exclusion criteria have been defined as part of the search strategy. First, the included publications had to be in English, and the journals had a Q1-Q2 rating. Duplicate results that appeared more than once in the search results of different databases were filtered and removed from the results. The final narrowing-down criterion was based on

the abstract, as studies whose topic was not relevant to the present SLR were excluded. Therefore, 20 relevant articles

were finally identified using the PRISMA model, which is discussed in detail in the results section.

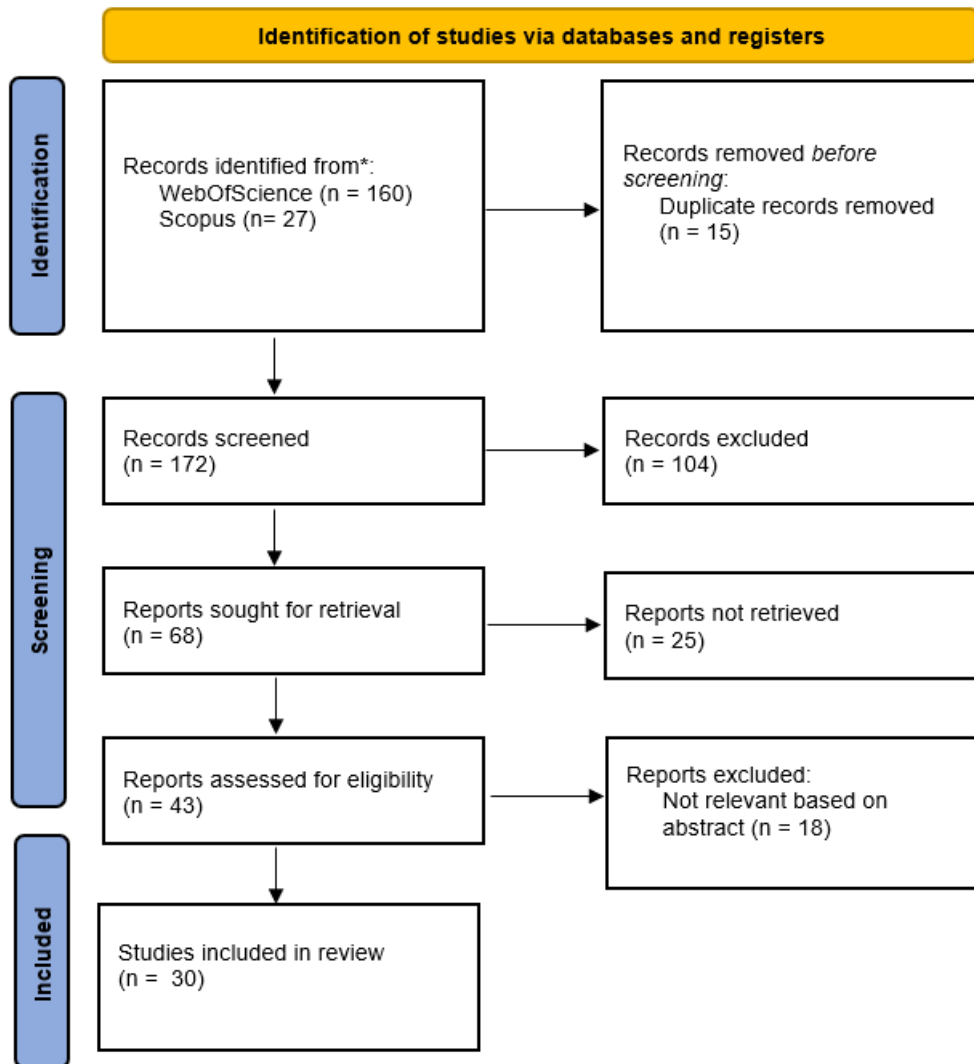


Fig. 2. Prisma Model

RESULTS

A descriptive analysis and the identified themes are presented in connection with the systematic literature review.

Descriptive Analysis

To illustrate the results obtained for the search terms, three graphs were created showing the distribution of literature by year, main journals, and keywords.

The number of publications shows an increasing trend over the period studied. Compared to the 2019 figures, from 2020 onwards, there have been almost twice as many papers on the subject. The evolution of the topic can be divided into several stages of development in terms of the number of studies. There were only a few studies from the initial study period

until 2009, while the number of studies doubled between 2010 and 2014. The following period, 2015-2019, saw a further increase, after which the number of studies on the topic almost doubled after a further increase from 2020 onwards (Figure 3).

Figure 4 shows the main journals in which the studies filtered by the search term filter were published. The journal with the highest number of studies analyzed was Food Quality and Preference, followed by the British Food Journal. These two journals stand out from the others in terms of the number of studies published. These journals are high-quality journals (Q1-Q2).

From the keywords extracted from the filtered articles, a branch plot was compiled showing the density with which

each keyword is related to each other and the number of times each keyword appeared in the filtered studies. In the graph, the size of the circle behind each keyword indicates the number of times that keyword has been used. The larger the circle, the more times the keyword has been used. The colors used for the plot show the year in which the keyword or link

appears most often. The most frequently used keywords were 'wine', 'quality', 'perception', 'brand', 'price', and 'information' (Figure 5).

