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Unpacking Behaviours: A Literature Study and Research Agenda on Consumer Behaviour in Packaging-Free Systems

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ABSTRACT

In an era where food packaging plays a dual role in both reducing food waste and contributing to global packaging waste, this study presents an analysis of packaging-free systems. As governments and organizations attempt to address the environmental impact of single-use packaging, packaging-free alternatives have emerged as a promising solution. However, there is a need for a comprehensive assessment of environmental sustainability and its alignment with consumer behaviours and preferences in this growing type of grocery system. Considering this need, this study employs an integrative literature review process, selecting 51 research articles. This selection was classified into three principal areas: the characteristics of packaging-free services, the dynamics of consumer behaviour and patterns from a household perspective. This review evaluates the effectiveness of packaging-free systems, exploring the factors that drive consumer adoption, the obstacles to transitioning and the relevance of theoretical frameworks like the theory of planned behaviour (TPB) and practice theory (PT) in understanding and assessing the sustainability of these alternatives. The result of this study is the identification of significant research gaps and opportunities, leading to a comprehensive research agenda. This agenda emphasizes the need for a more refined understanding of consumer classifications that extend beyond standard demographic metrics, delving into aspects like household structures, dietary preferences and regional variations. The study highlights the limited scope of existing literature by advocating for a holistic grocery analysis that blends packaging-free and conventional shopping practices to understand more realistic grocery scenarios, as not all products are available in packaging-free alternatives. It also underscores the importance of integrating environmental assessments with consumer behaviour studies to see the sustainability of the systems beyond reusable containers. Additionally, this research sheds light on the relatively unexplored area of online packaging-free services, questioning the sustainable implication of incorporating online alternatives in grocery practices, and suggests a broader application of theoretical frameworks, including activity theory (AT) as a new perspective to achieve a new understanding of these systems. Lastly, contributing to the overall understanding of packaging-free systems, the study concludes with a SWOT analysis that briefly identifies strengths in environmental sustainability and consumer awareness, balanced against weaknesses like data gaps and complex consumer decision-making processes.

1 | Introduction

Food packaging plays an important role in addressing the challenge of food waste, and the strategies to minimize waste often require a balance between sustainability and product protection. According to Eurostat, in 2020 in Europe, households generated 55% of food waste, resulting in 70 kg per inhabitant [1]. Indeed, food packaging is a key component in reducing food waste throughout the supply chain. This includes scenarios where increased packaging may be required to ensure the protection of products, with a holistic approach that considers the entire product-packaging system to optimize sustainability [2].

On the other hand, global plastic waste generated in 2015 had packaging contributing about 50%, with food packaging estimated to be more than a third of the world's total packaging market [3]. The environmental impact of food packaging refers to the negative consequences that packaging materials and processes have on the environment throughout their life cycle, including production, use and disposal [4]. When comparing the environmental impact of food waste and food packaging, studies have shown that minimizing food waste is generally a higher priority because it accounts for a larger proportion of the life cycle environmental impacts of the food packaging system [2]. In this article, the focus is specifically on food packaging, rather than packaging in general, due to its role in the packaging market and its influence on both environmental sustainability and the management of food waste.

Governments and international organizations are actively creating policies and regulations [5] designed to reduce the environmental impact of single-use packaging. This global effort has made packaging-free systems increasingly attractive as a viable solution to this environmental challenge. Packaging-free systems have gained popularity in recent years due to their purpose of offering products without traditional packaging [6]. Services with packaging-free alternatives can be related to Sustainable Development Goal (SDG) number 11: Sustainable Cities and Communities, as well as SDG 12: Responsible Consumption and Production, goals adopted in 2015 by all United Nations Member States [7]. At the same time, packaging-free systems align with the initiatives encouraged by the European Union (EU) single-use plastic Directive (Directive (EU)2019/904) [5] connected with the previous goals by promoting responsible consumption patterns, reducing plastic waste and certain single-use products.

Food packaging-free systems cover those services that offer food without single-use packaging but still involve packaging in the process, both bulk packages in the supply chain and reusable containers with the consumer, allowing the consumer to choose their own portions and encouraging them to bring their own packaging to purchase products or return the packaging to the company. The term packaging-free systems also encompasses those systems that allow bulk purchasing by eliminating the use of single-use packaging [6]. This could perhaps be perceived as 100% net zero. But in practice achieving a completely net-zero packaging system faces significant challenges, including the inevitable leakage and loss of packaging materials, the misplacement or improper use of packaging by consumers and the challenges associated with ensuring that all individuals return packaging for reuse.

In the discussion of packaging-free systems' sustainability, it is necessary to acknowledge the upfront carbon emissions connected with their creation and implementation, as well as the volume of sales and uses required to create a positive environmental impact. The possibility of balancing these initial emissions is dependent on the durability and reuse cycles of the packaging involved, which are heavily impacted by consumer behaviour. The extent to which customers are willing to accept and continually participate in reuse techniques determines the success of these systems in terms of environmental benefits. This is needed to understand the full environmental potential of packaging-free systems and to ensure that efforts to reduce single-use packaging do not result in higher overall emissions due to insufficient consumer engagement and system inefficiencies.

Consequently, when considering the environmental sustainability of food packaging-free systems, it is necessary to recognize that it goes beyond simply eliminating food single-use packaging from the service [8] and the way consumers engage in the system also influences the packaging's overall environmental impact. In this context, it encompasses exploring customer behaviour and preferences. Different consumers exhibit varying behaviours and attitudes towards packaging and waste reduction, which can affect the way these systems become environmental initiatives or not [8]. By taking into account user needs and habits, packaging systems can be tailored to reduce food and packaging waste, aligning with consumer expectations [9]. Although there is an evident desire to reduce single-use plastic waste, consumer willingness towards alternatives with less environmental impact may provide its own set of challenges [10].

Within this setting, this research is based on an integrative literature review (ILR) that allows to create a more holistic approach to combine food packaging, consumer behaviour and environmental aspects to examine the nature of packaging-free systems. It enables a comprehensive understanding of how these systems function and interconnect with other different areas of research. This review gathers insights into the use of packaging-free systems and reflects on whether they align with environmental consumer expectations and promote sustainable behaviours.

The desire to address these challenges is motivated by the reduced number of studies on food packaging-free systems. Understanding the viability and effectiveness of packaging-free systems is more important than ever as consumers and businesses look for ways to reduce their environmental impact. This research aims to examine the knowledge in the field and bridge the gap between packaging-free systems, consumer behaviour and sustainable studies, providing valuable insights that can inform policies, practices and consumer choices and guide us towards a more sustainable future.

In this context, some research questions are defined with the goal of this integrative review to serve as a roadmap for navigating the difficulties of food packaging-free systems where environmental concerns and consumer behaviour intersect. The research questions are the following: What role do consumer behaviour and decision-making play in the sustainability of packaging-free systems, and how are these factors assessed beyond traditional life cycle assessment (LCA) methodologies? What are the theoretical frameworks used in understanding consumer interactions with packaging-free systems and their shopping habits? What are the identified barriers and motivations that consumers face when transitioning to packaging-free systems? Following the analysis of the selected articles, a research agenda is proposed that not only provides a comprehensive view of current knowledge but also offers a clear direction for future research in this field.

In this context, a research agenda serves as a strategic guide, identifying crucial areas and questions that require further exploration and offering a clear direction for future research in this sector.

2 | Materials and Methods

To better analyse sustainable packaging-free systems, an approach that reaches interdisciplinary boundaries is needed. An ILR [11] was chosen for this research as it facilitates the combination of knowledge from different fields, bridging together the gap between food packaging-free systems, consumer behavioural studies and sustainable perspectives. This integrative approach is particularly suitable for a study like this one, where insights from multiple areas of practice are gathered to form a comprehensive understanding of this new type of grocery system [11].

This type of literature review aims to direct future research and shed light on areas that might require further exploration. Considering that in the context of environmental sustainability in packaging, an integrative review serves as a valuable tool, assessing the implications of current research findings and providing insights for researchers.

To develop this literature review, a systematic process inspired by the PRISMA [12] methodology was employed to facilitate transparent and complete reporting through the literature search process. Following this methodology, different steps were planned that were influenced by three phases: planning, conducting and reporting.

The planning phase, as the first step, laid the foundation for this research. It involved identifying key search terms, defining research objectives and developing a strategy for more focused research on packaging-free systems and consumer practices.

During the conducting phase, the review plan was executed. This included conducting literature searches, selecting studies and conducting in-depth content analyses. This phase allowed us to extract meaningful insights about the dynamics of packaging-free systems and the consumer doings associated with them.

The reporting phase involved synthesizing our findings into a coherent presentation. The results of this phase, including insights and reflections, have been systematically structured into a research agenda. This agenda contributes to a better understanding of environmentally sustainable packaging systems and consumer practices in this context.

2.1 | Planning the Scope

The scope of this literature review is to examine and synthesize existing research related to food packaging-free systems, consumer behaviour and sustainability. It involves identifying and analysing studies that address how packaging-free systems impact consumer behaviour in terms of product choices, purchasing habits and environmental decision-making. The scope of this research also seeks to look at studies that assess the efficiency and environmental effects of these systems to better understand how they contribute to sustainability. Lastly, a more general goal of this ILR includes identifying gaps in the literature and a research agenda that can shape future research.

