

# PACKAGING DESIGN AND FOOD LOSS: A DISCUSSION GROUNDED ON THE OBSERVATION OF PRODUCT PACKAGING ON SUPERMARKET SHELVES

## DESIGN DE EMBALAGENS E DESPERDÍCIO DE ALIMENTOS: UMA DISCUSSÃO BASEADA NA OBSERVAÇÃO EM GÔNDOLAS DE SUPERMERCADO

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### ABSTRACT

This article aims to discuss aspects of packaging which may be associated with food loss. Not only can this theme be approached through the environmental perspective (concerning the use of resources and raw materials), but also from the social one (as in food security and hunger). Thus, ten packaging categories were observed: yoghurt, *requeijão*, tomato sauce, mayonnaise, mustard, ketchup, olive oil, salad dressing, fruit jam and butter. Aspects observed include those of technical and communicative purpose, such as format, materials, types of opening, information on how to preserve contents and several others. This was done in order to identify in supermarket shelves the negative and positive outcomes of packaging within the scope of preventing possible food loss. It is concluded that while solely observing packaging is not enough to draw conclusions with regard to fully emptying their contents, it is still possible to identify critical cases of possible food loss and, therefore, highlight the designer's role and responsibility in packaging design and recognise them as an important agent in the issue of food loss.

**KEYWORDS:** Packaging. Food loss. Design.

### RESUMO

O presente artigo busca discutir aspectos das embalagens de alimentos, líquidos e pastosos, que parecem influenciar no desperdício de seus conteúdos. Sabe-se que esta é uma temática que tangencia discussões diversas que envolvem não só questões ambientais (referentes ao uso de recursos e matérias-primas), mas também as sociais (como a insegurança alimentar e a fome). Com o intuito de identificar, prontamente, aspectos positivos e negativos que influenciam na predisposição do desperdício do alimento contido em embalagens, foram observadas dez de suas categorias, em gôndolas de supermercados, quais sejam: iogurte, *requeijão*, molho de tomate, maionese, mostarda, ketchup, azeite, molho de salada, geleia e manteiga. Dentre os aspectos analisados, destacam-se as questões técnicas e comunicacionais como, por exemplo, formato, materiais, tipos de abertura e informações sobre conservação. Concluiu-se que, a partir da observação dos produtos nas gôndolas do supermercado já é possível identificar pontos críticos que possivelmente contribuem para o desperdício dos alimentos e, desta forma, destacar a responsabilidade e a necessidade de envolvimento do designer em projetos de embalagens.

### PALAVRAS-CHAVE:

Embalagem; Desperdício de alimentos; Design.



## 1. INTRODUCTION

Food waste or food loss is comprised of the characteristics that involve loss (involuntary reduction in the availability) and disposal (voluntary discarding) of food (PEIXOTO; PINTO, 2016). Approximately 1.3 billion tonnes of food are lost or wasted around the world each year, which accounts for roughly a third of all food produced. This phenomenon happens in several instances and for different reasons, from production to consumption by end users (ASCHEMANN-WITZEL *et al.*, 2018; FAO, 2013).

Upon observing the cycle of the product, the greatest negative environmental impact caused by loss happens after purchase (WILLIAMS; WIKSTRÖM, 2011). In this stage, due to the fact that food has already gone through its supply chain all the way to the end user, the environmental costs are those of production, transportation and storage, as well as the expenses with packaging that contains the food, which entails the use of raw materials, power consumption and fossil fuel, greenhouse gas emissions and other impacting elements (FAO, 2013; PORPINO, 2015).

Food loss related to packaging may occur due to several reasons: structural ones, materials used, resealability and portioning. This loss is also directly linked to consumers' perceptions and behaviours towards the food, and may be related to the moment of purchase, consumption or even storage (HEBROK; BOKS, 2017; WILLIAMS *et al.*, 2011).