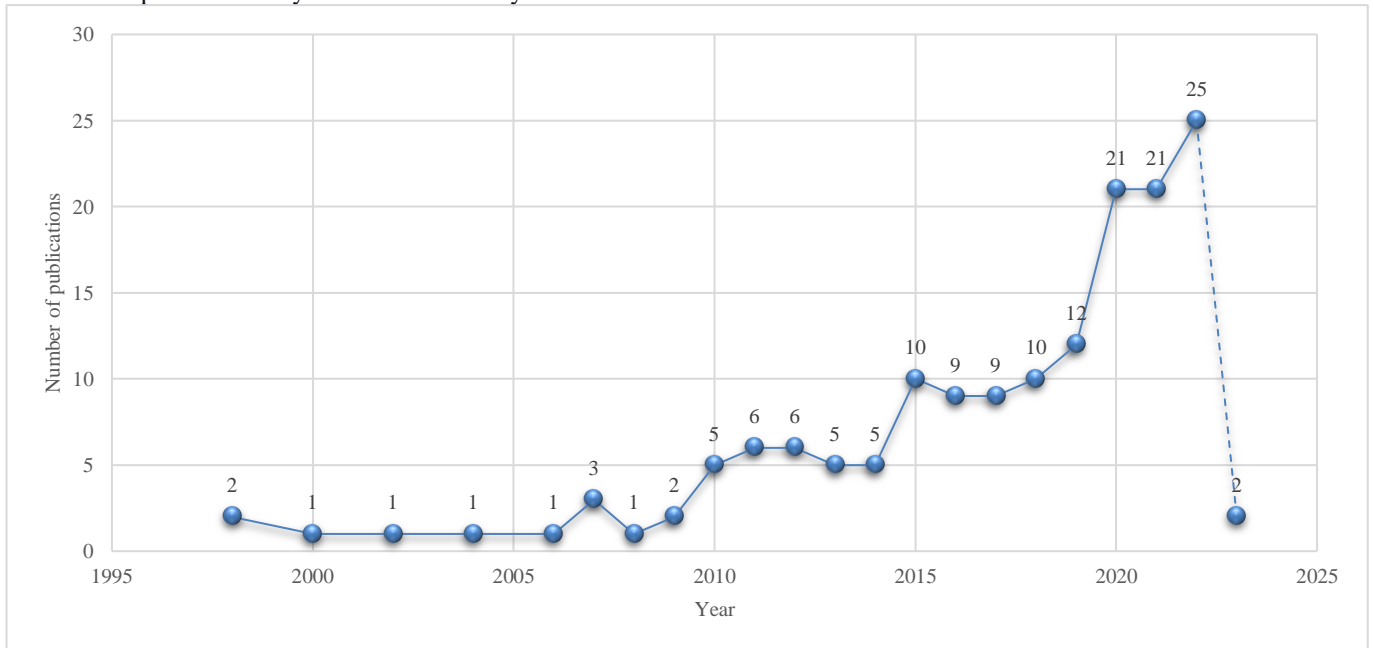


Fig. 3. Number of publications (1995-2023)

