



Green marketing in supermarkets: Conventional and digitized marketing alternatives to reduce waste



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ABSTRACT

This article seeks to identify and analyze green marketing actions that can reduce food waste (FW) of short shelf life (SSL) products by retailers and to propose effective FW mitigation strategies. The article is based on a multiple case study of selected supermarkets that have enacted strategies that emphasize FW reduction. The findings unveil both conventional or digitized green marketing actions that should be implemented in the following sequence: product, place, price, and promotion. First, products need to be grouped into categories based on retailers' brand and suppliers' brand. This help to prevent future problems with the items that bear the supermarket's brand. This categorization is also helpful in defining the right place, price, and promotion for products with SSL. Besides, the pricing of items with SSL should be dynamic. Lastly, careful attention paid to where offers are placed inside stores also can also help to leverage sales, leading to reduced food waste.

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1. Introduction

Supermarkets and consumers are some of the last tiers in a food chain. Food waste (FW) at the final tiers of the food chain can be responsible for approximately 60% of climate problems (Beretta et al., 2017). Around 10% of FW occur in retail activities and another 20% are caused by consumers (Wharton et al., 2021). The FW in supermarkets happens when perishable products are not fully sold before the end of their shelf life or when products that are nearing (but have not reached) their expiry date are shunned by consumers, especially if they are not able to consume them before the actual date of expiration.

Stores are pressured to discard products near the expiration date to create shelf space to stock fresher ones. Fresh products generate sales at higher prices. However, items removed from a shelf may be disposed of by supermarkets or their suppliers. Past studies have considered FW resulting from the expiration date, but little is understood about dealing with products nearing (but not yet hit) the expiration date. To fill this gap, this study focuses only on processed foods close to the end of the shelf life but that has not yet passed that date. It is supposed that overcoming the disposal of the items near the expiration date might require different approaches and actions from those applied to products past their expiration date.

The FW in supermarkets may be related to the preferences of customers (Gollnhofer, 2017), who may reject certain products (Göbel et al., 2015; Tromp et al., 2016). Supermarkets also face problems associated with operational management or resupply of store chains. Operational management problems include the preferential focus on commercial issues (Aschemann-Witzel et al., 2017; de Hooge et al., 2018; Devin and Richards, 2018) in reducing the costs of redirecting waste (Naidoo and Gasparatos, 2018), or in the management of promotional campaigns

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(Filimonau and Gherbin, 2018; Teller et al., 2018). In terms of resupply, the literature indicates that FW may be related to the purchase of items beyond the stores' sales capacity (Arunraj and Ahrens, 2015; Broekmeulen and van Donselaar, 2019; Teller et al., 2018) or the use of retailers' power over suppliers (Eriksson et al., 2017; Ghosh and Eriksson, 2019), especially when there is substantial power asymmetry in favor of the former (Matanda et al., 2016). Suppliers can also cause retailer FW. Suppliers can pressure retailers to ensure that their products are very fresh and displayed in large quantities on the shelves (Bilska et al., 2018).

The reduction in FW can be possible by reviewing the size of packaging (Ubirajara et al., 2018) or by raising consumer awareness about the benefits of eco-packaging (Zeng et al., 2020). Consumer awareness can be based on social pressures or media advertisements (Septianto et al., 2020; Wakefield and Axon, 2020). These pressures can make use of messages that appeal to people's religiosity (Minton et al., 2020) or messages that raise consumers' self-esteem. Some messages induce consumers to choose less attractive products (Grewal et al., 2019). The development of marketing policies and strategies for products that have already passed the expiration date may also be necessary - if the food is still fit for human consumption (Li et al., 2020).

Despite the actions listed above, FW still occurs in the food chains' final tiers (Beretta et al., 2017; Wharton et al., 2021). Marketing can boost sales by inducing customers to buy products from sellers (Kim and Oh, 2020). A marketing strategy entails four distinct steps: segmentation & targeting (identification of the group or groups of consumers that an organization wishes to serve), and positioning and differentiation (competitive perception of the product or the brand by the desired customer target) (Kotler and Armstrong, 2014).

Green Marketing (GM) is "concerned with all marketing activities that have served to help cause environmental problems, and that may serve to provide a remedy for environmental problems" (Hennion and Kinneer, 1976, p. 1). Over the years, GM has evolved and structured itself into a broader concept: sustainable marketing. This concept combines ecological issues with customer satisfaction and associated developments (Fuller, 1999). Furthermore, GM addresses other related concepts such as "Eco Marketing" (see Dangelico and Vocalelli, 2017). GM can influence customer purchase intention (Ko et al., 2013; Li et al., 2017) since consumers are concerned with firms' role in society, and sustainable activities positively affect organizational performance, brand image and loyalty (Fonseca et al., 2016; Nagar, 2013). GM can also help to leverage the sustainability of supply chains (Sharma et al., 2010) and enhance organizations' performance and competitiveness (Mukonza and Swartz, 2020).

Product, Price, Place, and Promotion are the components of GM mix. This mix helps to implement the desired marketing strategy. It also helps to position products - once green consumers have been identified (Rex and Baumann, 2007). Therefore, the GM should be aligned with the overall organizational strategy. Such alignment seems to be mandatory since there can be different consumer segments, e.g., active green activists and passive green activists (Modi and Patel, 2013), that respond differently to the marketing mix. In summary, an organization's strategy and its consumer segmentation can be relevant to the success of its GM actions. However, the studies on GM have focused on communicating the ecological benefits of a product (Liao et al., 2020), consumer perceptions about "greenwashing" (Martínez et al., 2020), the drivers of customers' purchase intention (Goh and Balaji, 2016), and the use of communication through social networks (Gonzalez-Lafaysse and Lapassouse-Madrid, 2016).

The literature analysis indicates the need for the reduction of FW, and the need for selling items near the end of the expiry date.

Successful selling requires attention to marketing. Among the marketing tools, GM presents itself as an alternative aligned with sustainable actions. Thus, this study investigates the following research question:

RQ - "How can supermarkets use actions of the green marketing mix to reduce food waste?"

The possibility of using GM to reduce FW can have a positive impact on the environment. This impact includes the reduction in the indiscriminate use of scarce natural resources (da Costa Maynard et al., 2020) and hunger (Fonseca et al., 2020), and to meet the UN's sustainable development goals (SDGs) (B. F. Giannetti et al., 2020; Biagio F. Giannetti et al., 2020; Patala et al., 2020). The research question will be addressed through a multiple case study in six supermarket chains operating in Brazil.

This article contributes value by highlighting that proactive selling for the different companies in a supermarket chain can improve GM actions (Dangelico and Vocalelli, 2017), reduce FW (Filimonau and Gherbin, 2018), and still generate some revenue from SSL items available in supermarkets or manufacturer's inventory (Dangelico and Vocalelli, 2017). This study also unveils the need to review strategies (Satyro et al., 2017) or practices to leverage sustainability.

The remainder of this article is structured as follows. The next section describes the theoretical foundations of the study in terms of GM's mix (Product, Price, Place, and Promotion). The research method is then described concerning framing, explaining, and analyzing information related to actual practices and mechanisms. The findings are structured in terms of how supermarkets can use GM to reduce food waste. Finally, the study's theoretical and managerial implications are considered, along with limitations and suggestions for future research.