2.2 | Planning the Literature Search

Before conducting the literature selection, an initial search for relevant documents was carried out as a starting point on Google Scholar to cast the widest net based on the scope, which defines the boundaries and objectives of the review. The articles found in this initial search were used as a foundation to identify key terms. These keywords were then employed to explore the diverse outcomes achievable through the Scopus search engine, as it allows us to look for the right coverage of documents. The initial search planning did not restrict the publication year, thus allowing for the inclusion of the most recent documents every week. The search was limited to articles, reviews and conference articles. The asterisk (*) in this context denotes a flexible set of attributes, which may even include the absence of characteristics. This approach was adopted due to the diverse writing styles found in publications, such as 'sustainab', which encompasses terms like sustainability or sustainable, allowing to relate to variations.

The search was conducted using the Scopus database, enabling advanced Boolean ('AND', 'OR') searches, which enhanced the precision of the research capabilities. In the first group of terms, the search was narrowed down to the food sector, researching within all fields: 'grocery' OR 'shopping' OR 'food' OR 'retail' OR 'stores' OR 'supermarket' OR 'edibles'.

In the second group of terms, the focus was on environmentally conscious packaging systems, which were researched within the article title, abstract and keywords: 'Packaging-Free' OR 'sustainab*' AND 'packaging' OR 'bulk' OR 'reuse' OR 'refill' OR 'circular' AND NOT 'energy'. The third group of terms was targeted at articles related to consumer doings within the title, abstract, and keywords: 'consumer behaviour' OR 'household' OR 'social practice' OR 'activity theory'. The term household was included in this group to obtain information about consumer behaviour concerning their household habits.

2.3 | Conducting the Review

The literature review process outlines several systematic steps for gathering and evaluating relevant research articles in a structured manner. This method ensures a complete understanding of the chosen research topic, and it is represented in Table 1 including the number of articles filtered in every step. The process is broken down as follows:

1. Preparation and definition of research focus: During this stage, key preparatory tasks were defined. Identifying the main search terms that were used to find relevant literature was part of this process. Furthermore, the research focus

TABLE 1 | Literature filtering process.

Step 1. Preparation	Step 2. Initial Search	Step 3. First Filtration	Step 4. Title and Abstract Review
• Identify the main search terms and refine the focus of the research. • Formulate a plan for conducting the research. • Arrange the initial search documents systematically.	• Initial search on Scopus with three groups of key terms.	• Removing duplicate results. • Checking the type of publication and the language.	• Checking titles and abstracts.
	280	261	113
Step 5. Second Review	**Step 6. Full Article Reading**	**Step 7. Identification of New Articles**	**Step 8. Final Filtration and Classification**
• Review the introduction, research goals and conclusions.	• Read full text.	• Snowballing from those articles. • Categorization of topics.	• Extract key insights from the articles. • Filtering by a more concrete last categorization.
71	44	+22= 66	51

was more defined, and a plan for conducting the research was developed. The initial collection of search documents was arranged systematically to maintain organization.

2. Scopus initial search with keyword groups: An initial search on the Scopus database was conducted after the term definition. To optimize the search and capture a wide range of relevant articles related to the research focus, three groups of keywords were used: a first group to refer to the food area, a second group to relate to the packaging and its systems and a third group to target the consumer behaviour and classification. The result of this research was 280 articles.
3. Removing duplicates and checking publication type and language: In the third step, the initial search results went through a preliminary filtration process. This involved removing duplicate articles and checking them to confirm the type of publication and language. In this step, the number of articles was reduced to 261.
4. Title and abstract review: The next step focused on evaluating the titles and abstracts of the remaining articles. This step facilitated further narrowing down the selection by discarding articles that did not align with the research objectives, obtaining 113 articles after this filtration.
5. Review of introduction, research goals and conclusions: A more detailed evaluation of the articles was conducted. This involved an examination of the selected articles' introductions, research objectives and conclusions. This step provided information about the contribution of each article. In this step, the number of papers was reduced to 71.
6. Full article reading: During this step, the full articles of the selected articles were read and analysed. This deep reading ensured an understanding of each article's methodology, findings and discussions. The number of papers obtained after reading the articles was 44.
7. Identification of new articles and categorization: This step involved finding additional relevant articles that were not previously identified. This process, known as 'snowballing' [13], aided in finding articles that may have been missed in previous searches, including 22 new articles. Furthermore, once the new articles were added, the selected articles were divided into five categories: consumer behaviour, barriers, drivers, economic aspects and system types. There was a distinction between articles that are directly related to packaging-free systems and those that are related to sustainable packaging to ease the connection of insights between them.
8. Final filtration and classification: In the final step, a more refined classification was applied to the articles. This step involved further filtration and refined categorization allowing a more focused selection and reducing the previous categorization from six to three main areas. Those areas allow for categories in the literature and are represented by a Venn diagram in the following section. In this final step, the number of articles was reduced from 66 to 51.

In Table 1, they were presented and briefly described each of the steps together with the resulting number of articles after filtering at each step, presented at the bottom of each step.

3 | Literature Results

Once the filtering process was completed, we moved on to the classification of the selected bibliography and its analysis. The literature results, background and content discussions will be detailed in the following sections.

3.1 | Literature Classification

Following the selection of the literature, it was found specific topic patterns within the selected articles. Based on these patterns, the literature was categorized into three groups.

The first group focuses on packaging-free systems and groups those articles that describe how they work and are implemented. This literature discusses different types of packaging-free systems, bulk shopping, drivers and barriers that consumers face in the use of them. Most of them make mention of the positive environmental outcome of reusing packaging and refer to the economic aspect of those systems for consumers.

The second group includes research articles that explore user behaviour when making a purchase decision between different packaging options. Although the articles in this category do not specifically address packaging-free products, they centre on food shopping activities and packaging in retail. They explore consumer awareness of environmentally friendly packaging, environmental impacts and consumer experiences as both barriers and drivers. However, they do not differentiate among various types of sustainable packaging beyond single-use sustainable options.

The third group includes articles that explore food packaging at the household level. This includes articles that discuss how consumers interact with the product at home as well as analyses based on household characteristics such as age, gender and income. These articles also touch upon the sustainability of consumer practices at home and their food waste habits. Notably, the selection does not distinguish between different packaging or systems. These articles provide insides on the interaction with packaging during and after the grocery.

By classifying the literature into these three primary groups, it was possible to find articles that could be categorized into two groups simultaneously. This classification gathers documents discussing consumer behaviour related to packaging-free products, which combined literature from groups 1 and 2. There were also documents addressing customer behaviour and household-level analysis, categorized into groups 2 and 3, and documents examining packaging-free systems with household-level classification, falling under groups 3 and 1. The least prominent group within this classification is Group 3 in combination with Group 1, combining household analysis and studies of packaging-free systems, and the classification of articles into all three groups simultaneously, as we can find a gap in the literature combining the study of packaging-free systems and its different uses depending on their household situation. In the intersection of the three groups, we can find the article by Jiang et al. [14], which classifies some preferences from packaging-free systems into different age ranges.

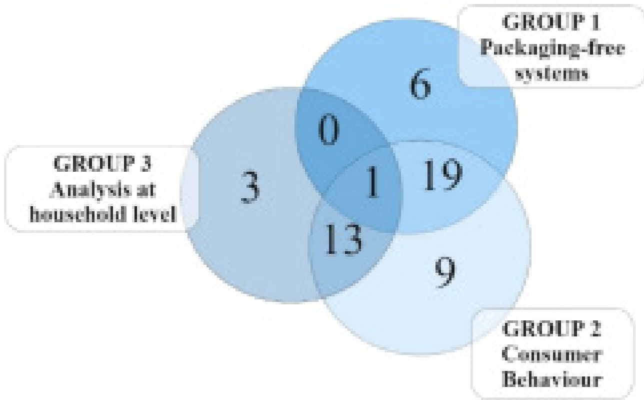

FIGURE 1 | Mapping of the literature classification in Venn diagram.

The Venn diagram in Figure 1 illustrates the classification of these three groups and the number of articles in the selected literature classified within each section. The diagram presents areas with a higher number of articles, such as the intersection of groups 1 and 2, and areas that might be underexplored as much as the intersection of groups 3 and 1 or the combination of the three groups.

3.2 | Literature Selection

The literature selected for this review includes not only articles on food packaging-free systems but also articles that are related to this area, with a strong emphasis on behavioural understanding of environmentally friendly packaging and packaging interactions and implications outside the grocery practice.

The literature selection process considered articles that address the topic of environmentally friendly packaging, either food single-use packaging or new packaging initiatives such as packaging-free systems. However, articles that only address packaging's environmental impact during production without addressing its use or how consumers interact with it were excluded. Despite their relevance in the field of reusable packaging, articles published by Ada et al. [15], Scharpenberg et al. [16] or Accorsi et al. [17] are not included in this selection as they do not address the environmental effects of packaging during consumer use.