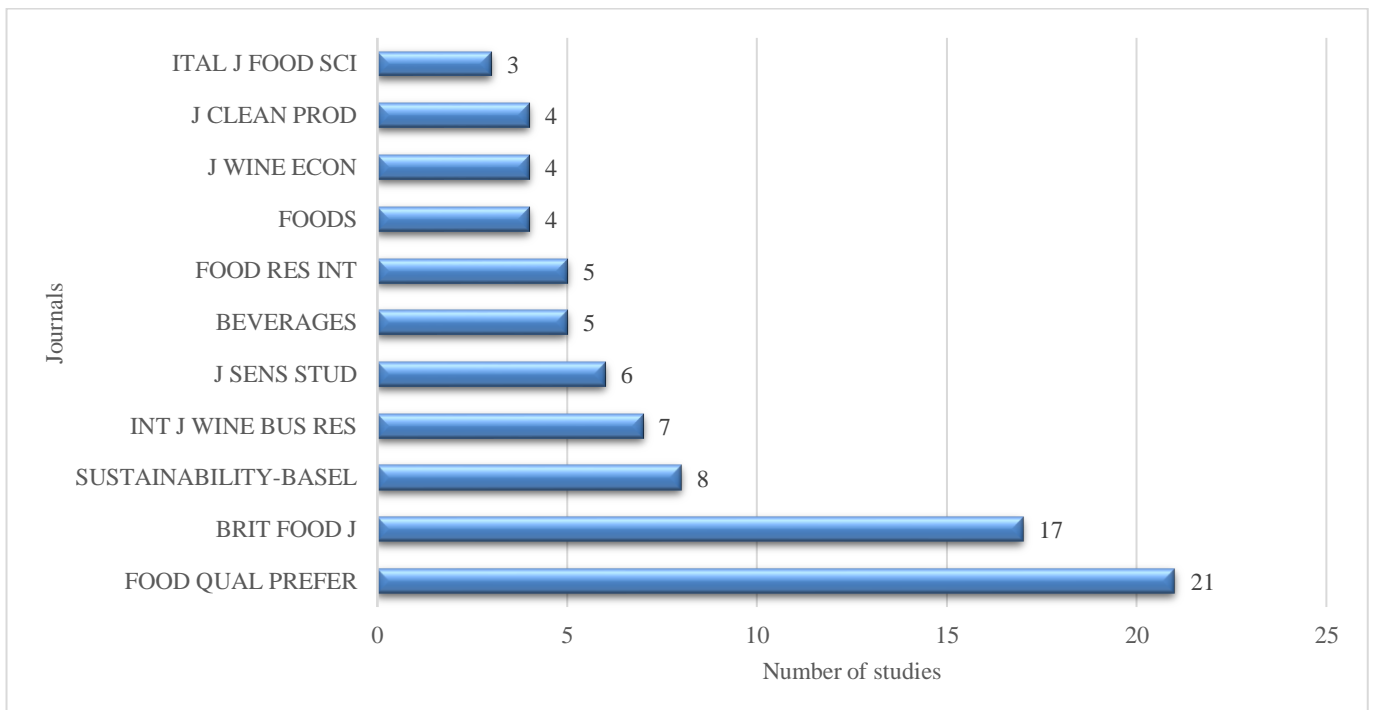


Fig. 4. Distribution of studies by journals

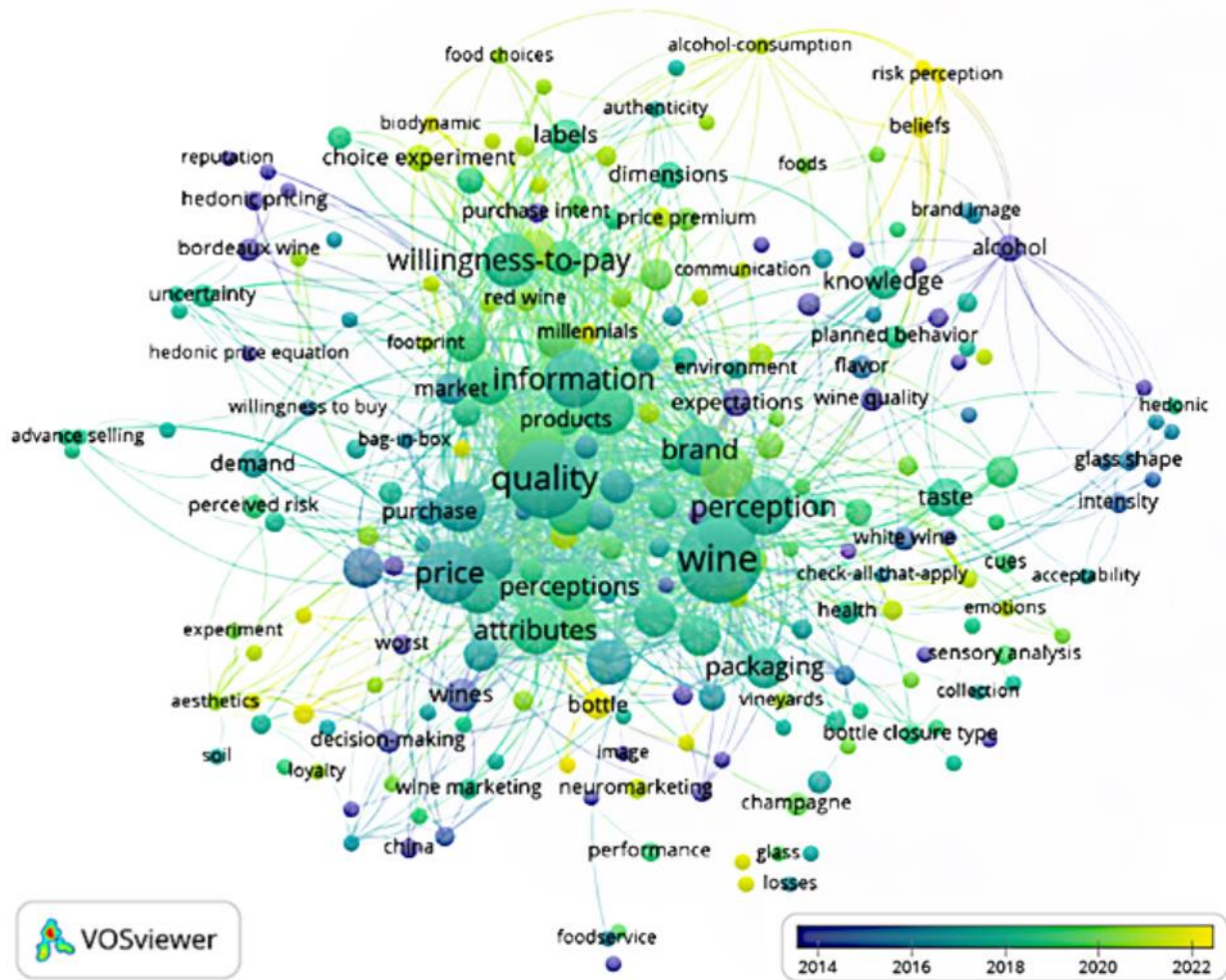


Fig. 5. Link between keywords

Thematic Analysis

The selected studies were grouped into three main categories: (1) winery and cognitive biases; (2) winery and sustainability; and (3) winery and cognitive biases and sustainability. In each category, studies relevant to the topics are analyzed.

Theme 1: Winery and Cognitive biases

The intersection of wine and cognitive biases is explored in the studies in this section. The studies reviewed cover the basic principles of behavioral economics and the origins of cognitive biases. They examine the basic consumer behavior and purchasing decisions observed when buying and choosing wine. The studies also include articles that point to cognitive biases along the lines of cognitive psychology. The articles processed are listed in Table 1.

Simon (1990) explains in his study the limitations of individuals' decision-making abilities. This was supported by the researchers Tversky and Kahneman, who mainly focused on cognitive biases and heuristics in their joint research. In their first large-scale work, they described individuals'

systematic decision errors under uncertainty (Tversky and Kahneman, 1974). In their later work, they introduced "prospect theory", which outlined a new theory of utility to replace classical theory. Their research found that losing a good "hurts" an individual nearly 2.5 times more than the positive projection of the gain of the same value as the good lost. This suggests that the behavior of individuals violates classical theory (Kahneman, 2013). Kahneman et al. (2021) demonstrate the importance of decision noise in livestock services, health care, and many other fields. According to their theory, individuals' decisions are not only affected by cognitive biases and heuristics but also by emotions and mood, which play a role in the decision process. Humans can only suffer these factors, as algorithms and artificial intelligence are not subject to the effects of decision noise (Table 1).

Consumers' decision-making processes to purchase wine are influenced by several factors. In such situations, consumers rarely have the opportunity to taste the wine, so they rely on several other factors. Such factors may include the brand name, the origin of the wine, the label, or the alcohol content. In addition to the wine's external characteristics, the store's

internal factors, such as the smell, music, crowdedness, or lighting, also influence consumer decisions (Jaeger et al., 2009). Based on a study conducted in Romania, Brata et al.

(2022) identified four main factors that are most important to consumers when buying wine: origin, reputation, wine label, and packaging.

Table 1. Processed studies in the field of winery and cognitive biases

| Topic | Method | Findings | Source |
|---|------------------------------------|--|--------------------------------|