2. Literature review

2.1. Product

GM in food retail demands attention to the products displayed to avoid customer rejection of these items. This rejection may be related to consumers' preference for foods with perfect shape and appearance (Aschemann-Witzel et al., 2015; de Moraes et al., 2020; Loebnitz et al., 2015), products with a high degree of freshness (Principato et al., 2015; Stangherlin and de Barcellos, 2018), items that have a long shelf life (Cicatiello et al., 2017; Teller et al., 2018; Tromp et al., 2016), and agricultural products from outside the station (Mena et al., 2011).

Retail product management also requires attention to the demand for these items to mitigate financial and environmental problems resulting from reduction in sales (Buisman et al., 2019; Lu et al., 2020). Analysis of this scenario suggests that product management can reduce FW and also expand retailer's earnings (Palacios-Argüello et al., 2020). The literature also presents alternatives for the destination of products near the end of validity that retailers were unable to sell. An example is the use of these products in the manufacture of other fast-selling products. For example, a ham package near the end of its shelf life can be used to make stuffed bread. In addition to the economic benefits, alternatives such as the one described can improve the retailer's image before its customers (Cicatiello et al., 2017; Coderoni and Perito, 2020). Product management also encompasses team engagement. To this end, the retailer can grant bonuses linked to reductions in the FW. Therefore, it is necessary to collect data on FW reductions (Coderoni and Perito, 2020; Teller et al., 2018).

The literature also recommends that retailers interact with their suppliers to improve product packaging (Ubirajara et al., 2018). This improvement can reduce the costs of materials used in packaging

or the costs of transporting the product, thereby mitigating the impacts of eventual reverse logistics (Alamsyah et al., 2020a, 2021; Alhamdi, 2020; Coderoni and Perito, 2020; Khan et al., 2020). Table 1 summarizes the studies on the causes and mitigators of FW related to the “Product”.

Product-related studies have focused on the causes and mitigators of FW. Other studies have investigated actions related to the Product in various business sectors. A summary of these studies is presented in Appendix B.

2.2. Price

Retail FW can be reduced by offering lower prices (Amoako et al., 2020; Buisman et al., 2019; Filimonau and Gherbin, 2018). These price reductions may be restricted to products that are approaching the expiration date (Aschemann-Witzel et al., 2017; Cicatiello et al., 2017; Symmank et al., 2018; Vittuari et al., 2020) or products with low freshness (Aschemann-Witzel et al., 2015; Symmank et al., 2018). The GM pricing must also consider the quantity in stock and the items’ remaining shelf file. (Kronrod et al., 2012; Ranjan and Jha, 2019; Vittuari et al., 2020). Also, it is necessary to consider the appearance and functionality of the product, as well as the costs associated with incorporating higher quality materials, production in compliance with environmental requirements, and the impacts of taxation (Peattie and Crane, 2005; Sana, 2020; Yue et al., 2020). The setting of prices in the GM must also consider aspects such as people, the planet, and profit (Cortes and Moretti, 2013; Nguyen et al., 2019; Pícha and Navrátil, 2019), referring to the interests of the triad of stakeholders including society, environment, and firm (Borchardt et al., 2019; Ndubisi et al., 2020). According to Ndubisi et al. (2020), managing the triple bottom line effectively ends in a positive-sum game (+, + & +) for the triad (of stakeholders). Further, Borchardt et al., (2019) underscored the need for enabling value cocreation and delivery across all stakeholders within the network.

However, GM pricing is not just about price reductions. Some consumers may be willing to pay a higher price for differentiated items (Pham et al., 2019). This provision opens space for the analysis of the “Premium price”. This is an additional amount that the consumer accepts to pay for a green product (Canavari and Coderoni, 2019; Drozdenko et al., 2011; Galati et al., 2019; Peattie, 2001). Studies show that the willingness to pay more for green products is increasing in developed countries (Essoussi and Linton, 2010; European Commission, 2014; Shao and Ünal, 2019). The definition of this additional amount needs to consider the benefits related to the product (Freestone and McGoldrick, 2008; Grimmer and Bingham, 2013). Among these benefits are charitable actions (Elfenbein and McManus, 2010), the product’s ethical differentials (Freestone and McGoldrick, 2008; Kushwah et al., 2019; Lago et al., 2020), or the benefits for future generations or the environment (Chan et al., 2012; Chen et al., 2019; Nguyen et al., 2019). In contrast,

premium pricing also has its limits. These limits are related to the perception of the operational risk of remanufactured, recycled, or reused products. Such perceptions negatively affect the willingness to pay a premium price (Bittar, 2018; Michaud and Llerena, 2011).

As noted, GM recognizes that prices can be reduced or increased by sellers. This finding opens space for analyzing the role of retail managers. Some supermarket managers usually set weekly and monthly FW goals (Ranjan and Jha, 2019). The definition of these goals needs to consider the economic motivation of consumers who frequent the store (de Hooge et al., 2018). As found, some consumers demand discounts and prizes (Zhou, 2018). These consumers would accept lower grade items (due to the lower family income). It should be noted that the sale of lower grade products at reduced prices can benefit a portion of the population, including consumers with low purchasing power. The sale of items suitable for consumption but not top-grade allows these people to have access to food. This access contributes simultaneously to social and environmental causes (Aschemann-Witzel et al., 2017). Table 2 presents an analysis of the focus of the other studies on the “Price” dimension of the GM.

Price-related studies have investigated the conditions for reducing or increasing the price of perishable items. Attention to these indicators can reduce FW. Other studies have investigated actions related to price in various business sectors. A summary of these studies is presented in Appendix B.

2.3. Place

The Place dimension of GM includes analyzing the stores’ geographic location where the product will be sold. Attention to these places can reduce FW (Mishra and Sharma, 2012). The analysis of “Green Place” involves the entire distribution of green products. This analysis starts at the point of production and goes to the point of consumption of the product. Also, there is a need to define a store location that is convenient for the target audience, because of the high level of the perishability of these products (Matanda et al., 2016). This location should also help improve the supply chain (Davari and Strutton, 2012). The location of a retail outlet should also contribute to the generation of jobs and the development of the local community and consider partners who are involved in the reuse or disposal of waste products (Madeira, 2019).

The definitions of “where” and “how” to make green products available inside the stores also demand attention. Attention to stores’ interior allows the retailer to influence consumers’ purchase intentions (Guyader et al., 2017). Ensuring the availability and visibility of the green products allow consumers to perceive its availability and increase their awareness, interest, and identification with these products (Kumar, 2014). Thus, products must be displayed in places where consumers can easily see and buy them (Mishra and Sharma, 2012). The internal location may also consider

Table 1
Causes and Mitigators of FW related to the Product.

Coding	Summary	References
Causes of FW - Products	Customers demand products with perfect shape and appearance, with a high degree of freshness or long shelf life.	(Aschemann-Witzel et al., 2015; Cicatiello et al., 2017; de Moraes et al., 2020; Evans, 2011; Gjerris and Gaiani, 2013; Gokarn and Kuthambalayan, 2017; Lago et al., 2020; Loebnitz et al., 2015; Mena et al., 2011; Principato et al., 2015; Stangherlin and de Barcellos, 2018; Teller et al., 2018; Tromp et al., 2016).
FW Mitigators - Products	Alignment between supply and demand for products. Use of items near the end of validity in the production of other items for quick sale (e.g. use of hams in stuffed bread). Bonus for employees who reduce the FW. Interaction between retailers and suppliers to improve packaging.	(Buisman et al., 2019; Lu et al., 2020; Palacios-Argüello et al., 2020) (Cicatiello et al., 2017; Coderoni and Perito, 2020). (Coderoni and Perito, 2020; Teller et al., 2018). (Alamsyah et al., 2020b, 2021; Coderoni and Perito, 2020; Khan et al., 2020; Polonsky and Rosenberger, 2001).