Throughout the filtration of research articles addressing food eco-friendly and reusable packaging, a distinct division of methods can be identified, with some articles using quantitative analysis and others using qualitative analysis. The quantitative research is limited to articles that use LCA and life cycle costing (LCC) approaches that focus on the production and disposal chain without considering the possibility that consumer behaviour may also play an important role in determining a product's environmental impact. Qualitative research allows us to analyse user behaviour and identify whether environmentally friendly practices are being implemented when grocery shopping, but they do not determine which is the impact of each action. It is not common practice in this field to combine quantitative analysis of the environmental impact of packaging with qualitative analysis of user behaviour.

Those documents that, based on consumer behaviours and preferences, have carried out a classification of consumers were considered during the filtering process. The results of this search can highlight research that classifies consumers mainly by age, gender or income, leaving aside other types of classifications that can also be relevant when choosing eco-friendly packaging alternatives. Other types of classifications such as the type of household, location or diet might provide different classifications of behaviour compared to the current one.

Another pattern to note in the articles examined is the study of consumer behaviour that focuses solely on behaviour while using packaging-free systems, as in the case of Miao et al. [18]. When integrating packaging-free systems into a user's routine, prior research has not addressed how users combine these systems with conventional shopping, considering that not all product types are available as packaging-free alternatives.

The filtered literature was grouped into three main groups mentioned in the previous section and into the intersection of these main groups. Taking them as a reference, in Table 2 is found the classification of the selected articles in each of the groups.

3.3 | Background Analysis

To provide a comprehensive understanding of the literature selection, this section shows background information on the selected literature of our study. The statistics of this literature review are presented in the form of figures.

Figure 2, which represents the documents by year from 2001 to 2022, shows a continuous increasing pattern over the last decade, peaking in 2022. This growing trend demonstrates a continuing interest and participation in the field that could be caused by the growing implementation of those services as well as awareness and the new regulations [5] controlling single-use plastics and promoting reusability.

Figure 3 shows the selected documents of this literature study organized by type. Most of the documents (79% of the documents) are classified as journal articles. Notably, reviews account for approximately 20% of the documents. The blend of primary research articles and review papers presents a balance and in-depth on the topic and ensures that the study is grounded in articles in the field.

In the selected literature reviews can be found some reviews on food waste, such as the study published by Chan [56], which looks into packaging-related studies in the context of household food waste, or another of his studies [51], which explores the different packaging solutions available to address household food waste.

A second field in the selected reviews is categorized in relation to consumers' decisions regarding purchasing food in environmentally friendly packaging, such as Martinho et al.'s [26] study, which examines consumers' decisions in this area, or Heidbreder et al.'s [20] study, which examines perceptions, behaviours and interventions about plastic waste and examines the variables influencing consumer attitudes and behaviour regarding plastic packaging.

In direct connection to food packaging-free systems, it included the research by Zaman [23], which explores the conclusions drawn from previous initiatives and offers guidelines for implementing effective packaging-free management principles into practice.

Figure 4 depicts articles by country or territory, offering geographical insights into the topic. The United Kingdom comes out as the country with the most articles in this literature selection, and Germany, Sweden, Australia and Italy are behind with almost half the number of publications. The result is largely Europe, with important contributions from Canada, the United States and Australia, showing global interest and collaboration in this field. The United Kingdom influence predominates in the publications of this literature review possibly due to the participation in various projects of UK universities such as The University of Sheffield that are aligned with environmental sustainability, including the reduction of plastic packaging and food waste through product innovation.

Figure 5 offers an overview of the interconnections between most of the articles that are included in this literature review. In this representation made through the platform *Litmap*, each article is shown as a distinct node, whose size represents the number of citations, and the connecting lines indicate the web of citations that link them together. These lines shape a chronological narrative, beginning with the earliest articles and moving to the right to the most recent. This representation not only illustrates the growth of ideas over time but at the same time displays the intellectual lineage that has contributed to the field's progress in the last two decades.

4 | Content Analysis

This section presents an exploration of the different packaging-free systems, covering several aspects. It begins by discussing these systems' potential for promoting sustainability, and it is followed by addressing the main theoretical perspectives used in the papers. Subsequently, the variety of packaging-free alternatives available in the current market is explored. Then, the attention is turned to examining the drivers and motivations that encourage consumers to use packaging-free solutions as well as the barriers and obstacles that might prevent their wide adoption. Lastly, the willingness to pay and consumer awareness about their environmental impact are addressed separately from the previous section due to their frequently suggested as key components in the analysis of a high number of articles presenting a significant role in the adoption of food packaging-free practices.

4.1 | Environmental Sustainability in Packaging-Free Systems

Even though sustainable analytic tools like LCA are methods that are frequently used to evaluate the environmental impact of packaging, it is observed in the literature that they mainly focus on environmental factors through the supply chain and do not frequently assess the complexities of consumer behaviour and decision-making processes. In the literature, there is a clear distinction between qualitative and quantitative methods for

TABLE 2 | Bibliographic selection and classification.

Group 1: Packaging-free systems 6 articles	1. Coelho PM, Corona B, ten Klooster R, Worrell E. Sustainability of Reusable Packaging–Current Situation and Trends [19] 2. Heidbreder LM, Bablok I, Drews S, Menzel C. Tackling the Plastic Problem: A Review on Perceptions, Behaviors, and Interventions [20] 3. Lofthouse VA, Bhamra TA, Trimingham RL. Investigating Customer Perceptions of Refillable Packaging and Assessing Business Drivers and Barriers to Their Use [21] 4. Rapp A, Marino A, Simeoni R, Cena F. An Ethnographic Study of Packaging-Free Purchasing: Designing an Interactive System to Support Sustainable Social Practices [22] 5. Zaman AU. A Comprehensive Review of the Development of Zero Waste Management: Lessons Learned and Guidelines [23] 6. Zhu Z, Liu W, Ye S, Batista L. Packaging Design for the Circular Economy: A Systematic Review [24]
Group 2: Consumer behaviours 9 articles	1. Boz Z, Korhonen V, Sand CK. Consumer Considerations for the Implementation of Sustainable Packaging: A Review [25] 2. Martinho G, Pires A, Portela G, Fonseca M. Factors Affecting Consumers' Choices Concerning Sustainable Packaging During Product Purchase and Recycling [26] 3. Otto S, Strenger M, Maier-Nöth A, Schmid M. Food Packaging and Sustainability – Consumer Perception vs. Correlated Scientific Facts: A Review [27] 4. Popovic I, Bossink BAG, van der Sijde PC. Factors Influencing Consumers' Decision to Purchase Food in Environmentally Friendly Packaging: What Do We Know and Where Do We Go From Here? [28] 5. Shankar A, Dhir A, Talwar S, Islam N, Sharma P. Balancing Food Waste and Sustainability Goals in Online Food Delivery: Towards a Comprehensive Conceptual Framework [29] 6. Wandosell G, Parra-Meroño MC, Alcayde A, Baños R. Green Packaging From Consumer and Business Perspectives [30] 7. Yokokawa N, Amasawa E, Hirao M. Design Assessment Framework for Food Packaging Integrating Consumer Preferences and Environmental Impact [31] 8. Fernqvist F, Olsson A, Spendrup S. What's in It for Me? Food Packaging and Consumer Responses, a Focus Group Study [32] 9. Johnson SL, Sommer R, Martino V. Consumer Behavior At Bulk Food Bins [33]
Group 1–2: Packaging-free systems and consumer behaviour 19 articles	1. Baird HM, Meade K, Webb TL. This Has Already Been Used! A Paradigm to Measure the Point at Which People Become Unwilling to Use Reusable Containers [34] 2. Gordon-Wilson S, Modi P, Eastman JK. Values, Personality Traits, and Packaging-Free Shopping: A Mixed-Method Approach [35] 3. Beitzen-Heineke EF, Balta-Ozkan N, Reefke H. The Prospects of Zero-Packaging Grocery Stores to Improve the Social and Environmental Impacts of the Food Supply Chain [36] 4. De Canio F. Consumer Willingness to Pay More for Pro-environmental Packages: The Moderating Role of Familiarity [37] 5. Ertz M, Huang R, Jo MS, Karakas F, Sarigöllü E. From Single-Use to Multi-Use: Study of Consumers' Behavior Toward Consumption of Reusable Containers [38] 6. Fuentes C, Enarsson P, Kristoffersson L. Unpacking Package Free Shopping: Alternative Retailing and the Reinvention of the Practice of Shopping [6] 7. Greenwood SC, Walker S, Baird HM, et al. Many Happy Returns: Combining Insights From the Environmental and behavioural sciences to Understand What Is Required to Make reusable packaging mainstream [39] 8. Herrmann C, Rhein S, Sträter KF. Consumers' Sustainability-Related Perception of and Willingness-to-Pay for Food Packaging Alternatives [40] 9. Kasza G, Veflen N, Scholderer J, et al. Conflicting Issues of Sustainable Consumption and Food Safety: Risky Consumer Behaviors in Reducing Food Waste and Plastic [41] 10. Keller E, Köhler JK, Eisen C, Kleihauer S, Hanss D. Why Consumers Shift From Single-Use to Reusable Drink Cups: An Empirical Application of the Stage Model of Self-Regulated Behavioural Change [42] 11. Kunamaneni S, Jassi S, Hoang D. Promoting reuse Behaviour: Challenges and Strategies for Repeat Purchase, Low-Involvement Products [43] 12. Louis D, Lombart C, Durif F. Packaging-Free Products: A Lever of Proximity and Loyalty Between Consumers and Grocery Stores [44] 13. Norton V, Waters C, Oloyede OO, Lignou S. Exploring Consumers' Understanding and Perception of Sustainable Food Packaging in the UK [45] 14. Miao X, Magnier L, Mugge R. Switching to Reuse? An Exploration of Consumers' Perceptions and Behaviour Towards Reusable Packaging Systems [18] 15. Săplăcan Z, Márton B. Determinants of Adopting a Zero Waste Consumer Lifestyle [46] 16. Steinhorst J, Beyerl K. First Reduce and Reuse, Then Recycle! Enabling Consumers to Tackle the Plastic Crisis – Qualitative Expert Interviews in Germany [47] 17. Testa F, Iovino R, Iraldo F. The Circular Economy and Consumer Behaviour: The Mediating Role of Information Seeking in Buying Circular Packaging [48] 18. Testa F, Di Iorio V, Cerri J, Pretner G. Five Shades of Plastic in Food: Which Potentially Circular Packaging Solutions Are Italian Consumers More Sensitive to [49] 19. Barbosa B, Shabani Shojaei A, Miranda H. Packaging-Free Practices in Food Retail: The Impact on Customer Loyalty [50]