| Cognitive processes in wine tasting | Review | taster's cognitive processes: <ul style="list-style-type: none"> - colour-flavour perceptual bias, - prototypical thinking, - knowledge-based wine judgments, - the close links between olfactory memory, - autobiographical memory and emotion, - and the notion of wine expertise. | <i>Parr, 2019</i> |
| Relationship between social media usage by consumers and the intention to buy wine online | Structured questionnaire (n=2,597) | Social media use has a positive and increasing effect on the propensity to buy wine online. | <i>Pucci et al., 2019</i> |
| Wine tasting, Willingness to pay (WTP) | Experiment (n=150) | Findings of the blind wine tasting reveal that price points are not statistically related to consumer preferences. | <i>Vsochio et al., 2019</i> |
| Wine psychology, Cognitive and perceptual factors | Review | 6 identified topics: <ul style="list-style-type: none"> - On the importance of the visual appearance of wine - Complexity, perceptual learning, and the perils of blind wine-tasting - Marketing - Wine glass - Multisensory atmospherics and the wine-tasting experience - Musical crossmodal correspondences with wine | <i>Spence, 2020</i> |
| Wine purchase decision, wine consumption behaviour | Questionnaire (n=554) | High-involvement participants provided more information about the last bottle of wine they had purchased. | <i>Jaeger et al., 2009</i> |
| How wine colour can influence the perceived aroma and flavour | Experiment (n=168) | <ul style="list-style-type: none"> - Mimicking the colour of a rosé wine can influence both the perceived aroma and flavour of a white wine - Participants with some degree of wine-tasting experience used more similar vocabulary to describe a fake rose and an actual rosé wine, as compared to an unaltered white wine | <i>Wang & Spence, 2019</i> |
| Extrinsic characteristics and intrinsic characteristics of wine | Questionnaire (n=285) | <ul style="list-style-type: none"> - intrinsic cues were ranked highest - taste is the most important factor - extrinsic cues and origin characteristics important for younger consumers with lower income | <i>Brata et al., 2022</i> |
| Self-reported knowledge influence of extrinsic cues on wine | Focus groups (5 groups) | <ul style="list-style-type: none"> - Participants with a high level of SR wine knowledge are willing to pay more per bottle. Give more importance to the region of origin, previous experience, and sensory profile - Participants with null or weak SR wine knowledge consider the price, region of origin, previous experience, and food pairing as most important. Evaluate wine extrinsic factors. | <i>Ferreira et al., 2022</i> |
| Standard profile of the typical wine consumer, features that can | Questionnaire (n=1338) | <ul style="list-style-type: none"> - The only variables found to be statistically significant are gender and educational status. - It is essential to focus on several attributes, among which there are of course quality and brand | <i>Lanfranchi et al., 2020</i> |