Table 2
Focus of studies on the Price dimension.

Coding	Summary	References
Price reductions	Applicable to products approaching the expiration date or with low freshness.	(Aschemann-Witzel et al., 2015, 2017; Cicatiello et al., 2017; Peattie and Crane, 2005; Raak et al., 2017; Sana, 2020; Symmank et al., 2018; Vittuari et al., 2020; Yue et al., 2020).
Premium Price	Demanded by consumers with less purchasing power.	(Aschemann-Witzel et al., 2017; de Hooge et al., 2018; Zhou, 2018).
	Demand analysis of quantities in stock and/or the remaining shelf life.	(Kronrod et al., 2012; Ranjan and Jha, 2019; Vittuari et al., 2020).
	Applicable to consumers willing to pay a higher price for differentiated products.	(Canavari and Coderoni, 2019; Drozdenko et al., 2011; Essoussi and Linton, 2010; European Commission, 2014; Galati et al., 2019; Peattie, 2001; Pham et al., 2019; Shao and Ünal, 2019).
	The increment is more readily accepted if the seller carries out charitable actions or actions to benefit future generations.	(Chan et al., 2012; Chang et al., 2019; Elfenbein and McManus, 2010; Freestone and McGoldrick, 2008; Kushwah et al., 2019; Lago et al., 2020; T. T. M. Nguyen et al., 2019).
	The increments face problems if the product presents risks to the consumer.	(Bittar, 2018; Michaud and Llerena, 2011).

the store’s ecological appeal, the existence of exclusive structures designed for green products, ecologically correct tones, and colors. Attention to these elements contributes to increasing environmentally conscious consumers (Nguyen et al., 2019; Paço et al., 2019). Table 3 presents an analysis of the other studies’ focus on the “Place” dimension of the GM.

A line of studies related to the Place focused on the point of sale (geographic location). The second line of studies analyzed the product’s location inside the store. Other studies have investigated actions related to Place in various business sectors. A summary of these studies is presented in Appendix B.

2.4. Promotion

Promotion through advertising is one of the drivers of environmental businesses (Papadas and Avlonitis, 2015). Studies indicate that advertising can positively influence consumers (Alamsyah et al., 2020a, 2020c; Paço et al., 2019) by helping to improve the environmental awareness of people (Alamsyah et al., 2020b) or inducing these consumers to adopt a more sustainable lifestyle (Kemper and Ballantine, 2019). Analysis of advertising actions points to an increase in the number of green advertisements over time (Kemper and Ballantine, 2019; Leonidou, 2011). This information presentation can make use of signs, white papers, websites, videos, and presentations. Combining these resources helps to keep people, the planet, and profits in focus (Chang et al., 2019; Cortés and Moretti, 2013). Labeling is another advertising action indicated in the literature. Good labeling can increase the intention to purchase environmentally safe products (Liao et al., 2020; Liu and Liu, 2020; Prihandono et al., 2020; Purohit, 2012).

The messages conveyed in advertising can influence consumers (Zubair et al., 2020). A good message demands attention to the content, format, and style. Concerning content, messages can highlight product performance or the company’s environmental history (Leonidou, 2011; Testa et al., 2011, 2015). The contents of the messages also need to be perceived as reliable by the customers. To that end, messages must be honest, transparent, and credible (Papadas

Table 3
Focus of studies on the place dimension.

Coding	Summary	References
Outdoor location	It considers the location of the product’s origin and consumption points and the target audience’s access. It aims to contribute to the generation of employment and the development of the local community and consider the partners that deal with the destination of the waste.	Davari and Strutton (2012). Madeira (2019).
Indoor location	Products must be displayed in places where consumers can easily see and buy them.	(Guyader et al., 2017; Kumar, 2014; Mishra and Sharma, 2012).

and Avlonitis, 2015), and provide accurate information about the sustainability of the supply chain (Saari et al., 2020). The format of the messages is another critical factor. Studies indicate that advertising messages must be clear (Borin et al., 2011; Prane, 2012), easy to remember, and personalized for the target audience (Bickart and Ruth, 2012). These messages should also generate an emotional commitment of the target audience (Hartmann et al., 2013). The style of the message is also essential. Assertive messages are more effective in raising customers’ awareness of the importance of the problems addressed (Fowler and Close, 2012; Kronrod et al., 2012).

Also, companies need to evaluate their ads’ effectiveness (Smith, Sergio; Molina-Murillo, 2005). The lack of consistency between actions and messages can compromise the effectiveness of advertising. Studies indicate that sales can be negatively affected if consumers notice an inconsistency in the message (Rademaker et al., 2015; Raška, 2015). Another study indicates that “greenwashing” negatively affects the company’s business (Raška, 2015). Damage to the company’s image can negatively affect customers’ purchase intentions (Ahmad and Zhang, 2020; Chen et al., 2020). Such a reduction in purchase intention can be attributed to damage to the consumer’s feeling of happiness (Szabo and Webster, 2020). This information analysis suggests that advertising should only be used when the company does not present environmental problems (Nyilasy et al., 2012). Table 4 presents an analysis of the focus of studies on the “Promotion” dimension of the GM.

The reviewed studies’ analysis indicates that the literature presents contributions related to the definition of the objectives of advertising, its alternatives for delivery, and the requirements of the messages aimed at reducing FW. Other studies have investigated actions related to Promotion in various business sectors. A summary of these studies is presented in Appendix B.

2.5. Research framework

For this work, GM actions are understood using its components, the mix of marketing, namely product, price, promotion, and location. The research framework of this study is shown in Fig. 1.

Table 4
Focus of studies on the Promotion dimension.

Coding	Summary	References
Promotion objectives	Positively influence consumers or improve their ecological awareness.	(Alamsyah et al., 2020a, 2020b, 2021; Kemper and Ballantine, 2019; Paço et al., 2019).
Promotion actions	Signs, white papers, websites, videos, and presentations. Differentiated labeling of sustainable products.	(Chang et al., 2019; Côrtes and Moretti, 2013). (Liao et al., 2020; Liu and Liu, 2020; Prihandono et al., 2020; Purohit, 2012).
Message requirements	Highlight product performance or the company's environmental history. Present honesty and transparency. Present clarity, be easy to understand and remember, or personalized for the target audience. Present assertiveness. Present consistency between actions and messages.	(Leonidou, 2011; Testa et al. 2011, 2015). (Papadas and Avlonitis, 2015; Saari et al., 2020). (Bickart and Ruth, 2012; Borin et al., 2011). (Fowler and Close, 2012; Kronrod et al., 2012). (Nyilasy et al., 2012; Rademaker et al., 2015; Raška, 2015).