(Continues)

TABLE 2 | (Continued)

Group 3: Analysis at a household level 3 articles	1. Chan RBY. Packaging Solutions for Household Food Waste in the Context of the Food/Beverage–Packaging Industry: A Comparative review of empirical Literature and Industry Press Releases [51] 2. Williams H, Wikström F, Wetter-Edman K, Kristensson P. Decisions on Recycling or Waste: How Packaging Functions Affect the Fate of Used Packaging in Selected Swedish Households [52] 3. Griffith R, Leibtag E, Leicester A, Nevo A. Consumer Shopping Behavior: How Much Do Consumers Save? [53]
Group 2–3: Consumer behaviour and household-level analyses 13 articles	1. Carvalho JS, Oliveira JDSC, De São José JFB. Consumers' Knowledge, Practices, and Perceptions About Conventional and Sustainable Food Packaging [54] 2. Cavaliere A, Pigliafreddo S, De Marchi E, Banterle A. Do Consumers Really Want to Reduce Plastic Usage? Exploring the Determinants of Plastic Avoidance in Food-Related Consumption Decisions [55] 3. Chan RBY. A Review of Packaging-Related Studies in the Context of Household Food Waste: Drivers, Solutions and Avenues for Future Research [56] 4. Martínez LMC, Mollá-Bauzá MB, Mora AG. A Consumer Behaviour Approach to Analyse the Sustainability of Food Purchasing [57] 5. Nilsson E, Gärling T, Nordvall AC, Marell A. Who Shops groceries Where and How? – The Relationship Between Choice of Store Format and Type of Grocery Shopping [58] 6. Norton V, Oloyede OO, Lignou S, Wang QJ, Vásquez G, Alexi N. Understanding Consumers' Sustainability Knowledge and Behaviour Towards Food Packaging to Develop Tailored Consumer-Centric Engagement Campaigns: A Greece and the United Kingdom Perspective [59] 7. Oliver M, Vrabič-Brodnjak U, Jestratijevic I. Consumers' Socio-demographics Influence Between Purchase Intention and Actual Behavior of Environmentally Friendly Grocery Packaging [60] 8. Su DN, Duong TH, Thanh Tran Dinh M, Nguyen-Phuoc DQ, Johnson LW. Behavior Towards Shopping at Retailers Practicing Sustainable Grocery Packaging: The Influences of Intra-personal and Retailer-Based Contextual Factors [61] 9. Williams H, Wikström F, Otterbring T, Löfgren M, Gustafsson A. Reasons for Household Food Waste With Special Attention to Packaging [62] 10. Williams H, Lindström A, Trischler J, Wikström F, Rowe Z. Avoiding Food Becoming Waste in Households – The Role of Packaging in Consumers' Practices Across Different Food Categories [63] 11. Zeng T, Durif F. The Influence of Consumers' Perceived Risks Towards Eco-design Packaging Upon the Purchasing Decision Process: An Exploratory Study [64] 12. Schanes K, Dobernig K, Gözet B. Food Waste matters – A Systematic Review of Household Food Waste Practices and Their Policy Implications [65] 13. Laroche M, Bergeron J, Barbaro-Forleo G. Targeting Consumers Who Are Willing to Pay More for Environmentally Friendly Products [66]
Group 3–1: Analysis at a household level and packaging-free systems O Articles	
Group 1–2–3: Packaging-free systems, consumer behaviour and analysis at a household level 1 article	1. Jiang X, Dong M, He Y, et al. Research on the Design of and Preference for Collection Modes of Reusable Takeaway Containers to Promote Sustainable Consumption [14]

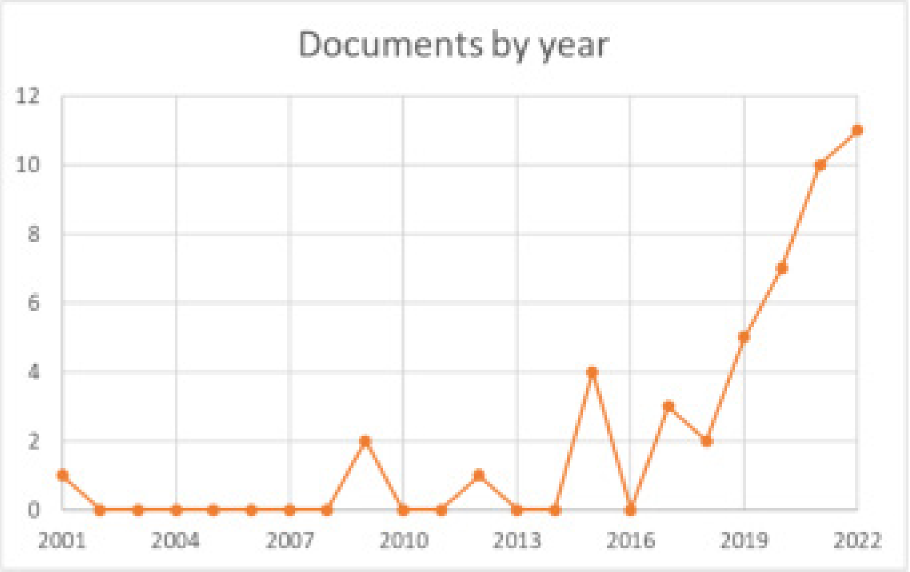

FIGURE 2 | Documents by year.

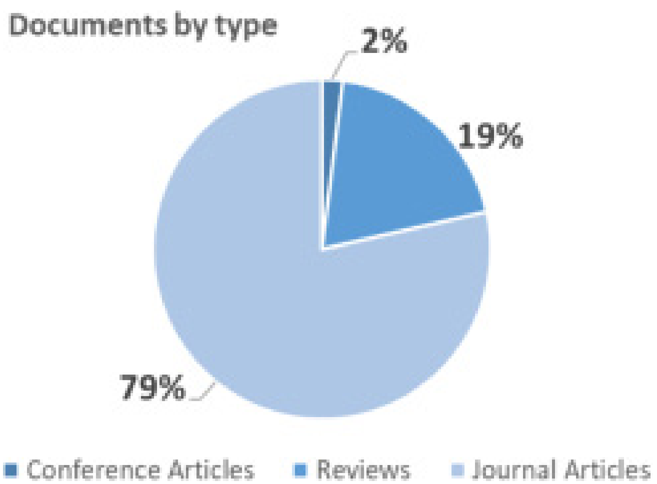

FIGURE 3 | Documents by type.

assessing the environmental impact of both the packaging and the consumer.

Beitzen-Heineke et al. [36] researched the potential of packaging-free grocery stores in improving the social and environmental impacts of the food supply chain. The authors highlight the advantages of such systems by reducing packaging waste, which can contribute to waste reduction, resource conservation and lower carbon emissions associated with packaging production and disposal. The authors argue that packaging-free systems can encourage customers to engage in more environmentally friendly behaviours such as bringing their own containers and purchasing in bulk helping the system become more sustainable overall [36]. But though these systems can encourage the adoption of more environmentally sustainable behaviours, it has not yet been quantitatively demonstrated that the behaviours that consumers engage in are sustainable enough to consider the whole process of use more sustainable than the use of food single-use packaging.

In addition to considering the environmental impacts of packaging, it is important to evaluate its sustainability within a broader framework [67]. Lewis et al. [67] claim the need for an alternative approach to assessing packaging's environmental impact, which considers factors beyond LCA including social and financial impacts when making packaging decisions. They argue that a comprehensive evaluation should consider a more holistic approach as considering consumer behaviour or waste practices.

When discussing environmental sustainability in relation to packaging-free systems, it needs to be mentioned that removing packaging from food products can also be less environmentally sustainable in certain situations. Although eco-friendly packaging practices, such as purchasing packaging-free products, can help reduce plastic use, food waste and transportation costs [50], it is important to consider the broader environmental impacts of packaging. The production, use and disposal of packaging materials are associated with various environmental impacts [68]. However, several studies have shown that for certain products, the environmental benefit of decreased food waste outweighs the environmental impact caused by the use of additional packaging material [4].