According to a report by the Food and Agriculture Organization (FAO, 2014), the development of new packaging technologies is one way to reduce food waste, which is a global preoccupation. Advancements in this sector are of paramount importance, as they not only guarantee the quality and security of food, but also influence in environmental aspects and social issues like food security and hunger. Thus, designing packages as a tool to minimise food waste is a means to reduce the environmental impact caused by the food-packaging system, while also attending to the needs of consumers, such as usability, ergonomics, food preservation, portability and others (WIKSTRÖM; WILLIAMS, 2010).

## 2. FOOD LOSS

Eating is a basic need that consists of obtaining the necessary nutrients that produce energy for the body to function, grow and move, which are absolutely fundamental processes for an organism to survive. Thus, the harm caused by hunger in humans is not only restricted to a physical or neurological one, but also cognitive and emotional.

One of the consequences of hunger is the difficulty of bringing individuals subjected to this context back to society or into the labour market.

Hunger equates suffering and exposes human fragility in the contemporary world (GOULART, 2008; ROSANELI *et al.*, 2015). Food waste can then be considered a problem of a social, cultural, ethical and environmental context in this day and age (HEBROK; BOKS, 2015; PORPINO, 2015); and just like hunger, it demands a multidimensional reflection, as it is a result of wrong methods in the process of development (GOULART, 2008; ROSANELI *et al.*, 2015).

### 2.1 The consumer and food loss

Food loss may occur in different ways and for different reasons throughout the supply chain. Regarding consumption, the loss may occur when the consumer i) buys more than they will consume; ii) does not know how to properly preserve the food for lack of clear information in the package; iii) prepares food excessively; iv) stores the food inadequately and/or v) when the package does not preserve the food as it should once opened. Such activities do not always happen consciously, but as a result of a complex process that involves questions such as: social interactions, routine, habits, infrastructure, emotions, knowledge, perceptions and practices (ASCHEMANN-WITZEL *et al.*, 2018; HEBROK; BOKS, 2017; LOBO, 2013; SANDES, 2013; SILVENIUS *et al.*, 2014; WILLIAMS *et al.*, 2011). Therefore, consumer behaviour can be understood as a critical factor that influences loss or waste. Issues that may result in food being discarded are: not wanting to eat food prepared the day before, change of plans, not knowing what to do with some types of food (or parts of them) and excessive worrying with hygiene (COX; DOWNING, 2007; RUSSELL *et al.*, 2017; WILLIAMS *et al.*, 2011).

These issues may occur due to consumers being so involved in their daily routines that food is often neglected (HEBROK; BOKS, 2017). Moreover, there is the difficulty in noticing other loss factors such as overbuying (either because of poor planning or a desire to save time when grocery shopping), stocking food for "precaution" and buying products in larger packages for economic reasons. These can make matters worse when food is not fully consumed (SVANES *et al.*, 2010; WILLIAMS *et al.*, 2011).

According to the Food and Agriculture Organization, consumers' perception that wasting food is not that damaging to the environment - as food eventually returns to the soil as organic matter - is not an uncommon one. There are several reasons for this to be a misconception, one



of them is that food does not "return" to the soil (FAO, 2013). According to Calixto (2016), 85% of Brazilians have no means to recycle waste properly, which includes composting and proper disposing of organic waste. It is estimated that 24 million tonnes of waste are inadequately placed in Brazil (LANDIM *et al.*, 2015). Thus, if not given a proper destination, organic matter in the process of decomposition will produce high rates of methane gas, which is 25 times more damaging than carbon dioxide in regard to the greenhouse effect (FAO, 2013).

## 2.2 Packaging

In the food industry, packages play different roles, among which are: containing, protecting and transporting food while preserving its nutritional characteristics, both quality-wise and safety-wise (JORGE, 2013; NEGRÃO; CAMARGO, 2008). If a package does not fulfil its purpose, the product may be wasted, sometimes even before it reaches consumers.