3. Methodology

3.1. Research design

This study takes a qualitative approach, given the focus of the research on how supermarkets can use GM mix to reduce FW. The multiple case study methodology is convincing and robust because it allows individual case analysis and in-depth scrutiny between cases (Eisenhardt, 1989; Patton, 2002). A sample of supermarkets was selected for the study, considering that large quantities of food are lost at this point in a supply chain (Beretta et al., 2017).

A systematic literature search was carried out to identify relevant studies on the topic. Systematic reviews can increase methodological rigor and highlight future research opportunities (Arksey and O'Malley, 2005; Briner and Denyer, 2012). First, the article searches criteria identified relevant studies based on the research question to find evidence on why food waste occurs in supermarkets. The searches for articles were limited to peer-reviewed journals published in English. The Web of Science and Scopus were used as databases for research. Keywords used for searches included "food waste" and "green marketing", as well as "food waste", "retail", and "supermarket" (details see Appendix A). The second search criterion included the keywords "Green Marketing", "Product", "Price", "Place", and "Promotion". The purpose of this research was to identify which research gaps and which industrial sectors researchers have been focusing on through GM (details see Appendix B). The set of search criteria utilized the snowball technique, verifying the articles found by searching databases.

We encoded the articles gathered by dimensions using the ATLAS TI software for qualitative data analysis in the next step. The codes were organized around price and product promotions to reduce short-term food waste (SSL). Finally, we synthesized the evidence collected (Arksey and O'Malley, 2005) in a table that lists food waste in retail and green marketing actions that impact reducing food waste, especially in supermarkets.

Based on the literature review described above, a coding approach was chosen for the qualitative text analysis stage

(Saldaña, 2015), based on substantiated theory (Corbin and Strauss, 1990). The coding procedure described in the literature used the existing ATLAS TI software, which was used to find out causes of food waste as well as its mitigators. This analysis unveiled that the supply chain and the retailing literature present causes of FW related to the product, as well as mitigators related to Product, Price, Place, and Promotion.

3.2. Data collection

The activities associated with data collection for this study began with defining the profile of the companies to be investigated. We used purposeful stratified sampling (Palinkas et al., 2015; Patton, 1990) to select six supermarkets that carry out actions that emphasize the reduction of FW. The number of supermarkets is within the appropriate range indicated in the literature, 6 to 10 (Yin, 2009). Table 5 presents prominent aspects of the supermarkets investigated.

On this basis, the selected supermarkets were asked to indicate those responsible within their organization for processes focused on reducing food waste from stores. All nominees agreed to participate in the survey. These respondents are employees who hold decision-making power over waste mitigation actions. The interviewees' profile is shown in Table 6.

For the data collection process, questions were created based on the literature review above. These questions focused on the actions that emphasize FW reduction. The questions asked to the respondents in the supermarkets are in Appendix C.

All interviews were conducted between January 2020 and March 2020. The interviews began with a pilot study involving supermarkets 1 and 2. These pilot studies were aimed to test and validate the research instruments. All the companies were subsequently investigated in full. The data collection involved semi-structured interviews with participants, in addition to document analysis. The meetings were scheduled personally by the authors. The authors conducted the interviews and recorded all information reported since the audio recording was not authorized. These records were later transferred to Microsoft Word for text editing. The interviews were considered completed when two conditions were met: all research protocols had been applied, and no new evidence was emerging from the interviewees (Corbin and Strauss, 2007). After this, the documents were submitted and coded using ATLAS TI software.

At the end of each interview, the participants were asked if they could provide any relevant documents relating to the topics discussed. These documents represent public and management reports from the companies investigated. Supermarkets 1, 2, and 3 had internal quantitative reports on sales and food waste, and supermarkets 4, 5, and 6 provided internal quantitative reports on food waste. Results from publicly available electronic documents

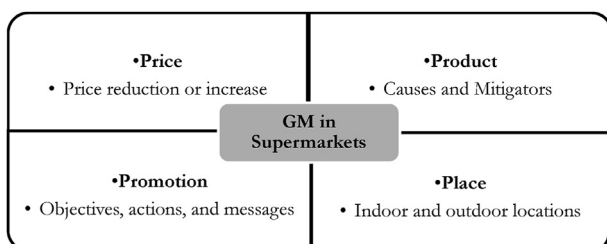


Fig. 1. Research framework.

Table 5
Profile of supermarkets surveyed.

Supermarket	Region of operation	Nature of Ownership	Revenue (USD)	Food Retail Ranking
Supermarket 1	Brazil	Brazil	0.15 billion	55°
Supermarket 2	Brazil	Brazil	0.15 billion	59°
Supermarket 3	South America	Netherlands	1.90 billion	2°
Supermarket 4	Brazil	Brazil	0.29 billion	10°
Supermarket 5	Global	Brazil	7.00 billion	25°
Supermarket 6	Brazil	USA	0.45 billion	1°

Table 6
Profile of supermarket respondents.

Supermarket	Position	Experience in Position	Duration
Supermarket 1	Regional Manager	35 years	75 min
	Store Manager	23 years	45 min
Supermarket 2	Regional Manager	30 years	70 min
	Store Manager	18 years	60 min
Supermarket 3	Regional Manager	10 years	78 min
	Store Manager	20 years	78 min
	Store Manager	17 years	67 min
Supermarket 4	Regional Manager	10 years	85 min
	Store Manager	22 years	45 min
	Store Manager	19 years	75 min
Supermarket 5	Store Manager	21 years	59 min
	Regional Manager	30 years	70 min
	Store Manager	17 years	51 min
Supermarket 6	Store Manager	19 years	47 min
	Regional Manager	10 years	88 min
	Store Manager	19 years	59 min

identified on the Internet were also considered, allowing for triangulation between interviews and documents.

3.3. Trustworthiness, credibility, and reliability

Experts were used to review this study to replicate our results (Eisenhardt, 1989). A set of usage restrictions was used to ensure credibility and proper use. These criteria cover the extent to which the company fits into the study's objectives, understanding, generalization, control (Corbin and Strauss, 2007), transferability, reliability, and integrity (Corbin and Strauss, 2007; Hirschman, 1986; Wallendorf and Belk, 1989). Adjustments were made in the selection of companies. The interviewees showed understanding, while generalization was achieved by selecting professionals who work in companies of similar size. The validation of results and transferability of participants with integrated control refers to selecting professionals who work in companies that have developed FW mitigation actions in the supermarket chain. Reliability was addressed, with a focus on the benefits of these actions in reducing food waste. Confirmability is related to the individual analysis of each case. This analysis was carried out over three days, including all the evidence on the performance of the investigated companies. After analyzing each case individually, a cross-analysis of cases was performed using the ATLAS TI software. The aims of these analyses were to identify similarities and differences between the interviewees, and the reasons for these similarities/differences. In both analyses, the results were coded to compare and contrast them with the existing literature. This codification was based on grounded theory (Corbin and Strauss, 1990; Strauss and Corbin, 1998). Also, the results were analyzed and interpreted based on the guidelines for developing and implementing the green marketing mix presented by (Dangelico and Vocalelli, 2017). Customer segmentation was also considered, with the definition of the characteristics of the group or group of customers to be served, to better understand the purchasing behavior of the consumers.

Understanding the client's behavior is an important aspect to be considered in the elaboration of marketing strategies, and in establishing Green marketing mix actions (Dangelico and Vocalelli, 2017). The revised documents were then presented to the interviewees. Aspects of integrity include anonymity and ethical standards.