Given this, it is needed to recognize that, while reducing packaging can be an environmentally friendly option for certain products, it is not a one-size-fits-all solution. The environmental impact of packaging varies depending on the type of product and its shelf life. For perishable goods, packaging can significantly extend the shelf life and reduce food waste, which is a critical environmental concern. In such cases, the added packaging might contribute less harm to the environment compared to the wastage of the product itself [2].

Finding a balance between food packaged and unpackaged products within consumers' shopping routines is most likely to be the realistic of environmentally sustainable shopping habits. Not all products are suitable for sale without packaging because some items require protective or preservation measures. Perishable goods, such as fresh produce, or delicate items may still require some form of packaging to ensure their quality and safety [2]. Non-perishable goods, on the other

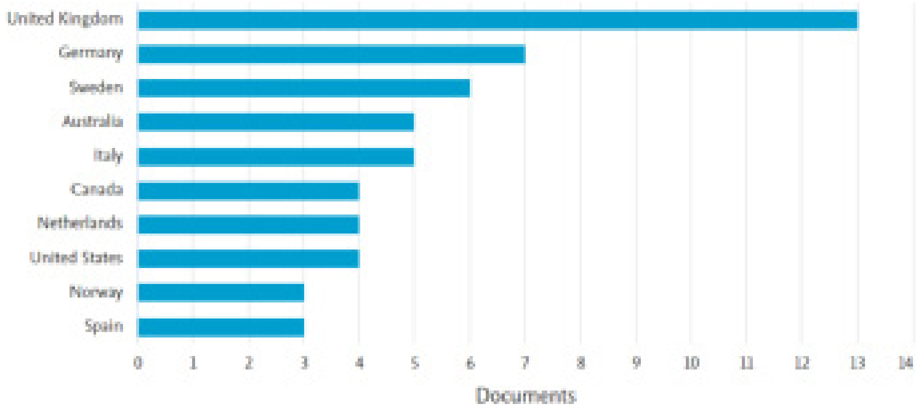

FIGURE 4 | Documents by country and citation.

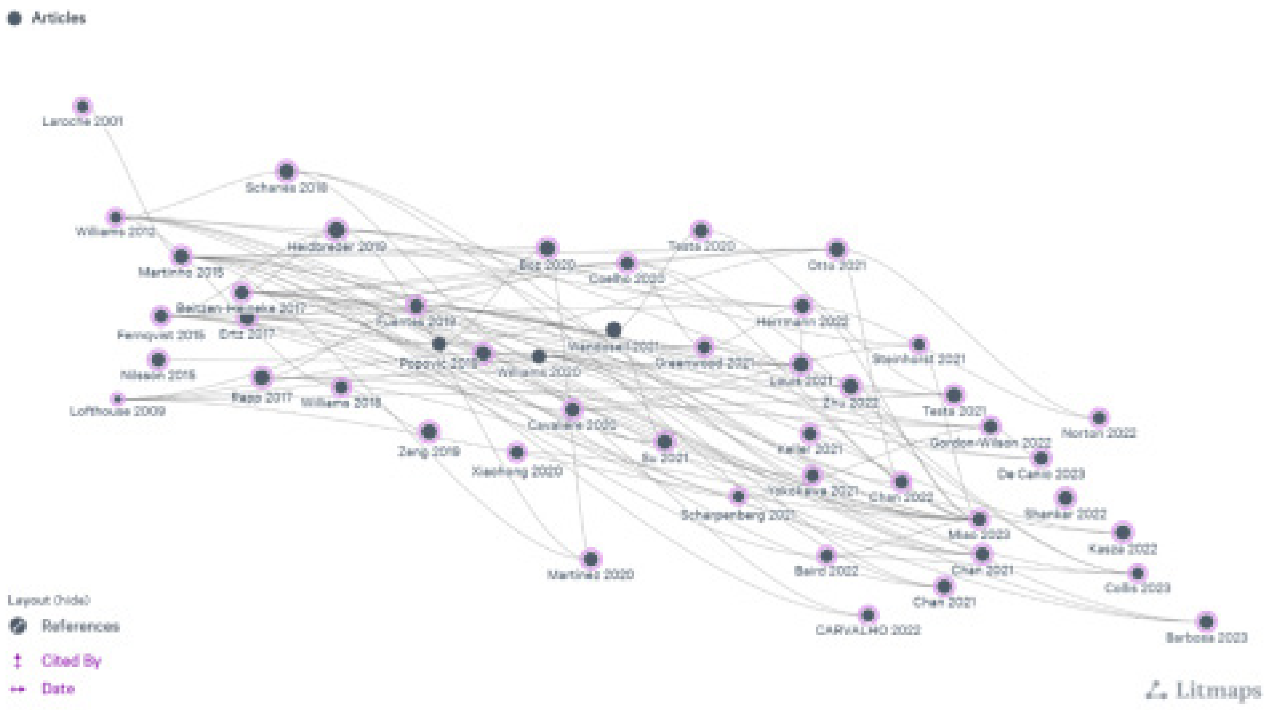

FIGURE 5 | Representation of the literature by date.

hand, such as grains or pulses can easily be sold in packaging-free systems. As a result, consumers will need to adjust to a shopping environment that combines the convenience and necessity of packaging with the environmentally conscious option of purchasing products with minimal or packaging-free alternatives.

This hybrid approach recognizes that the food industry's environmental sustainability needs flexibility in shopping choices. Achieving a more environmentally sustainable shopping experience will require driving the right balance between packaging and waste reduction.

4.2 | Theoretical Perspectives

When assessing what people do and how they interact with food packaging systems, there are multiple theoretical perspectives. The behaviours and perceptions of consumers in relation to grocery habits and packaging-free systems are explored in the selected literature through the lenses of the theory of planned behaviour (TPB) [69] from the socio-psychology model and practice theory (PT) [70] from the cognitive science model. These theoretical frameworks provide a structure for in-depth research of consumer interactions with packaging-free systems and shopping habits, exposing the dynamics that drive their behaviours and perceptions in this field.

TPB suggests that individuals' behaviours are influenced by their attitudes, subjective norms and perceived behavioural control. Design interventions based on the TPB can be used to promote desired behaviours and perceptions in food packaging-free systems, as well as to shape subjective norms by promoting social norms that support the use of packaging-free, such as emphasizing other consumers' widespread adoption of packaging-free systems [71]. Furthermore, using these interventions can focus on increasing consumers' perceived behavioural control by providing resources and support to facilitate the use of packaging-free, such as providing easy access to bulk stations and instruction on how to properly use and dispose of returnable containers.

TPB has been applied in some studies gathered in this research to understand consumer behaviour and decision-making concerning eco-friendly packaging. TPB, for example, was used in the study conducted by Boz et al. [25] to examine individuals' intentions to engage in environmental packaging alternatives. The study found that attitudes, subjective norms and perceived behavioural control were significant predictors of intentions to engage in environmental activism [25]. The study conducted by Ertz et al. [38] to understand consumers' intentions and behaviours regarding the use of reusable containers is another example of the use of TPB in the context of eco-friendly packaging. They conducted a study on consumers' attitudes towards reusable container consumption and observed that attitudes, subjective norms and perceived behavioural control influence consumers' intentions to use reusable containers.

PT, on the other hand, emphasizes the role of social practices in shaping individuals' practices and perceptions [72]. According to this theory, behaviours are not just driven by individual attitudes and intentions but are incorporated within broader social practices. In the case of packaging-free systems, consumers' behaviours and perceptions are influenced by the practices surrounding the use of packaging-free, such as the routines and conventions associated with obtaining and using packaging-free. PT suggests that interventions should go beyond individual-level factors and target the broader social practices surrounding packaging-free systems. This may involve interventions that both disrupt and develop new practices [73].

An example of this theory applied in the selected literature is the research by Rapp et al. [22] where an ethnographic study was conducted to explore the social practices associated with packaging-free purchasing and the role of packaging in consumers' everyday lives [22]. The study used PT to look into how packaging influences consumers' routines and practices, as well as how an interactive system can be designed to support sustainable social practices [22]. The study explores the social and cultural factors that influence consumer behaviour in terms of packaging and sustainability, emphasizing the importance of convenience, freshness and product quality perceptions in consumers' decisions to purchase packaged or unpackaged products [22].

Although the TPB and PT have provided valuable insights into the field of consumer behaviours and perceptions in packaging-free systems, it should consider the potential contribution of activity theory (AT) as an alternative and complementary theoretical framework. AT introduces a lens that considers the interactions between human activities, social contexts and the role of artefacts as it is explored in the research by Wanjun et al. [74]. AT can focus on mediating the effects of artefacts aligned with the material aspects of packaging-free systems, such as reusable containers and bulk dispensers, which play a crucial role in shaping consumer behaviours. By exploring the interplay between individuals, social practices and artefacts, AT could provide a holistic understanding of why and how consumers engage with packaging-free systems, offering insights for designing effective interventions and strategies in the field.