The most thoroughly discussed phenomenon of packaging is that related to its disposal, taking for granted its actual purposes. According to Hellström, Olsson and Fredrik (2016), this happens because the package is only perceived effectively by the consumer when it is ready to be thrown away, which may explain why they are taken as wasteful or even unnecessary. Thus, their main role of protecting and preserving their contents is belittled. The choice of packaging aspects (how to open the package, its shape and material) is then essential and determinant to guarantee the protection and safety of the product while also adapting to meet its necessities and maintaining its integrity (RUFINO *et al.*, 2012; WIKSTROM; WILLIAMS, 2010).

Reasons for package-related food loss during the consumption stage are several and may be related to the moment of purchase, preservation or actual consumption. Research done in Sweden highlights that packaging may be the reason behind 20-25% of domestic waste. This may occur due to the size of packages, difficulty in emptying them, insufficient information about food preservation, wrongly preserving products that are meant to be consumed in portions and many others (HEBROK; BOKS, 2017; WIKSTRÖM *et al.*, 2014).

One of the most relevant aspects that may exert influence on food loss - both negatively and positively - is information on the package. In this regard, the most commented item is the indication of an expiration date for the product, which stands out as factor that influences waste by inducing consumers to dispose of food even if it is still fit for consumption (HEBROK; BOKS, 2017; WIKSTRÖM *et al.*, 2013).

According to Hellström, Olsson and Fredrik (2016), packages are fundamental to modern society, mainly with regard to food preservation, increase in shelf life and loss minimisation. The Brazilian Package Association (ABRE, p. 10), in their publication *A Embalagem Construindo Sustentabilidade* ["Achieving Sustainability Through Packaging"], comments that "[...] packages adapt to their societies, reflect their habits, values and development stage", and indicates that the opposite also occurs, that is, the package can also help propel other types of consumer behaviour which may in turn contribute to sustainability.

Developing packages is a multidisciplinary effort, thus, questions related to food loss during consumption are also related to the designer's role. According to Teixeira (2011), it is the designer's responsibility to weigh the interests of their clients and the demand of consumers, which are driven by different perceptions, lifestyles and subjective and objective values. Negrão and Camargo (2008) list several points to be taken into consideration in packaging projects, and even without directly correlating them with food loss itself, it is understood that these may impact on that front. Among some of the points are: the colours in the package, typography, materials, production processes and laws and regulation.

## 3. MATERIALS AND METHODOLOGY

This research entails direct observation of shelves in four supermarkets, followed by the description of selected packages. To do so, some inclusion criteria were determined for the disproportionate stratified sample and, afterwards, a form was developed to gather data, as shown in Figure 1. The following was determined for the observed food products: i) they should be either liquid and/or paste; ii) they should be available for purchase in at least three different supermarkets in the city of Belo Horizonte, in the state of Minas Gerais - Brazil; iii) they should come in more than four different package types (hereinafter known as product variants); iv) that said differences should comprise of variations in the package shape, its materials, types of opening and/or preservation. Besides these, some other categories to be observed were defined based on information gathered throughout research on pertaining literature (in regard to the research done by author Thaís Behar during her ongoing Master's degree under the supervision and co-supervision of professors José Carpintero Rezende and Kátia Andréa Carvalhaes Pêgo, respectively).

Research at supermarkets was registered via photos, forms and complementary note-taking in fieldwork notebooks. The data gathered served as basis to the analysis done via the tabulation of data and analyses through defined post-observation

criteria, which will be commented on afterwards. The categories observed were: yoghurt, requeijão (milk-derived spread produced mainly in Portugal

and Brazil), tomato sauce (paste, puree or pulp), mayonnaise, mustard, ketchup, olive oil, salad dressing, fruit jam and butter.