4. Findings

Our data analysis focused on exploring how supermarkets can reduce food waste through GM strategies. Our interviews and document analysis results indicate that despite the supermarkets' efforts to better manage their purchases and operations, FW problems are still significant. More details on these results are presented below.

4.1. Product

GM product-related actions require attention to the SSL items maintained in the retailer's inventory. These items are divided into two groups: the manufacturer's brand and the retailer's brand. Branded products that are near the end of their shelf life can be sold through different channels without the possibility of causing damage to the retailer's image. This possibility dramatically increases the number of redirection alternatives for these items (details in the Place dimension). In contrast, SSL products near the end of the validity date can only be sold in stores or wholesale owned by the supermarket chain. This limitation aims to avoid problems for the supermarket chain. Among these problems, is the possibility of damage to consumers' health. This condition limits the reduction in the FW of branded supermarket items. Despite the negative impacts of the FW, the interviewees stated that the damage to brand image would be greater than the benefits resulting from a reduction in the FW. In the interviewees' opinion, the reduction of the retailer's branded items' FW is limited to a few points of sale. It is also necessary to focus on mitigation actions on the Place, Price, and Promotion actions. Below are some relevant testimonials.

SSL products with the manufacturers' brand do not concern us. Any problem in the after-sales will be the manufacturer's (Store Manager at the Supermarket 1).

To preserve the image of the store chain, we need to be very careful with the products that carry the supermarket's brand (Regional Manager at the Supermarket 4).

The analysis of the possibilities and limitations of directing the products to other places is presented below.

4.2. Place

Place-level actions focus on products that bear the manufacturer's brand and on products that bear the retailer's brand. Also, it is necessary to analyze the internal location in stores. Details to follow.

Products bearing the manufacturers' brand with SSL can have multiple destinations. For example, supermarkets can sell SSL items

at the store where they are stored (this requires a price review – see details on the analysis of actions related to Price). Another option is to sell SSL items at the wholesale chain or at other chain stores that serve customers with less purchasing power. A final alternative is to sell these items to other, smaller merchants. These smaller merchants are known as “discount hunters” and have their stores in regions inhabited by people with less purchasing power. As it turns out, consumers with less purchasing power are eager to purchase items with SSL because any penny saved can be used to buy other food. Furthermore, close to the expiry date is not a serious problem for consumers with less purchasing power in emerging countries. These consumers consume SSL items quickly (often on the same day of purchase). The supermarket chain can also sell products under the manufacturer’s brand to bars and restaurants, as these establishments can use SSL items in a few days.

As our network has a wholesale, we sell part of the SSL with the manufacturer’s brand to “discount hunters” (Store Manager at the Supermarket 5).

SSL products are very well accepted in bars and restaurants, as consumption is fast (almost immediately) (Store Manager at the Supermarket 3).

Products with the retailer’s brand have fewer options in terms of place (considering the possibility of damage to the retailer’s brand). Thus, the FW of products with the retailer’s brand is limited to bars, restaurants, and event houses (since such customers consume the SSL item quickly). Selling to these small traders needs to be proactive. Success in proactive sales requires structuring a specific sales team for this activity (details in the Promotion dimension). Supermarket E archive data indicates that the sale of SSL items with the retailer’s brand on the retailer’s channels can guarantee gains up to 20%, higher than those obtained from the sale of items from the manufacturer’s branded items.

We reduced the FW by sending frozen products with SSL and private labels to other business units in the chain (Regional Manager at the Supermarket 5).

Our proactive sales channel leveraged the sale of perishables with SSL (Regional Manager at the Supermarket 4).

In addition to the external locations (External Place), GM needs to consider the internal location (Internal Place) of perishable items. The findings reveal a kind of mantra in retail, namely: retail is detail. This mantra demands continuous attention to the path taken by different consumers of perishable products inside the store. The end of the aisle (corners of the corridor) constitutes places where there is more significant traffic of customers. Exposing products with SSL in such places increases the chance of a promotion, thus leveraging sales and reducing FW. Observations inside the stores indicate that the same product may have a different shelf-life items (long and short). So, attention to the position in the shelf is mandatory to reduce FW. Items with longer shelf-life should be placed in the bottom part of the shelf, while SSL items should be exposed in the middle of the shelf. The surroundings of the exhibition site should also be analyzed in detail. Internal documents about internal location indicate that perishables should be exposed close to colder environments. Such a location can increase the durability of the products. This increase in durability leverages in-store sales, helping to reduce FW. These benefits are related to the extension of the time that an item remains attractive to the consumer.

Exposing products near environments with lower temperatures expands the image of quality perceived by the consumer (Regional Manager at the Supermarket 2).

4.3. Price

The price reduction of products with SSL is the best alternative to leverage sales. However, reductions can compromise a

supermarket’s chain performance. The big challenge is to reduce the FW through sales prices that also mitigate the seller’s losses. However, not all price reductions produce losses for the retailer. In some cases, these reductions can leverage the sales and profits of other non-perishable items for sale at the supermarket (or on its partners). Success in this approach demands attention to the type of SSL product sold. Regardless of the brand of the product with SSL (own or manufacturer’s), the discount amount is tied to the remaining life and sales potential of the item.

Products with the manufacturer’s brand are sold at discounts. In the wholesale of the supermarket network, these discounts can reach 70% of the original price. These items are purchased by smaller retailers known as “discount hunters”. This type of merchant serves consumers with lower purchasing power. This is a win-win relationship that develops between small retailers and supermarkets. On the one hand, supermarkets can sell part of their SSL items (thus reducing the FW and generating revenue from them). On the other hand, the hunter buys items at lower prices. These lower prices are then transferred to the hunter’s customers. Often this is done with a low-profit margin. Such transfers at lower margins aim to attract customers with lower purchasing power to the hunters’ shops. In an emerging country, actions like this can profit small retailers (given many people with lower purchasing power). This profit will be generated by selling other products to these consumers.

Discount hunters buy many items with SSL. For this type of merchant, a low-price SSL item is very important. (Store Manager at the Supermarket 1).

Discount hunters fill their shops when they pass on products with SSL at reduced prices (Store Manager at the Supermarket 2).

Products with the retailer’s brand are also sold at massive discounts (up to 50% off the original price). However, these discounts are smaller than the ones offered in wholesale. File data and interviews indicate that these discounts can be as much as 50% off wholesale at the supermarket chain. Other progressive discounts are offered in the chain’s stores or other retailers’ sales channels (see Promotion). Bars, restaurants, and event venues are the big buyers of the items with the manufacturer’s brand.

Markdown policy depends on the type of shop and varies between 3 markdowns of 10, 15, and 50% of the original sale value. Our business sells to bars and restaurants around the supermarket (Store Manager at the Supermarket 3).

The discount is related to the remaining shelf life of each branded supermarket product. Larger discounts are offered by the alternative channels or wholesale of the network (Regional Manager at the Supermarket 6).

The price reduction demands actions that minimize the financial losses of supermarkets. Some actions are based on sharing losses with suppliers. Data obtained in interviews and documents provided revealed formal contracts between suppliers and supermarkets. These contracts oblige suppliers to lower the prices of items with SSL. These discounts are offered by the manufacturer considering the final validity of the product. Supermarkets and wholesalers use these discounts to leverage the sale of SSL items. To slightly increase the gains from SSL price reduction by the supplier, supermarkets delegate authority to store managers. These managers can change the price throughout the day. As found, such a change slightly increases the supermarket’s earnings when selling SSL.