4.3 | Current Packaging-Free System Classification

Several types of reusable packaging systems exist, including returning and refilling container systems. These systems aim to reduce waste and promote sustainable behaviour by allowing consumers to reuse packaging instead of disposing of it after a single use [21]. Although the focus of this article is food packaging, other items, such as cleaning supplies, can also fall under this classification.

The returnable packaging system involves the use of containers that are designed to be returned to the manufacturer or retailer after use. These containers are typically made of durable materials such as glass or plastic and are intended to be used multiple times before being recycled or disposed of. Consumers can return the empty containers to designated collection points, where they are then cleaned, sterilized and refilled for future use [18].

Within this returnable packaging system, a distinction can be drawn between two alternative methods for packaging return. One approach involves an arrangement wherein a company collects the packaging directly from your home, whereas the second alternative involves a system whereby the consumers personally transport the packaging to a designated collection point, often situated within establishments such as supermarkets [39].

The refilling packaging system, on the other hand, allows consumers to refill their containers with the product of their choice. In this system, consumers purchase a container once and then refill it with the desired product from bulk dispensers or refill stations. This eliminates the need for single-use packaging and reduces waste [18]. This system is particularly popular in packaging-free supermarkets, where consumers bring their own containers to fill with the desired products.

In the refill systems, there exist two main different variations. The first involves the purchase of refill packaging, which is subsequently emptied into the original container. The second option involves bringing the packaging to the store, where it can be replenished on-site, offering a convenient on-the-go solution [39]. Lofthouse et al. [21] classify the refilling packaging alternatives into 15 different types depending on how the consumers make use of the packaging; some examples of those are dispensed concentrates, original packaging swapped for new products or lighter weight refill through part reuse.

Both the returning and refilling systems rely on consumer participation and behaviour change. Consumers need to actively engage in returning empty containers or refilling their own containers for these systems to be effective. The success of these systems also depends on the availability and accessibility of collection points or refill stations [18].

A major difference between refill and return systems is the ownership of the container by the consumer. In the case of refill containers, the consumer owns the container, whereas, in the case of returnable containers, the container belongs to the company and is used by different consumers at each return [39].

In addition to considering these services, we can consider that nowadays there are available alternatives with online purchasing modes, facilitating how consumers can make the purchase of packaging-free products. For example, with online refill containers, consumers can get the containers delivered or they can order pick-up options with the groceries ready.

Finally, when addressing reusing packaging, we can include repurposing alternatives, in which a package is reused for different products or purposes [32].

In essence, these reusable packaging systems offer a potential solution for packaging waste reduction and more sustainable consumption. They encourage a shift away from single-use disposables, promoting the repeated use of containers. Whether through returning containers or refilling them, consumers play a key role in driving these eco-friendly practices. However, it is worth noting that current research on packaging-free systems often overlooks the analysis of consumer behaviour using online retail alternatives within these different types of systems. Analysing systems with online shopping alternatives can be relevant when analysing the barriers and motivations that users find in these services, finding a different way of interacting with collection points or bulk shops and at the same time can generate a different environmental impact. Within online alternatives, for example, there is a shift in the selection of the product from consumer to store employee, choosing for the consumer products with varied expiration dates. However, this shift can also present an opportunity to choose items with shorter expiration times, potentially altering food management practices to minimize waste. Although online shopping may reduce impulsive grocery shopping, finding a balance between convenience and consumer control over their food management should be a further explored area for optimizing environmental sustainability in packaging-free grocery shopping.

Within the packaging-free refill systems, we can also classify another type of system, which consists of refilling your containers at home with mobile refill stations. These systems are less common and are usually trucks or cargo bikes that bring bulk products from home to home for consumers to refill their own containers. LoveRefill [75] and TopUptruck [76] are some examples of those services implemented in London.

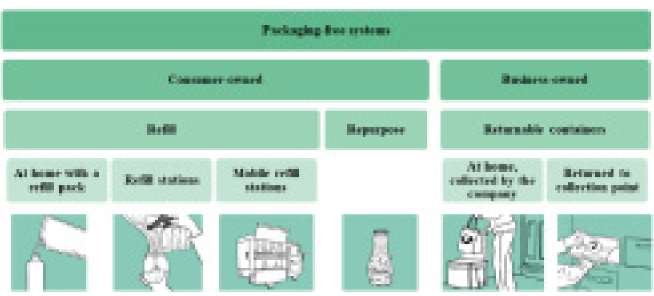

FIGURE 6 | Packaging-free systems categorization.

Figure 6 represents the types of packaging-free systems based on the classification by Greenwood et al. [39] including the last type of system mentioned.

Despite the ambiguity in the common naming of system types, Table 3 shows the selected literature that discusses the different types of systems, refill, and returnable systems. In this classification, repurposed packaging is not mentioned as in the articles it cannot be perceived the special mention of repurposed packaging when using them in packaging-free systems. This classification makes a clear distinction between refill services; however, when it comes to returnable services, they are frequently analysed alongside refill services as they also perform the process of filling a container, sometimes without highlighting the owner of the container. In Table 3, we can see the reference numbers of the articles in this classification where 18 articles discuss refill systems and 7 articles of those that are discussed in common with returnable services.

4.4 | Discussion About Drivers and Barriers Associated With Packaging-Free Systems

This section examines the drivers and motivations that encourage the use of packaging-free systems as well as the barriers and difficulties that prevent it. It explores the similarities and differences between these drivers and barriers, shedding light on the multiple faces of consumer behaviour in this context. Recognizing that not all drivers and barriers are generally applicable to the diverse systems covered in the previous section, it also looks at how they emerge differently across different packaging-free systems. At the same time, in this section, it is made special mentions to the consumer's willingness to pay and awareness, as are topics raised when discussing drivers and barriers in a high number of papers.

4.4.1 | Barriers for Reusable Packaging Systems

When it comes to environmentally friendly packaging systems and eco-conscious grocery practices, consumers face some obstacles that shape their decisions and behaviours. These barriers, which vary from economic considerations to social dynamics, create a complex scenario in which environmentally friendly options must be carefully considered.

The cost barrier is at the forefront of these challenges. Although reusable packaging systems and packaging-free grocery approaches

TABLE 3 | Classification of references and systems.

	Articles discussing refill systems	Articles discussing refill and returnable systems
No. of the reference	[18, 21, 36, 38, 43, 45, 46]	[14, 15, 18, 19, 24, 34, 39, 41, 44, 47, 49]
No. of articles	7	11

have long-term environmental benefits, the initial costs often discourage consumers from making the switch [42]. The perceived higher costs of reusable containers, as well as the possibility of higher prices in zero-waste grocery retail, may cause consumers to be hesitant towards accepting these alternatives [14].

Convenience, a key factor in modern consumer decisions, can also be a barrier. In packaging-free systems, consumers may find it inconvenient to bring their own containers or plan their shopping trips ahead of time. This contrasts with the convenience of pre-packaged goods provided by traditional retailers. In the research published by Jiang et al. [14], they point out that *70%* of consumers who answered their questionnaire used takeaway services because it is convenient and saves time. However, 57% of consumers would not spend time returning the containers to the collection bins as requires additional time.

Concerns about hygiene and proper cleaning procedures, as well as the difficulty of adapting to new practices such as buying items by weight, all add to the inconvenience. Consumers are now more aware of hygiene, especially since COVID-19, and packaging with scratches can create negative perceptions regarding its cleanliness [18]. Hygiene is a barrier that also affects retailers, as they must address not only space constraints but also strict hygiene requirements for collecting and storing reusable containers and dispensers [19]. This hygiene requirement at the same time can lead to unsustainable behaviours due to the impossibility of returning items to the dispenser, leading to abandoning the filled packaging at the supermarket as pointed out in the research by Miao et al. [18]

Choice and brand diversity also play a relevant role. When compared to the conventional market, packaging-free practices may present consumers with fewer options and brands. This restriction may have an impact on consumers who value a wide range of options and have specific brand preferences. Furthermore, the lack of product information in zero-waste grocery retail can make it difficult to make informed decisions, adding to the complexity [44]. According to the study by Louis et al. [44], consumers expect not only concrete information on the product and bulk system but also information on the cleaning of containers or the store management.

Another aspect of these barriers is the interactions in the retail environment. Whereas some customers appreciate the increased in-store staff interaction in zero-waste grocery retail, others find it to be overwhelming or time consuming [77]. It is difficult to balance the need for guidance and customer service with the desire for efficient and streamlined shopping experiences.

Social factors also play a role. Peer pressure and social norms can discourage consumers from adopting sustainable practices like using reusable containers. Some people may be hesitant to adopt eco-friendly alternatives because they are afraid of standing out or appearing different from the crowd [42].

There are also considered other technical barriers as failures with product dispensers, for example, can result in spillage and negative emotions among customers. The risk of refills being unavailable in reusable packaging systems and the potential complexity of product flow control contribute to the uncertainty that consumers may experience [18]. In the study by Miao et al. [18], participants pointed out that if technical problems are no quickly solved, they would feel frustrated and choose a pre-packed product, interrupting the habit of buying in reusable packaging.

The proper fit of packaging for different types of food introduces another layer of challenges. The unsuitability of certain container shapes and materials for foods with liquids and high temperatures in reusable takeaway containers can influence consumer choices and preferences. An example of this issue found in the literature was ordering Chinese food with liquids [14].