**Package Preselection Form**

Fieldwork Dates: \_\_\_\_\_

Supermarkets : \_\_\_\_\_

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Sold refrigerated     Refrigerated after opened     Dry     Liquid     Paste

|           |   |   |
|-----------|---|---|
| Category: | <input type="checkbox"/> Chocolate Flavoured Milk<br><input type="checkbox"/> Soy-based Food<br><input type="checkbox"/> Coffee<br><input type="checkbox"/> Alcoholic Beverage<br><input type="checkbox"/> Yoghurt<br><input type="checkbox"/> Olive Oil<br><input type="checkbox"/> Milk Cream<br><input type="checkbox"/> <i>Requeijão</i><br><input type="checkbox"/> Mayonnaise<br><input type="checkbox"/> Mustard<br><input type="checkbox"/> Butter<br><input type="checkbox"/> Salad Dressing<br><input type="checkbox"/> Others: _____ | <input type="checkbox"/> Sports and energy drinks<br><input type="checkbox"/> Fizzy drinks<br><input type="checkbox"/> Juice<br><input type="checkbox"/> Tea<br><input type="checkbox"/> Milk<br><input type="checkbox"/> Cooking oil<br><input type="checkbox"/> Condensed Milk<br><input type="checkbox"/> Cream Cheese<br><input type="checkbox"/> Ketchup<br><input type="checkbox"/> Tomato Sauce<br><input type="checkbox"/> Margarine<br><input type="checkbox"/> Pâté |
|-----------|---|---|

Package Variants:     4     6     8     10     \_\_\_\_\_

Types of variations     Material     Shape     Opening     Technical Information

Others: \_\_\_\_\_

Brands:     4     6     8     10     \_\_\_\_\_

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Comments: \_\_\_\_\_

Does it show clear preservation information?     Yes     No    \_\_\_\_\_

Any uncommon information on preservation?    Yes     No   

Which? \_\_\_\_\_

Does it show recycling information?     Yes     No    \_\_\_\_\_

Materials: \_\_\_\_\_

Figure 1 - Package preselection form. Source: developed by authors

In the tabulation stage, the following were identified: package materials, indication and symbols of recycling, sizes and variety in shapes, the placement and clarity of information regarding preservation after opened, as well as how the product was being sold: dry or under refrigeration. In this stage, products were separated into liquids or pastes. Brand variety was only generally noticed, as this was not pertaining to this research and the overall problem. An infographic with the data compiled can be seen under the Results item (figure 2).

#### 4. RESULTS

The data was gathered in four supermarkets in the city of Belo Horizonte, in the state of Minas Gerais,

Brazil, with the objective of broadening the variety of packages observed. In general terms, these establishments show a variety of brands, with some of them present across all four. However, two of the four supermarkets also had imported products, packages with a greater variation in portion sizes, larger packages for greater portions (possibly for the use of restaurants) and smaller packages for individual consumption.

The aim of this investigation was to obtain a first impression regarding package-related food loss happening prior to the use or consumption of food products. The following graph summarises information which was considered relevant in the

scope of this research: categories, sizes, shapes/formats, materials, brands and others.



Figure 2 - Preliminary selection. Source: authors' archive.

Three items were selected to be commented on after fieldwork: i) package shapes and sizes; ii) information regarding materials and recycling; iii) information on preservation, use and legibility. It was chosen for data to be presented like this - and not through product categories - due to similarities shared between distinct categories, which has allowed them to be approached similarly.

#### 4.1 Shapes and sizes

Two important characteristics observed in supermarket shelves were the variety of shapes and sizes of packages. The importance of observing these characteristics derives from the understanding of possible consumption moments, target audiences, ergonomics and functionality.

Upon observing yoghurt shelves, it is possible to notice that the same brand or sub-brand shows a great variety of shapes and sizes for the same product (figure 3a). As in most other categories, it is understood that these variations occur due to different ingredients or compositions in the food product - for instance: lactose free, fat free, dessert, etc. - or because of the moment of

consumption (on the go, to be eaten at home, as a side dish) and target audience (families, children, individual consumption). In the case of requeijão packages, a small variety was seen, despite some brands selling the same product in at least three different packages. This seems to happen due to brand positioning and an interest in adding value to the product, and not because of the different moments of consumption. However, the existence of screw caps for partial consumption and usability was detected (figure 3b).