| | | | |
|--|---|---|-----------------------------------|
| influence his/her purchasing choices | | | |
| Wine consumer preferences, the interactive and individual influences of socio-demographic and behavioural-cognitive factors on the frequency and quality of wine consumption | Questionnaire (n=207) | The results show the dominant influence of socio-demographic factors, such as region, place of living (urban-rural areas), family size, age, income and education of consumers as well as behavioural-cognitive factors, such as the price importance, place of purchase and product characteristics, in all analyzed target variables. | <i>Jovanović, 2017</i> |
| Factors influencing the likelihood of wine choice | Discrete choice experiment (n=828) | Advertorial communication can have a significant effect on future purchase behaviour, and telling a story about what makes a particular country different from others is an effective way to improve the choice of that country's wine | <i>Williamson et al., 2016</i> |
| The existence and influence of gender effects on wine choice, wine labelling | Five focus groups (n=45) | Women frequently associate wine with the context of consumption; while men frequently associate wine with convivial and sensorial pleasure. Front label information seems to be more important for women, while the back label descriptors are more relevant for men. | <i>Ferreira et al., 2019</i> |
| The importance of bottle design about other purchasing criteria | Questionnaire (n=437) | The low importance of bottle design in shaping consumer preferences compared to other attributes (origin, price, and category of wine). | <i>Chamorro et al., 2020</i> |
| Violation of rationality limits decision-making, | Theoretical summary | Individuals violate the assumptions of rational thinking. | <i>Simon, 1990</i> |
| Cognitive biases and heuristics | Summary of experiments | Individuals make poor decisions when they are uncertain or make systematic errors of judgment | <i>Tversky and Kahneman, 1974</i> |
| Cognitive biases and heuristics, utility theory | Mathematical theory, and experimental evidence (14 experiments) | The utility curve of individuals does not fit the classical theory. The feeling of loss hurts nearly 2.5 times more than the feeling of gaining utility equal to the value of the good lost. | <i>Kahneman, 2013</i> |
| Decision noise, mood, and emotional state impact on decision-making | Summary of experiments and theories | In decision-making, not only cognitive biases and heuristics play a role, but also decision noise, which depends on the emotional and mood state of the decision-maker. | <i>Kahneman et al., 2021</i> |

Questionnaire surveys are often used to investigate wine consumption habits, as they can achieve a large number of items in a relatively short period (Jovanović, 2017; Lanfranchi et al., 2020; Brata et al., 2022; Jaeger et al., 2009; Chamorro et al., 2020). In addition to questionnaire surveys, focus group surveys can be used to explore underlying motivations. Ferreira et al. (2019) conducted five focus groups to explore how gender and label influence wine purchase decisions. The study revealed that for women, the information on the front label is more important, while men primarily find the descriptions on the back label of the wine more important. Ferreira et al. (2022) also conducted a focus group study to investigate the impact of self-reported knowledge on extrinsic cues of wine. Participants with a lower level of self-reported knowledge rely on extrinsic attributes when buying wine, while those with a higher level of self-reported knowledge are more willing to pay more for a bottle of wine and attribute more importance to their region of origin.

The phenomenon of wine tasting can also be examined in terms of cognitive psychology (Parr, 2019; Spence, 2020). Parr (2019) has collected research that examines the cognitive processes of wine tasting during the perception of wine. Cognitive psychology can also be used to identify the main cognitive biases associated with wine tasting. An example of one such bias is how wine color can influence the perceived aroma and flavor. Imitating the color of rosé wine can influence the perceived aroma and taste of white wine (Wang & Spence, 2019).

Overall, it can be said that many factors influence consumers during wine consumption and wine purchases, which can greatly influence taste perception and decision-making. These influencing factors can also be present in the case of sustainable wines, on which, in our opinion, preliminary information and, thus, education can have a great impact. Some biases could likely be alleviated if consumers were aware of the environmentally friendly alternatives and thus

could be encouraged to consume them. There has been a lot of excellent research in the field of wine-making and cognitive distortions, but in my opinion, this area is inexhaustible, and it may be worthwhile to test the effect of information in the future during some wine selection decision-making.

Theme 2: Winery and Sustainability

The common intersection of wine and sustainability is described in the following section. Life Cycle Analysis (LCA) is commonly used to assess the environmental impact of different types of wine packaging. The results of these studies are presented in this chapter. Sustainability is a major

issue in all industries, including the wine industry, and is being explored in many ways (as illustrated by Table 2).