4.4.2 | Different Barriers Depending on the System

Although we are discussing reusable packaging in all cases, the ownership factor of each system changes the perception of the packaging. Notably, the issue of hygiene becomes more pressing in the context of returnable packaging. The fact that these containers have previously been used raises serious concerns about cleanliness and sanitation. This distinct challenge results from the commonality of returnable packaging, as consumers confront doubts about the quality of cleaning practices. Similarly, the presence of scratches, marks and wear from previous users adds to the discomfort associated with using containers that show visible signs of prior use [34].

Another barrier is found in services where the packaging is owned by the consumer and is not returnable. In these cases, when the consumer goes to the supermarket to buy the product, they need to plan ahead and make sure they bring the packaging with them [44]. Returnable packaging, on the other hand, calls for more thorough planning mainly when returning packaging but not when collecting the food.

Considering the context of online alternatives, it is essential to recognize that barriers can vary significantly from physical packaging-free systems. Online packaging-free alternatives are unlikely to encounter barriers like convenience and interaction with retailers. It becomes difficult to identify those differences because there are not many studies on online options in the literature on packaging-free systems.

4.4.3 | Drivers for Reusable Packaging Systems

Several factors influence consumer adoption of reusable packaging systems, highlighting the shifting attitudes towards environmental sustainability and consciousness. Consumers who value both aesthetics and space-saving efficiency will appreciate an appealing and functional design that includes minimalist, reusable and stackable containers [18]. Convenience and ease of use are important to consumers, who want packaging that protects product integrity during transportation and storage [18]. Consumers who recognize the overconsumption of plastic packaging and its negative impact [18] strongly value the environmental value of packaging-free alternatives.

Care for the environment and community drives consumers towards packaging-free grocery retail, reflecting a desire to minimize environmental damage and support local economies [77]. The possibility of bringing their own containers and buying products in measured quantities offers positive flexibility to some consumers [77]. Likewise, the availability of locally sourced items increases the appeal of packaging-free grocery stores to those who value fresh, high-quality produce [77]. Financial incentives play an important role in making reusable packaging more appealing [19], and some examples found in the literature are long-term cost savings, discounts or deposit systems.

Convenience is a frequent subject, with simple systems and return options influencing consumer acceptance of reusable packaging [19]. The desire to make environmentally conscious choices drives the shift from single-use to reusable options, which is aided by awareness of negative environmental consequences [42]. This transition is also shaped by social norms and positive emotions, emphasizing the importance of perceived control over behaviour [42].

Drivers such as reducing food waste, improving food quality, limiting waste and raising environmental awareness boost proximity and loyalty to grocery stores [44]. The adoption of reusable takeaway containers is driven by the versatility of these containers across different kinds of food types, and the hygienic dishwashing centres further facilitate their use in some cases [14]. To facilitate the return of the packaging to the dishwashing centres, there are alternatives such as allowing the consumer to make a previous appointment to get the container delivered instead of taking it themselves to the dishwashing centres [14].

Overall, the motivations for consumers to use reusable packaging include aesthetic appeal, convenience, environmental concerns, financial incentives and social norms, among other factors. According to most of the selected sources in the literature, environmental awareness is one of the main drivers for decision-making.

4.4.4 | Tensions Between Barriers and Drivers

When it comes to analysing the factors that encourage or prevent the adoption of packaging-free systems, certain factors show roles as both barriers and drivers.

Whereas some users consider packaging-free systems to be user-friendly and convenient for portion measuring [18], others find them difficult to adapt to. Concerns about the efficacy of packaging cleaning procedures can discourage some users, but for others, it may act as an incentive to avoid maintenance responsibilities and ensure hygiene [14].

Another conflict among the incentives and constraints is peer pressure and social norms for using eco-friendly alternatives, which can work as both a driver and a barrier for different people [42]. According to the results of Keller et al. [42], emphasizing social norms can be an effective tool for motivating change away from single use—in this case, single-use cups. And for those consumers who have already chosen an alternative, allowing them to integrate that alternative into their daily routines is more effective.

Another contradiction is the lack of trust in these services with which they feel unfamiliar, but other users see it positively for the reputation of the supermarket [36]. On the other hand, the cost of products within these services also acts as a barrier and an incentive, with some consumers emphasizing the initial investment and others focusing on long-term savings [14, 42].

This contradiction between barriers and drivers may be due to the generalized categorization of different consumer groups during the analysis of the results. Different consumer groups may find different alternatives in the systems drivers or barriers depending on their location, diet, income or household situation. It may also be a reason why some consumers are more likely to choose different types of packaging-free systems where they did not find certain barriers that they found in other systems, such as having preferences for returnable packaging to avoid the cleaning process, refilling to have the ownership of the container or online alternatives for its convenience.

4.4.5 | Willingness to Pay

The literature has extensively emphasized the impact of willingness to pay and consumers' awareness on their decision-making process when choosing food packaging. Consumers' economic view of food packaging-free systems is influenced by several factors, including both barriers and possible benefits. Higher initial costs [14, 42], perceived price disparities compared to conventional retailers [21], uncertainties regarding cost allocation for returning packaging [19] and upfront expenses for acquiring parent dispensers in refill systems [19] are all barriers to the adoption of packaging-free systems.

Despite these barriers, several studies provide insights into how customers perceive alternative packaging options in terms of cost. According to Griffith et al.'s research [53], bulk purchase is considered a financially advantageous option, potentially resulting in savings due to lower per-unit prices. Hossain's findings, on the other hand, show that income gaps might impair consumers' ability to obtain the cost savings associated with bulk purchases, emphasizing the role of economic inequalities [78]. According to the study, quantity discounts may compensate for product quality variations, thus leading to underestimating consumption inequality. Furthermore, the study found that middle- and upper-income households are less likely to face budget constraints when it comes to grocery spending.

Although the discussed studies do not explicitly focus on packaging-free systems, they provide valuable insights into consumer perceptions and economic aspects regarding packaging alternatives. One study on consumer willingness to pay for pro-environmental packages discovered that consumer familiarity with such packages can influence their willingness to pay premium alternatives [37]. This shows that consumers who have become used to purchasing eco-friendly packaging in their grocery stores may be more willing to shift to packaging-free systems.

Research findings also indicate that environmentally conscious consumers are more inclined to pay a premium for eco-friendly packaging alternatives, suggesting a potential economic motivation for adopting such systems [40].

4.4.6 | Consumer Awareness

According to many of the selected articles in the literature, awareness among consumers is essential for promoting eco-friendly packaging and reusable container usage. Those highlight the importance of consumer understanding in their packaging practices, also showing how awareness affects package perceptions, influences willingness to pay for eco-friendly solutions and fosters consumer loyalty to eco-friendly alternatives.

According to Chan [51], educated customers are more willing to choose eco-friendly packaging solutions. Similarly, Fernquist et al. [38] highlight the importance of consumer awareness and education in promoting more sustainable choices by emphasizing how consumer attitudes, perceived benefits and barriers are key to the adoption of reusable containers.

Another example is the study conducted by Hermann et al. [40], which looks at customers' willingness to pay for sustainable packaging, revealing that environmental concerns and perceived benefits impact preferences. This highlights how customer awareness and perception influence package decisions. Furthermore, Louis et al. [44] suggest that packaging-free products can improve consumers' perceived proximity to grocery stores and that increased consumer awareness influences loyalty and long-term shopping habits.

In relation to household waste, a study in the United Kingdom also highlights the importance of raising consumer awareness and providing education for promoting sustainable waste management practices, including the reduction of packaging waste [79], as well as the literature review by Heidbreder et al. [20] and the study by Kasza et al. [41], which emphasizes the value of awareness in driving behaviour change and promoting more sustainable packaging practices, particularly about plastic packaging.

Consumer awareness and willingness to prioritize environmental concerns in their purchasing decisions do not always translate into sustainable choices in the realm of packaging preferences [8]. Studies have revealed an intriguing disparity between consumers' attitudes and behaviours. Although a significant portion of consumers express concern for environmental issues, their primary driver in choosing packaging is often package functionality and product protection. Consumers also tend to place the responsibility for sustainable packaging on manufacturers, without being willing to pay additional costs themselves [8].

In conclusion, though awareness and willingness to purchase eco-friendly packaging are relevant steps presented in many of the selected articles in the literature, they alone may not be sufficient to drive eco-friendly packaging choices. Barriers like misconceptions, cost considerations and suspicions of greenwashing can hinder the translation of environmental concerns into action.

5 | Discussion and Conclusions

The food and the plastic waste from packaging emphasize the need to optimize food packaging taking into account environmental considerations. Packaging-free systems emerged as a potential solution to reduce single-use packaging and its associated environmental effects, aligning with government and international efforts to combat these challenges. However, this review has shown that the current state of research has several areas to explore further. It offered an exploration of the multifaceted aspects related to packaging-free systems. It provides insights into environmental sustainability considerations, the conceptual frameworks employed in the field and how to broaden it. Exploring the multiple types of packaging-free alternatives provides a better understanding of the differences between systems and how different barriers and drivers influence consumer choices revealing some contradictions within these systems. As we move forward, addressing these research agenda can lead to exploring in other directions the implementation of packaging-free alternatives considering other new aspects.