Figure 3 - Preliminary selection. Source: authors' archive  
 There is not a wide variety of packaging shapes across different tomato sauces, even considering pulps, purees and pastes. Variations that do occur also seem to be due to brand positioning and

aesthetics, while sizes appear to be designed for full consumption, with larger ones (1.5 kg) aimed at restaurants.

Mayonnaise, mustard and ketchup packaging presented great similarity in the observed criteria. In these shelves it is possible to notice a concern with the different moments of consumption, with brands offering products in different types of packaging, varied squirt bottles with screw caps and flexible properties (figure 4a). However, none of the four supermarkets had reduced portions of these categories. It was also possible to notice an industrial concern in facilitating the use and consumption by placing the cap upside down (figure 4b). In this case, in order to balance their weight, the caps are larger, which renders the use of more materials in their making.



Figure 4 - Mayonnaise, mustard and ketchup. Source: authors' archive

It was seen that salad dressings also do not present reduced portions - most packages range between 185 and 970ml. Furthermore, time for consumption after opened is mostly very short (ranging between seven and fifteen days, depending on the brand), which requires the product to be consumed daily. Owing to its paste-like texture, it may be deduced that packaging shapes seem adequate for full extraction of contents, with the exception of two

specific types which showed very pronounced curves and right angles (figure 5).



Figure 5 - Salad dressings. Source: authors' archive

With regard to the size of jam packages, they seem adequate for individual consumption. However, there are cases in which fully emptying the container may be difficult due to its shape. This is the case with right angles, which interfere when trying to access the internal area of the container. Another feature that may lead to food loss or difficulty in extraction is the presence of sinuous short-radius curves, as well as multi-sided containers (figure 6).



Figure 6 - Jams. Source: authors' archive

Butter packaging is the one which shows the smallest variation in size and shape, although one of the types, due to its right-angled corner, seems to present greater difficulty when trying to fully extract its contents (figura 7[1]). Another characteristic noticed was that butter sold in block packages have lines indicating measurements which help partial consumption in recipes. (figure 7[2])



Figure 7 - Butter. Source: authors' archive

## 4.2 Information on Materials and Recycling

As for specifications on materials and recycling, it was observed across all categories that some brands only provide with information on the materials used in the making of the main containers, but not on caps, labels or seals. There are also instances of generic information not indicating the actual material, and some named "others", without specifying the type of plastic (mainly in flexible packaging), as observed in Figure 8.



Figure 8 - Recycling symbol and "others". Source: authors' archive

In yoghurt shelves, while not a rule, it was possible to identify some products which listed all materials used (figure 9[1]). These were found printed under the packages, although some were not entirely legible - which was also noticed in all categories using hard plastic: *requeijão*, mayonnaise, ketchup, butter, mustard, salad dressing and yoghurt (figure 9[2]).



Figure 9 - Recycling symbol. Source: authors' archive

It could also be seen that glass packaging across all categories did not provide with information on the materials used. Other unusual characteristics in terms of communicating materials were present in a few specific packages, some of these were: a tomato sauce package illustrating which trash can should receive its solid waste (figure 10[1]); another tomato sauce in a glass pot providing with details on label materials, which was not present in all other products using this type of material (figure 10[2]); information on a ketchup packaging which specified the materials of the bottle, the label and the cap separately (figure 10[3]); a brand of butter using metal packaging; the presence of thin slices of wood as packaging for one type of *requeijão* (It is believed here that another internal packaging is present in order to protect the food, but that is not possible to ascertain merely from external observation.); besides these, only one brand of butter showed recycling information on their tablet-sized/block variants.