The packaging industry has recently developed several alternatives to glass bottles for wine packaging, including aluminum cans, Tetra Pack cans, PET bottles, and Bag in Box. Packaging alternatives to glass bottles are lighter and more flexible, while glass bottles are fragile and heavier (Gomes et al., 2019). The main function of packaging is to store food; however, if the weight of the packaging is equal to the product inside, it is obvious that the efficiency of the whole system is reduced, both in terms of product distribution and the amount of material needed for packaging (Ferrara and De Feo, 2020).

Table 2. Processed studies in the field of winery and sustainability

| Topic | Method | Findings | Source |
|--|-----------------------------|--|-----------------------------------|
| Life cycle assessment (LCA) of wine packaging | LCA, Scenario modelling | Best to worse (alternative packaging): - 1. Bag in box - 2. Aseptic carton - 3. PET - 4. Glass | <i>Ferrara & De Feo, 2020</i> |
| Standardized LCA- the focus is on GHG emissions (wine packaging) | LCA, Scenario modelling | - The highest potential impact on GHG reductions is related to glass bottles - The CO ₂ production of one bottle of wine is 0.829 kg | <i>Ponstein et al., 2019</i> |
| Environmentally sustainable practices in the vineyard- views of wine consumers | Questionnaire (n=109) | Consumers have a strong demand for wine that is produced using "green" production practices | <i>Forbes et al., 2009</i> |
| Environmental impact of PET packaging | Life cycle assessment (LCA) | Highlights the need to conduct LCA studies of PET since many aspects are still not fully understood. | <i>Gomes et al., 2019</i> |

Forbes et al. (2009) sought to answer the question of whether environmentally sustainable practices in vineyards can benefit the wine market. In this regard, the opinions of wine consumers in Christchurch, New Zealand, were assessed using structured questionnaires. The results of the research show that there is a strong consumer demand for wines produced using "green" production practices. Consumers believe that the quality of sustainable wine is equal to or better than that of conventionally produced wine and are willing to pay a higher price for this wine.

Ferrara and De Feo (2020) applied a life-cycle assessment to investigate which type of wine packaging is the least polluting. The results show that the worst packaging alternative is the single-use glass bottle, followed by the multilayer PET bottle. From a sustainability perspective, the bag-in-box is the best choice, followed by the aseptic carton. Given the urgent need to reduce greenhouse gas emissions from food value chains, the study by Ponstein et al. (2019) analyzes the greenhouse gas emissions from wine production based on primary data from 5 wineries, one wine cellar, and nine wine producers in Germany. The results show that the reuse of glass bottles deserves close attention from wine

producers, consumers, and policymakers striving for an efficient decarbonization of the wine value chain. The mitigation potential of reusing an average bottle is more than three times greater than the mitigation potential of reducing the weight of bottles. The combination of bottle weight reduction and reuse can reduce the greenhouse gas emissions per bottle of wine by 47% (Ponstein et al., 2019).

Many studies have been published on sustainability and wine-making; however, in this section, we have illustrated in more detail those related to packaging, as we would like to continue in this direction of research in the future. The results suggest that life-cycle analysis is a suitable method for assessing the environmental impact of wine packaging. As a continuation of this research, we would like to carry out this type of study to identify the most appropriate alternative, taking into account the whole life cycle in Hungary, where wine and wine gastronomy represent a significant part of the economy (Szabó & Závodi, 2018). In addition to packaging, however, it may also be worthwhile to carry out an LCA in the case of wine-making processes, thus obtaining an even more comprehensive picture of the practices of the wine industry.

Theme 3: Winery, Cognitive Biases and Sustainability

At the intersection of wine, sustainability, and cognitive biases are articles that explore consumer attitudes and behaviors in this area. The issue of environmental protection also arises about wine's extrinsic and intrinsic characteristics. Intrinsic characteristics include a more environmentally friendly version of viticulture and the wine-making process itself. The attitude of consumers towards this type of wine is

also an important characteristic in the context of willingness to pay. In Sauvignon Blanc's case, sustainability attributes can influence WTP in a positive direction (Tait et al., 2019). Schäufole and Hamm (2017) also found similar results in their research. Consumers in different countries are willing to pay a premium for wines produced using sustainable wine production methods. Informing consumers about environmental concerns during a wine tasting can strongly moderate consumer preferences (as illustrated by Table 3).