This research has a few limitations that need to be considered. First, the selection of the search engine is the main restriction. Although the chosen database, Scopus, is known for its reliability, solely relying on it to find academic articles and studies might have prevented the inclusion of potentially relevant research that is available in other databases. The selection of literature might have been influenced as a result of using Scopus. To address this limitation, a snowballing approach was used, uncovering additional relevant literature not necessarily inside the Scopus database.

The period for data collection, which was limited to studies published up until September 2023, is another restriction. This temporal limitation implies that the review does not consider any relevant studies or developments published after this date. As a result, the accuracy and timeliness of the review's conclusions might be impacted.

The last limitation of this study is the lack of standardized terminology across packaging-free systems, which could lead to ambiguity and confusion. When attempting to compare and classify different packaging systems, the lack of a common terminology presents a challenge as terminology can vary between studies. A common terminology needs to be developed to facilitate a more effective discussion in this field.

Reviewing the included articles, we can conclude that the topic is gaining traction, with the number of publications rising in recent years. The geographical spread of authors seems to be in line with where many of the papers on the intersection of packaging, users and sustainability originate.

Contrasting this study to the extent literature, it should be noted that previous papers either strongly focus on the environmental sustainability side, through LCAs (be it with too limited system boundaries), or strongly focus on user behaviour (which could be classified as social sustainability). Through the presented research agenda, a more holistic approach is argued for, integrating environmental assessment and user behaviour within the wider system boundaries of the household level.

Returning to the research questions, we may conclude that the selected literature shows that choices made by consumers have a significant impact on the environmentally sustainable performance of packaging-free systems, but the variation in actual consumer behaviour is ill-addressed. Then, the analysis presents the theoretical foundation used in the literature for understanding consumer interaction within packaging-free systems, with the two primary theories existing in the literature being the TPB and PT. Finally, the barriers and motivations found in the literature revealed financial considerations, inconvenience, hygiene concerns, restricted choice and social reasons, among others, presenting some tensions between certain barriers and drivers.

The main contribution of this research is the articulation of a research agenda aimed to outline key areas for future exploration. The identified research points are presented in the next section and offer novel perspectives including refining consumer household classification within consumer behaviour analysis, looking into consumer behaviour and environmental impact when purchasing groceries online, investigating the dynamics of packaging-free systems in combination with traditional shopping, considering the potential triangulation of environmental assessments with consumer behaviour, broadening the theoretical framework and looking into the study of different types of packaging-free systems. At the same time, this research offers an overview of current systems and extends the knowledge gathered in previous literature reviews in the area of reusable packaging.

Building upon these research directions, considering a switch to logistical systems based on refillable packaging could represent a significant shift in the current landscape. Evaluating its sustainability benefits requires analysing realistic future scenarios alongside current practices. This paper particularly emphasizes the importance of user behaviour in these refill scenarios to ensure their feasibility and practicality. It should be acknowledged that the landscape for single-use packaging is also likely to evolve, with possibilities such as further lightweighting of designs or modifications in testing standards like ISTA/ASTM/ISO. However, these potential developments in single-use packaging are beyond the current scope of this literature review.

As another way to offer an overview of this research, a SWOT analysis is presented as a tool for summarizing the understanding and future possibilities of packaging-free systems. This analysis involves the systems' strengths, weaknesses, opportunities and threats helping stakeholders identify significant opportunities for innovation, improvement and growth by visualizing the landscape of packaging-free designs. The SWOT analysis provides a picture of the current understanding but also prepares the path for future sustainable practices of packaging-free projects. In Table 4, we can see the result of this analysis.

6 | Research Agenda

Through this integrative literature review, several research areas that need further research and exploration have come to light. These areas allow us to outline a research agenda for future research that aims to bridge these explored areas together and get a broader understanding of the packaging-free alternatives. This agenda is composed of the following points:

1. Lack of consumer classification: The current collection of research frequently misses a full classification of households when examining their preferences for alternative packaging-free methods. Although age and gender categories have been widely used, there is a gap when considering other categorizations such as family structure, dietary preferences or geographic region. These unexplored classifications could provide useful insights into multiple consumer behaviours, revealing unique barriers and drivers specific to each group. This gap goes in line with Popovic et al.'s [28] research conclusions, which could clarify and justify some aspects of consumer adoption of packaging-free systems, thereby improving our understanding of the challenges and drivers involved in implementing them into daily routines.

2. Need for a holistic grocery analysis: The research area identified in the literature is the limit of a holistic analysis of shopping scenarios when looking at consumer grocery habits. Most studies examining packaging-free systems focus primarily on consumer behaviour and attitudes when using such systems. However, there is a huge study gap in terms of a more holistic exploration of consumer behaviour that considers the combination of packaging-free and traditional buying patterns. Realistic scenarios recognize that not all items at the moment have packaging-free alternatives and that implementing packaging-free alternatives in certain types of products is not necessarily the most environmentally sustainable decision. Exploring user behaviours within the context of these integrated shopping systems can provide a deeper comprehension of the issues that customers confront when implementing packaging-free options into their grocery shopping routines. This, consequently, can help shape the design of systems that allow for the smooth integration of packaging-free choices.

3. Triangulation of environmental assessment with consumer behaviours: When considering environmental analysis in the context of packaging, the emphasis has been on assessing the product's environmental impact through quantitative methods, frequently overlooking the factor of consumer behaviour. We can better determine whether packaging created to encourage environmentally sustainable behaviours is successfully achieving its intended goals by broadening our perspective to include the environmental quantitative assessments of different consumer decisions and practices and merging it with qualitative data usually collected concerning consumer behaviour.

4. Lack of exploration of online packaging-free services: Packaging-free digital systems offer a different consumer interaction, with possible benefits such as convenience and the elimination of technical barriers associated with in-store systems (e.g. packaging refilling or pre-preparation). The existing

TABLE 4 | Swot analysis of packaging-free services.

Strengths	Weaknesses
Possible reduction in waste, resource usage and emissions	Insufficient evidence on the sustainability of consumer behaviours in those services
Consumer loyalty after making the first packaging investment	Accessibility of the systems in cities and supermarkets
Diverse options like returnable and refillable containers	Higher initial costs and perceived price disparities
Promoting awareness of singles use and possible more sustainable practices	Perceived inconvenience and hygiene concerns
Flexibility in quantity and choices in refill stations	A lack of common terminology across systems leads to confusion
Aesthetic appeal and convenience for some consumer groups	Technical barriers in systems, such as dispenser failures
	Limited product choices and fewer options
	Limited potential for further innovation and marketing differentiation once a system is in place
Opportunities	**Threats**
Integrating packaging-free alternatives in current supermarkets as an alternative to packed products	Consumer resistance to change can lead to habits and preferences for conventional packaging
Exploration of new online models for ordering and delivering	Misconceptions and greenwashing, overcoming consumer doubts and misinformation
Partnerships with local businesses	Potential food-safety incidents that impact public perception of pack-free systems
Governments are supporting initiatives to promote reducing single-use products through policies and regulations	Social pressures and norms that may discourage consumers from adopting packaging-free options
Geographical expansion to reach new areas where these systems have not been implemented	
Increased electrification and advances in autonomous vehicles for delivery systems	
Increased demand for sustainable alternatives	

literature, however, frequently overlooks the user perspective on these online services. Studying consumer perceptions, preferences and barriers to online packaging-free alternatives can provide relevant insights into why some consumers prefer these options over in-store experiences, as well as shed light on the specific challenges and benefits associated with this shopping model. Moreover, reflecting on the food management practices and expiration dates when consumers do not select their groceries adds another layer of complexity to the analysis considering potential food losses challenges.

5. A broader application of the theoretical framework employed in the literature: Although the literature has predominantly used the TPB and PT to study consumer behaviours and perceptions in grocery habits and packaging-free systems, there is a clear possibility for adopting AT to broaden these perspectives. AT is another lens in the area of environmentally sustainable interventions that can be used to analyse consumer doings, enabling to finding of tensions and contradictions between the artefact and the user in a set context [74]. By incorporating AT, this research area can gain a broader perspective that extends beyond individual attitudes and social practices, looking into the complexity of how consumers engage in environmentally sustainable behaviours within complex systems [74]. Broadening the theoretical framework can lead to exploring the field in a more comprehensive examination of the dynamics in packaging-free systems contributing to a more solid understanding of sustainable grocery habits and creating effective intervention strategies.
6. Exploring repurpose packaging and mobile refill stations: Compared to packaging-free systems in-store, mobile refill stations have not been fully explored in the literature, which suggests that there is room for new insights and behaviour exploration. In the same way, repurposing packaging when shopping in packaging-free systems has not been strongly developed in the literature, and this could lead to different environmentally friendly implications when implementing packaging-free systems. Examining a wide range of packaging-free alternatives enables comparisons and a deeper comprehension of current and future grocery packaging-free trends.

The authors intend to focus on packaging-free systems in future research and to seek a deeper understanding of multiple of the points presented in this research agenda to gain a better comprehension of sustainable grocery habits and consumer preferences in this field.

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Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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