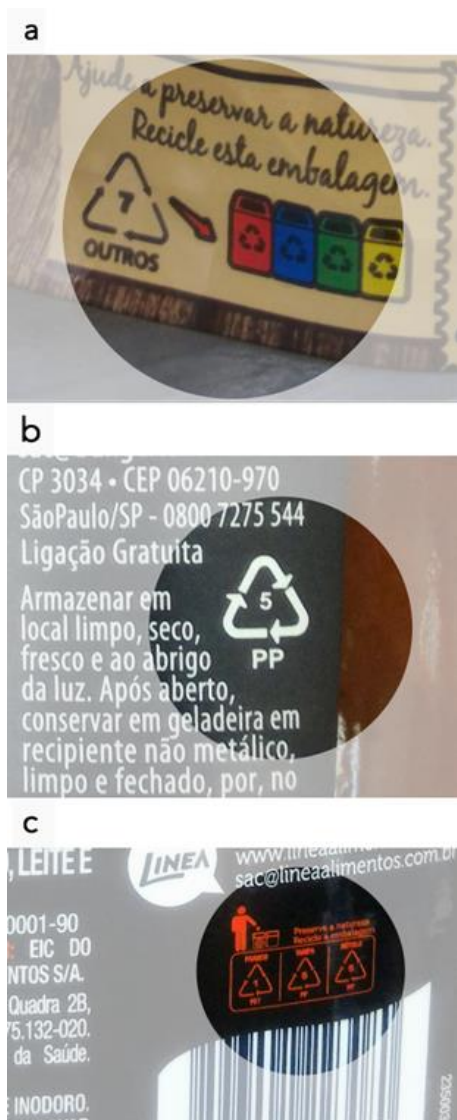


Figure 10 - Differing recycling symbology. Source: authors' archive

### 4.3 Information and Legibility

As far as information on preservation methods is concerned, overall, all categories have presented a small print alongside other legal disclaimers and information, such as the maker's address or the ingredients, as observed in Figure 11[1]. Thus, in most products it is difficult to promptly identify the best way to preserve the food. Moreover, some packaging samples showed a poor combination regarding the contrast between background colour and typography, as seen in Figure 11[2], which hindered legibility. Another negative aspect was observed in block-sized butter packages: depending on how the package is sealed, some formations are lost (figure 12).



Figure 11 - Information on food preservation. Source: authors' archive



Figure 12 - Packaging closure covering information. Source: authors' archive

It was also found that packages that had information on preservation methods or ingredients in a metallic sealing (foil) were not as legible as those showing similar information on flat surfaces, which further hindered legibility (figure 13).



Figure 13 - Information printed onto foil. Source: authors' archive

In terms of expiration dates, there is no distinct pattern to each category - the different uses vary with packaging types, colour and label layouts. These can be present at the bottom of the package, on the label, on the cap or in metallic seals. Furthermore, depending on where and how they were printed, some numbers may be hard to read. This happens primarily when the expiration date is printed on metal sealing, as it is usually stamped onto the package via the application of



small dots, which might make it illegible if misapplied.

A poor design or manufacturing choice was also observed in a batch of olive oil of a certain brand: the expiration date was printed on the removable seal of bottle caps, as seen in Figure 14. In this case, once the seal is removed, information will also be lost. As this is not a product with a high perishability, this aspect may not be critical to it, but this can lead to food loss should it occur in other categories. However, an interesting aspect observed in the same packaging was the presence of a tag containing information on how to properly use the dispenser spout.



Figure 14 - Information on removable seal. Source: authors' archive

Among the several differing examples found in aspects of information, the following have stood out: i) instructions on how to freeze the product in some packages (figure 15); ii) a warning found in a mayonnaise product about handling the package carefully (figure 16a) - which seems to be directed at retailers and was not found in other products or categories; iii) a brand of tomato sauce which clearly illustrated in a front panel information on serving and portion sizes (figure 16b) - it is understood that this may help consumers better select the size of the products they are purchasing.