Table 3. Processed studies in the field of winery and cognitive biases and sustainability

| Topic | Method | Findings | Source |
|--|------------------------------------|--|--|
| Examines the effects of an extrinsic attribute of wine (closure type) on perceptions of intrinsic attributes of wine (appearance, taste, bouquet, and overall quality) | Experiment (n=310) | Wines with natural corks were rated significantly higher than wines with screw caps and artificial caps. | <i>Reynolds et al., 2018</i> |
| Consumers' WTP for a 25 cl aluminium can of wine | Questionnaire (n=554) | - The alternative packaged wines are associated with lower-quality - 19% of the sample would buy canned wine | <i>Ruggeri et al., 2022</i> |
| Attitude toward alternative wine packaging- | Questionnaire (n=1000) | - 91% of respondents want to buy only wine packaged in glass bottles - 62% of respondents are willing to re-evaluate the purchasing of wine in alternative packaging | <i>Ferrara, Zigarelli & De Feo, 2020</i> |
| Consumer perception of wine packaging types, sustainability | Questionnaire (n=271) | - The weight of the bottle has an impact on the WTP - The heavier bottle is associated with better quality and higher price (expertise) | <i>Soares, Ramos & Poças, 2022</i> |
| Consumer preferences for sustainable wines, wine tasting | Experiment (n=178) | - Blind taste: the five selected wines were deemed substantially equivalent by participants. - Info and info taste: participants expressed, on average for all the products assessed. - Sustainability concerns proved to powerfully moderate consumer preferences | <i>Lerro et al., 2021</i> |
| Non-traditional wine packaging's influence on consumer purchase intention | Experiment (4 studies) | - The effect of packaging on purchase intention -> aluminium can - have a negative impact, lower taste perceptions - Eco-friendly label- enhances product appeal | <i>Orlowski, Lefebvre & Back, 2022</i> |
| Consumer perceptions, preferences, and willingness-to-pay (WTP) towards wine with sustainability characteristics | Review (1312 articles) | A considerable segment of consumers across different countries with positive perceptions about sustainable production methods of wine are willing to pay a premium for such a wine. | <i>Schäufole & Hamm, 2017</i> |
| Wine consumer preferences for sustainability attributes | Discrete choice experiment (n=766) | „The presence of sustainability attributes can influence Sauvignon Blanc choice and that consumers have a significant positive willingness-to-pay for several of these attributes.” | <i>Tait et al., 2019</i> |
| Food packaging, consumer perception, and the scientifically assessed environmental sustainability | Review | Consumers rate the sustainability of packaging largely based on the circular economy achieved. | <i>Otto et al., 2021</i> |

Food packaging plays an important role in ensuring food quality and food safety. The material, form, and design of different packaging types vary widely, meaning they have different environmental impacts (Otto et al., 2021). The wines on the shelves of commercial shops in many parts of the world are usually sold in glass bottles. The reasons for the success of glass bottles over alternative packaging types are manifold and rooted in the complexity of wine. Understanding this phenomenon is important to understand consumer attitudes,

habits, preferences, and beliefs. Consumers are used to the glass bottle and associate different qualities with it. Consumers tend to judge wine quality based on their perceived characteristics. Several studies have concluded that consumers associate higher quality with wine bottles than other alternative packaging (Ruggeri et al., 2022; Ferrara et al., 2020; Orlowski et al., 2022). In addition to quality, consumers tend to judge glass packaging as a more

sustainable alternative than, for instance, PET bottle packaging (Ruggeri et al., 2022).

In Italy, there is widespread skepticism about wines bottled in alternative packaging. For this reason, the study by Ferrara et al. (2020) presents a preliminary survey of 1000 wine consumers, aiming to explore consumers' attitudes and willingness to purchase wine packaged in more sustainable packaging alternatives than glass bottles. Results show that 91% of respondents are unwilling to try alternative wine packaging and prefer to buy only wine packaged in glass bottles. However, some 62% say they would be willing to reconsider buying wine in alternative packaging after being informed that the quality of the wine is not affected by alternative packaging and that its use can improve the sustainability of the wine.

Within the topic of consumer behavior, sustainability and wine-making, we highlighted those studies where consumer studies were conducted that are related to more environmentally friendly wine consumption. The questionnaire and wine-tasting methodologies seem appropriate for these tests based on the results. After the LCA analyses, we would like to use these methods to identify the cognitive distortions related to alternative wine packaging and the reasons behind individual customer decision-making.

DISCUSSION

The authors conducted a remarkably exhaustive SLR for their (and the readers') edification and to reduce their consternation at the possibly perplexing role of sustainability in the wine industry. A total of 187 hits (results returned by the computer) were found for keywords searched for in two databases. These results were reduced to 30 articles by making the search terms more exacting, and critically and methodically evaluating the papers returned. With 25 papers released in 2022, the total number of studies on this subject has been rising annually, suggesting that what is now but a mere snowflake may soon become an avalanche. Food Quality and Preference published the most papers (21) on this topic—being the clear winner—and was followed in publication by the British Food Journal (17), a close second.

The study investigated consumer attitudes and cognitive biases towards alternative wine packaging in the wine sector. We desired to know what was previously unknown—to go forth, to bravely discover new realms in consumer economics and psychology. Our paper fortifies the existing body of knowledge on the role of sustainability of the wine sector in consumer preferences, with the matter of packaging first and foremost on our minds.