The contract obliges the supplier to reduce the price of the item with SSL held in our inventory (Store Manager at the Supermarket 1).

The unit manager has the autonomy to lower the price of products with SSL. This reduction according to store demand helps to reduce FW (Store Manager at the Supermarket 5).

4.4. Promotion

The price reduction needs to be accompanied by promotional actions. Among those interviewed, a promotion should help reduce the financial losses that supermarkets and manufacturers would have with FW. Among the promotional actions are testing campaigns and proactive sales. The testing actions supported by visual advertisements inside the shops enhance the sales of SSL products. Shop managers have the autonomy to plan and execute such promotional actions. Respondents reinforced the importance of this autonomy, as well as the partnership with suppliers. Proactive sales require a specific team for SSL items. These teams must be in the wholesale or retail shops (this includes small and large shops). In the case of small shops, the manager is responsible for proactive sales. The vendors' mission is to prospect and close sales to discount hunters (small shops, bars, restaurants, and event promoters). As ascertained, proactive sales teams make informal use of social media to leverage sales to small retailers.

A proactive sales team not only benefits the retailer. Manufacturers often partner with retailers to sell their products with SSL. The manufacturer's goal is to leverage the knowledge that these small teams have about the local market. Archive data from one of the supermarkets investigated reveals the importance of proactive selling to reduce FW. While traditional wholesale sales accounted for 83% of total sales (this includes long and short shelf-life products), proactive sales accounted for 17% of items sold (mainly SSL enabled products).

Manufacturers use us to reduce their product stocks with SSL (Regional Manager at the Supermarket 5).

To avoid FW inside a shop, you need to have a proactive sales team (Regional Manager at the Supermarket 3).

An analysis of the findings shows that it is necessary to analyze SSL products' implications on the retail chain image (Product). This analysis requires attention to the brand of products with SSL. Consideration of product brands allows us to define which points of sale SSL products can be redirected to (Local). This redirection considers the profile of the customers of these stores. The customer profile analysis guides the determination of prices to be offered in each store and the promotional actions to be carried out. Fig. 2 illustrates the identified sequence.

Despite the improvements in the management of purchases and operations realized by the supermarkets investigated, FW's problem is still significant. So, the sale of SSL products is still mandatory. Success in selling these items requires simultaneous attention to more than one dimension of the GM. Also, a sequence of approaches to GM mix was identified. This sequence of actions was observed in a chain of stores with dozens of stores (Supermarkets 2) and in a chain with hundreds of stores (Supermarkets 6). Table 7 presents a summary of findings.

5. Discussion

The findings indicate a logical sequence of GM food retail actions (Dangelico and Vocalelli, 2017). These actions must start with a distinction between products with retailers' brand and those with manufacturers' brand. This distinction allows defining the points of sale to which products with SSL can be directed. The peculiarities of the selected point of sale must be considered when setting prices and promotions. Details of actions at the Product, Place, Price, and Promotion levels are as follows.

5.1. Product

FW reduction needs to consider the possibility of damage to the supermarket's image (e.g. problems related to products with SSLs).

The elimination of these problems requires categorizing products with SSL into two groups: products with manufacturers' brands and products with the supermarkets' brand. This categorization must be considered in parallel with the analysis of production and consumption sites (Davari and Strutton, 2012). This study also indicates the need to consider damages to the brand when defining GM actions (Chkanikova and Lehner, 2015; Dangelico and Vocalelli, 2017).

5.2. Place

The Place where a supermarket chain can sell items with SSL can also reduce FW. This definition begins with analyzing the markets capable of selling the product under the retailer's brand. This type of product must be sold to small establishments where consumption is almost immediate. This conclusion indicates how the disposal of processed foods with the supermarket brand can be minimized without compromising the retailer's image with its other customers (Scholz et al., 2015; Young et al., 2018). Products with the manufacturer's brand can be sold anywhere. This study shows that selecting the most appropriate Place for the sale of items with SSL (regardless of the brand) can improve the results of GM actions (Dangelico and Vocalelli, 2017).

The study also contributes by corroborating the notion that increasing the number of points of sale can reduce the FW of items with SSL (Buzby and Hyman, 2012; Smith et al., 2012). This point of sale expansion should focus on small companies, especially those that will use the product before the end of its validity. The findings also contribute to knowledge and practice by indicating that the combination of products and markets allows low-income consumers to have greater access to items that would otherwise have been discarded.

5.3. Price

Price management can speed up the sale of products with SSL (regardless of brand). These prices must be offered by the supermarket chain stores that serve consumers with less purchasing power or small retailers interested in significant discounts. The definition of prices considers the combination between the peculiarities and the possibilities of the buyers. According to the literature, consumers with less purchasing power are attracted by reduced food offers (Aschemann-Witzel et al., 2017; de Hooge et al., 2018; Zhou, 2018). Consideration of the combination of peculiarities and possibilities leads supermarkets to offer lower prices for items with SSL sold in their stores located in the regions where consumers with less purchasing power reside. This combination also applies to small retailers serving these consumers. This study indicates the need to consider this combination in the process of segmentation and targeting related to prices (Dangelico and Vocalelli, 2017). It is about defining "where" the supermarket chain should practice lower prices, as well as "how much" to charge for these items (regardless of the product's brand). This finding helps to indicate a new element to be considered in the management of food prices—these elements are quantities in stock and the product's remaining shelf-life.

Price management also requires store managers to be able to adjust product prices with SSL dynamically. As noted, this delegation of power to managers can increase financial gains and reduce FW in food retail. These findings suggest that GM pricing needs to be dynamic and less bureaucratic to reduce the transformation of SSL items into FW. However, price management must guarantee a minimum gain for the retailer. This objective can be consummated through the help of various brands and products kept in stock by supermarkets. The analysis of this variety suggests the need to develop a tool to support store managers. An alternative would be to use the simulation-based optimization model (Buisman et al.,