Our study, despite its consequences, has limitations. We intend to undertake additional research in which we scour more databases for more and better results with more precisely tuned keywords, and we acknowledge that our Review of the Literature could be less than ideal due to the incompleteness of the tools at our disposal. Only English-language studies were used in the study, so language bias may appear as an additional imitation. Additionally, our study's theoretical framework and methodology could stand to be

brought closer to the platonic ideal through expansion, and we submit that those who build their research on a different foundation may have findings different from ours. The subject area covered by the study is a very broad and complex problem involving a wide range of stakeholders, including all actors from production to wine consumption. At different stages, different challenges have to be addressed to promote sustainability, which is significant from an economic, environmental, and social point of view. Further research is needed to investigate the issues fully and identify the constraints and problems that currently have no adequate solution or need improvement. This is one of the main limitations of the present study, but in this case, we have focused on the sustainability and consumer challenges related to wine packaging.

Despite the aforementioned, the SLR has helped the authors identify and uncover a gap in the study of cognitive biases and consumer behavior towards alternative packaging in the wine sector. The studies conducted thus far, while not without value, leave much to be desired, and our research illuminates a path forward—to a greener future—for viticulture and the entirety of the wine industry so that this indispensable part of the Hungarian economy may be greener, leaner, and (economically) meaner.

CONCLUSION

The fascinating, germane, and remarkable relationships between sustainability and consumer behavior in the wine sector have continued to transfix the authors of this paper, who have undertaken a quest, likely never-ending, to better understand this domain, with ever more compatriots along for this herculean task. In the publications we painstakingly review, (1) wine and cognitive biases; (2) wine and sustainability; and (3) winery and cognitive biases and sustainability (as a combined focus of study) were the subjects of these investigations. Thirty publications were ultimately examined in the current study out of the 187 articles that were taken from the databases, with a smaller number of these studies being given more attention. Since our search was undertaken in the first quarter of 2023, we were able to include but two articles published in 2023; however, the search from 1995 to the present reveals that 25 papers were unleashed upon the world in 2022 was 25, this year—2023—may have far more in store for dedicated student of this domain than we were able to include.

We did not approach sustainability and viticulture from but one angle, which makes our study novel, if not entirely, a new thing under the sun. We examined customer behavior in addition to sustainability, which provides a comprehensive understanding of the issue relative to what came before. We used the PRISMA model, which is widely accepted in the academic community and in which we have placed considerable confidence, and we found a gap in wine packaging. Although existing research did much to draw the minds and intellects of researchers to the matter of minimally environmentally destructive packaging, research on the preferences and behaviours of consumers was less than faultless. Playing an important role in consumer decision-making in the wine sector, the decision noise and prospect

theory, as well as other theories, do much to explain why consumers behave as they do. The underlying mechanisms and causes of certain biases are imperfectly understood and defined despite researchers investigating consumer attitudes regarding alternative packaging for years upon years. We strongly recommend, without reservation, additional research in these areas.

Sustainability in the wine sector is a major and complex issue, as it plays an important role, from the cultivation of vines to the wine-making process. It is important to note that this is a large topic, and there are many areas to explore, but in this research, we have tried to look at it from a consumer perspective, so these processes are only touched upon. Overall, the harmony of the environmental, social, and economic triad is worth considering. Sustainable development is what the wine industry must pursue on a global scale, and sustainable packaging holds astounding and ever-expanding promise in this regard. Wine industry leaders must put the adoption of sustainable practices front and center. The intensifying demand for sustainable products in international markets supports such a mindset and goal-setting endeavor. Countries with more prominent sustainability are likely to accept novel packaging more readily, as consumers are more inclined to prefer sustainable solutions. Overall, we have demonstrated that the interaction between sustainability and consumer behavior in the wine industry is profoundly dynamic. Thus, we must tackle this issue from many angles. For wineries, this can be profitable in terms of market competition and environmental protection.

The SLR helped to identify further research directions and appropriate methodologies for the research. A possible research direction was identified as alternative wine packaging, which could be approached from several angles. Firstly, we would suggest the LCA methodology for carrying out sustainability studies, which, based on the literature, has been identified as an appropriate method for analyzing the emissions of specific packaging materials. However, to perform a full LCA analysis, it may be necessary to set up different scenarios to obtain more accurate results. For some packaging materials, national legislation and restrictions also play an important role, as different countries have different legislation. The second perspective is the dimension of consumer acceptance towards alternative packaging, where it is essential to identify the underlying influencing factors and cognitive biases towards each packaging. The results suggest that questionnaire interviews and experiments are an appropriate methodology in this dimension. The third pillar is the retailers, whose role is equally essential for a complete analysis. We consider in-depth interviews to be the most appropriate method for gathering the views of manufacturers and retailers. Although these are the main lines of research identified in the literature review, the complexity of the subject means that other lines of research can be pursued to understand the subject.

Our present research allows us to conclude that alternative packaging may be accepted throughout the Hungarian (and global) wine market, but not without effort. Wine industry managers must take heed of the findings here if they wish to introduce alternative packaging. They must fully dedicate themselves to educating consumers and dispelling snobbish

myths and delusions. Only by doing so may wine producers and marketers make this world of ours a greener place.

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