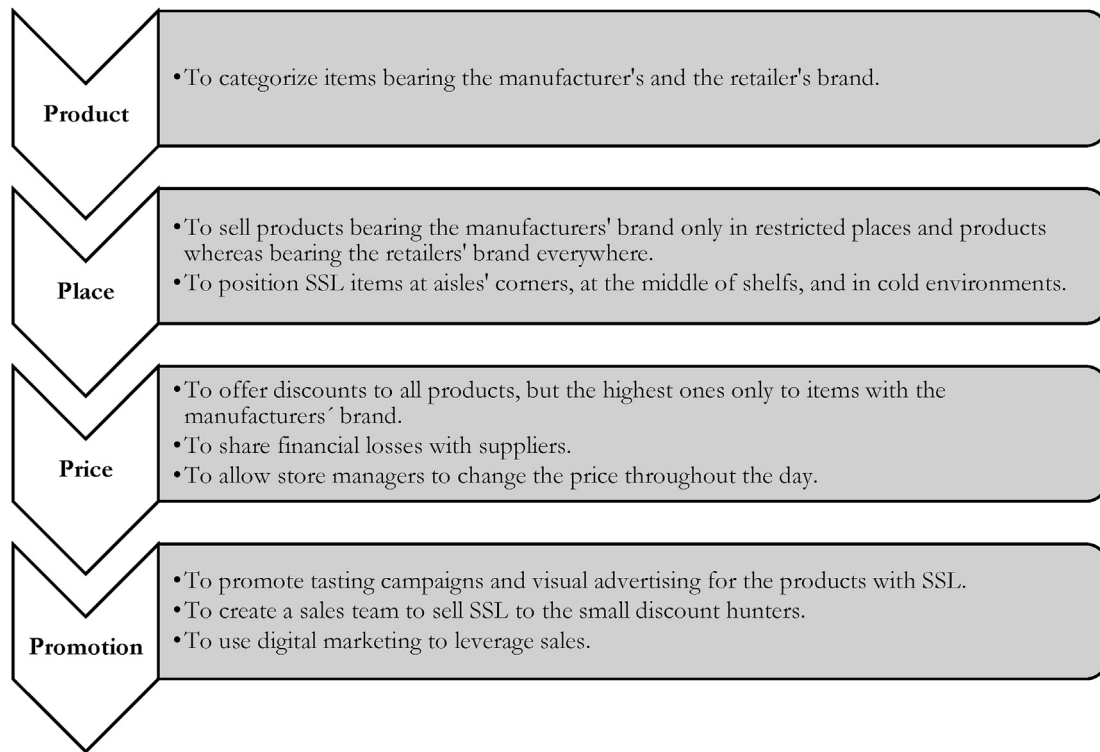


Fig. 2. Sequence of application of the GM's mix to reduce FW.

Table 7
How supermarkets can use GM to reduce FW.

Code	What to do	Why does it
Product	To divide the SSL items into two groups: those bearing the manufacturer's brand and items bearing the retailer's brand.	To avoid risks sanitary and preserve the image of the supermarket.
Place	To sell SSL products bearing the manufacturers' brand in all places that serve customers with less purchasing power.	To rapidly leverage sales and consumption of items with SSL.
	To sell SSL products bearing the retailers' brand only to bars, restaurants, and events' houses.	To simultaneously leverage sales and preserve products brand.
	To place items with SSL at the end of corridors (at the corner of aisles).	To catch consumer's attention to the inside of stores.
Price	To place items with SSL at the middle of shelves, while items with longer shelf-life are placed at shelves bottom side.	To sell items with SSL earlier than the items with longer shelf life.
	To place perishable products, close to cold environments.	To extend the shelf-life of perishable items in tropical countries.
	To sell SSL products at huge discounts.	To attract the discount hunters.
	To offer the highest discounts only to items with manufacturers' brand.	To preserve the image of the products bearing the supermarket's brand.
Promotion	To share losses resulting from the lower prices with suppliers.	To reduce the supermarket's losses and subsidize the items in the promotion.
	To allow store managers to change the price throughout the day.	To rapidly adapt offers to local demand or conditions.
	To promote tasting campaigns and visual advertising for products with SSL.	To induce customers to buy items with SSL.
	To create a sales team to sell items with SSL for discount hunters.	Increase sales to hundreds of small stores or establishments in peripheral regions (increased SSL items' sales to the most impoverished).
	Use teams of sales and digital marketing (e.g., social media) to help supermarkets reduce their FW.	To induce suppliers to get engaged in supermarkets' promotions.

2019). For that, it would be necessary to consider the other dimensions of the GM, namely Product, Place, and Promotion. This consideration would help to reduce financial losses and FW. Another contribution is related to the pricing of items displayed inside the store. In this case, the findings suggest that efficient management can be improved by considering the possible mitigating actions resulting from the GM.

5.4. Promotion

Success in Promotions demands proactive prospecting and selling actions for small merchants (small markets that serve low-income

consumers or bars, restaurants, and event houses). These proactive actions are also of interest to manufacturers, as these manufacturers sell products with SSLs in their warehouses through supermarkets. This conclusion contributes to knowledge and practice by indicating that prospecting and proactive selling can improve GM actions. The findings also indicate that this win-win relationship reduces FW (Filimonau and Gherbin, 2018), and avoids legal problems related to the correct disposal of food (Drozdenco et al., 2011). Another finding indicates that supermarkets use their market knowledge to bargain for further price reductions with these manufacturers. This is an action to reduce losses in the retailer's earnings. The discounts granted by the manufacturers are then passed on by the supermarket chain or

wholesaler to small retailers, thus, facilitating the sale of items to consumers who have less purchasing power. These findings indicate how retailers can use their proactivity to reduce FW in the chain and still generate some revenue from SSL items (Dangelico and Vocellelli, 2017; Kumar et al., 2020).

The promotion of tasting inside stores is a lever for sales of items with SSL. As determined, tasting allows the consumer to ensure the safety and reliability of the food. This finding adds value by indicating an alternative means to reinforce consumer credibility (Papadas and Avlonitis, 2015), in ways that positively influence these consumers' purchase intentions (Raška, 2015). This finding also indicates how tasting helps avoid product information asymmetry (Rademaker et al., 2015), and how retailers can avoid damaging their image when selling SSLs (Testa et al., 2011, 2015). The findings related to tasting also indicate an alternative to the content usually focused on in GM advertising (Prane, 2012).

6. Conclusions

6.1. Academic contributions

Perishable products will be thrown away if they are not sold in time. Therefore, an urgent need exists to identify actions to reduce FW in retail stores. The first contribution of this study resides in the examination of green marketing mix practices, considering the evolution of the business environment. We advance the green marketing literature by exploring segmentation and targeting approaches through supermarkets' use of GM mix to mitigate FW (Dangelico and Vocellelli, 2017). Specifically, we offer a novel perspective on global actions in favor of reducing FW by reducing its financial losses through lower-priced sales of SSL items. We investigated six supermarket companies that act strongly to reduce FW. Given the dynamic nature of the study context (perishables retail), our study provides useful insights on how coordinated actions in the 4Ps of marketing can positively impact FW reduction, as well as increase the circular economy by avoiding financial losses of the investigated organizations.

The study also focuses on green marketing strategies for FW reduction, an empirical context that has not received sufficient attention from the literature. Most studies of green marketing models/stories focus on strategies for production, pricing, availability, and promotion of green products (see Appendix B). Interestingly, many of the findings corroborate the findings of previous studies that marketing strategies in supermarkets may contribute to FW reduction (Filimonau and Gherbin, 2018; Teller et al., 2018; Young et al., 2018). This suggests that green marketing strategies can make a strong contribution in the expansion of the circular economy and the reduction of the impact of FW by coordinated and sequential actions of the members of the supply chain. The identified actions should be implemented in the following sequence: product, location, price, and promotion. First, the products should be categorized into items with the retailer's brand and products with the manufacturer's brand. Such grouping aims to avoid future problems with the items that bear the brand of the supermarkets. This effort also helps to define suitable locations, prices, and promotions of products with SSL. Also, the pricing of SSL-branded items needs to be dynamic. Careful attention to where offers are placed inside stores are also helpful in leveraging sales.

6.2. Contributions to retailers and policymakers

Losses related to products with SSL in retail stores are estimated at the US \$ 90 million per year in Brazil. This study's findings point

out several contributions on "how" to manage perishable products with SSL to avoid such losses. The research also suggests a sequence of actions related to GM mix. Attention to this sequence can boost sales of products with SSL, thus helping to reduce FW.

Hundreds of small businesses help in avoiding the disposal of perishable foods and in feeding lower-income consumers. To improve these benefits, policymakers could develop actions to leverage sales of items with SSL. One alternative is to ask big retailers to develop and maintain an up-to-date database of SSL items, places, and prices. This database could be accessed by small businesses or charities (using the internet) interested in leveraging sales of items close to the expiration date.

6.3. Limitations and future studies

Like any study, this research has some limitations, which can serve as opportunities for future studies. First, this is a qualitative and multiple case study, with results from a limited number of supermarkets. Its exploratory nature suggests the need for further studies on the subject. Also, despite operating in the same region, one of the investigated companies belongs to the group that operates globally, while the other five companies operate regionally. These limitations suggest that other supermarkets of different sizes also need to be investigated. Therefore, the generalization of these results should be treated with caution due to the limitations.

Future studies may investigate how to improve proactive sales in small supermarket chain stores or supermarket wholesale distributors; how to use green marketing to improve online sales of items close to the expiration date to consumers with lower-income; what is the impact of the shelf space and position on the sale of items with different expiration dates; how firms can improve the granting of discounts based on Big Data management and analytics; what mechanisms can be applied to improve the earnings of retailers who help manufacturers to sell items with SSL; and what impact would the strengthening of relations between manufacturers, supermarkets and discount hunters have on FW reduction.

CRedit authorship contribution statement

Jorge Ubirajara Gustavo: Conceptualization, Investigation. **Luiz Reni Trento:** Supervision, Software, Writing – original draft, Investigation. **Michele de Souza:** Writing – original draft, Investigation. **Giancarlo Medeiros Pereira:** Writing – original draft, Data curation, Methodology. **Ana Beatriz Lopes de Sousa Jabbour:** Methodology, Writing – review & editing. **Nelson Oly Ndubisi:** Writing – review & editing, Visualization. **Charbel Jose Chiappetta Jabbour:** Writing – review & editing, Visualization. **Miriam Borchardt:** Writing – original draft, Data curation, Methodology. **Leandro Zvirtes:** Writing – original draft, Investigation.

Declaration of competing interest

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Appendix A. Focuses of the FW studies

Focus	References
Product	(Aitken et al., 2020; Alamsyah et al., 2020b; Aschemann-Witzel et al., 2015; Buisman et al., 2019; Cicatiello et al., 2017; Coderoni and Perito, 2020; de Moraes et al., 2020; Evans, 2011; Gjerris and Gaiani, 2013; Gokarn and Kuthambalayan, 2017; Khan et al., 2020; Kuah and Wang, 2020; Lago et al., 2020; Lee et al., 2020; Loebnitz et al., 2015; Lu et al., 2020; Mena et al., 2011; Pahlevi and Suhartanto, 2020; Palacios-Argüello et al., 2020; Polonsky and Rosenberger, 2001; Principato et al., 2015; Shahsavari et al., 2020; Stangherlin and de Barcellos, 2018; Teller et al., 2018; Tromp et al., 2016; Waris and Ahmed, 2020; Zhang et al., 2020).
Price	(Aschemann-Witzel et al., 2017; 2015; Bittar, 2018; Canavari and Coderoni, 2019; Chan et al., 2012; Chang et al., 2019; Cicatiello et al., 2017; de Hooge et al., 2018; Drozdenko et al., 2011; Elfenbein and McManus, 2010; Essoussi and Linton, 2010; European Commission, 2014; Freestone and McGoldrick, 2008; Galati et al., 2019; Issock et al., 2018; Kronrod et al., 2012; Kushwah et al., 2019; Lago et al., 2020; Michaud and Llerena, 2011; Mkhize and Ellis, 2020; T. T. M. Nguyen et al., 2019; Peattie, 2001; Peattie and Crane, 2005; Pham et al., 2019; Raak et al., 2017; Ranjan and Jha, 2019; Sana, 2020; Shao and Ünal, 2019; Symmank et al., 2018; Vittuari et al., 2020; Yue et al., 2020).
Place	(Davari and Strutton, 2012; Guyader et al., 2017; Kumar, 2014; Madeira, 2019; Mishra and Sharma, 2012; Yasir et al., 2020).
Promotion	(Alamsyah et al., 2020a, 2020b, 2021; Arroyo and Carrete, 2019; Bickart and Ruth, 2012; Borin et al., 2011; Chang et al., 2019; Cortés and Moretti, 2013; Fowler and Close, 2012; Kemper and Ballantine, 2019; Kim et al., 2020; Kronrod et al., 2012; Leonidou, 2011; Liao et al., 2020; Liu and Liu, 2020; Mkhize and Ellis, 2020; Mydock et al., 2018; Nyilasy et al., 2012; Paço et al., 2019; Papadas and Avlonitis, 2015; Prihandono et al., 2020; Purohit, 2012; Rademaker et al., 2015; Raška, 2015; Rihn et al., 2019; Saari et al., 2020; Setyawati et al., 2020; Testa et al., 2015).

Appendix B. Focuses of the GM's studies

Focus	Code	Summary
Product	Design	Elements that can influence consumers to purchase energy- efficient home appliances (Waris and Ahmed, 2020), fashion products that bear a green logo (Lee et al., 2020), eco-friendly furniture (Shahsavari et al., 2020), or organic products (Aitken et al., 2020). Drivers of loyalty towards eco-friendly plastic products (Pahlevi and Suhartanto, 2020).
	Technology	Barriers to consumer acceptance of recycled and remanufactured products (Kuah and Wang, 2020). Retailer incentives to the manufacturer(s) that adopt green technology (Zhang et al., 2020).
Price	Influence	Influence on consumer trust in energy-efficiency labels (Issock et al., 2018).
		Influence on buying intention of organic meat (Nguyen et al., 2019), organic products (Mkhize and Ellis, 2020), milk with lower carbon footprint (Canavari and Coderoni, 2019), remanufactured goods (Bittar, 2018), or natural wine (Galati et al., 2019).
Place	Requirement	Manufacturing industries should improve environmental performance when formulating a green business strategy (Yasir et al., 2020).
	Promotion Benefits	Green advertising affects the individual's attitude (Kim et al., 2019). Green promotion creates customer awareness about the companies' commitment to environmentally friendly products (Setyawati et al., 2020). Well-designed logos increase respondents' bids (Rihn et al., 2019) and may influence the consumer purchase decision (Prihandono et al., 2020).
Management	Management	Presentation of environmental information on operations or supply chain (Saari et al., 2020), on the use of renewable energy (Mydock et al., 2018), or product sustainability and quality (Mkhize and Ellis, 2020).
		Attention to the socioeconomic level of the segment (Arroyo and Carrete, 2019)

Appendix C. Questions proposed to interviewees

Codes	Questions
Product	How do you assess the possibility of reducing FW through the management of products displayed in the supermarket? How could the results of this management be improved?
Price	How do you evaluate the possibility of reducing FW by managing the prices of products displayed in the supermarket? How could the results of this management be improved?
Place	How do you evaluate the possibility of reducing the FW through the product exhibition square? How could the results of this management be improved?
Promotion	How do you evaluate the possibility of reducing FW by promoting products in the supermarket? How could the results of this management be improved?

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