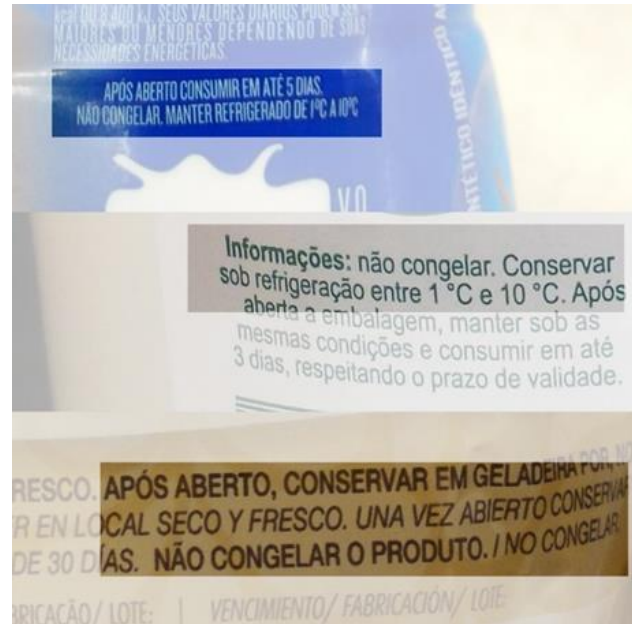


Figure 15 - Information on freezing and refrigeration. Source: authors' archive



Figure 16 - Diverse information. Source: authors' archive

## 5. DISCUSSION

This research has allowed for the observation of aspects regarding the discussion that intertwines "food loss", "packaging" and design. One of them is that some packages which are not designed for partial consumption may be inducing consumers to attempt to close them, then causing food spoilage. In these cases, what may minimise loss is impeding the closure of the package once it has been opened, as the consumer is forced to transfer the remainder to another container (if not fully consumed when opened). Two cases in point can be mentioned, a tomato sauce packaging made of

steel which had a cap that did not allow for later closure and another whose cap could be placed over the can (figure 17). In the latter, the inadequacy of the type of closure may result in faster spoilage rate, if compared to it being inside a plastic container under proper indications of preservation in a refrigerated environment after opened.



Figure 17 - Types of opening and closure in cans. Source: authors' archive

Another important aspect observed in the category of tomato sauces was that some flexible packages specified that their contents should be transferred to a non-metallic container once opened. The same was not found in steel packages. On the other hand, these same steel packages present instances where the number of portions and serving sizes is informed. It is understood that doing so (figure 16[2]) can help domestic planning when preparing meals and considering portion sizes, which may minimise food loss.

Information on freezing may also help consumers understand the different possibilities of food preservation, but none of the categories observed have been consistent in showing this. Even if freezing is not allowed for a certain product, having this information printed on the package is interesting as it may reduce the likelihood of consumers storing the product inadequately. As mentioned in ABRE's publication "Achieving Sustainability Through Packaging", it is possible that packages create new patterns of consumer behaviour.

Other issues which may exert negative influence on processes that involve sustainability and food loss have been observed. One of these is the lack of information about materials used in the packages, which may hinder its recyclability (BARBOSA, 2014) or separation for later disposal of waste, either by households or by trash and recycling centres. It was observed that most packages only indicated one of the materials (normally that of the container), neglecting details about labels, seals and/or caps. This might be due to the lack of incentives and efficiency in the collection and appropriate disposal of garbage in Brazil, as mentioned by Landim *et al.* (2015).

Still on materials and recycling information, there is an alarming lack of distinction between the different types of plastic used in packaging where materials are listed as "others". In some cases the material may seem like paper instead, which makes it hard for consumers to dispose of the package adequately, as is the case of some butter packages that come in blocks. There are few consumers that are familiar with the Technical Symbology of Material Identification (BARBOSA, 2014, however, it is understood that the habit of observing this technical informations and comprehending it's meaning can become common if encouraged and explained its importance.

Regarding product conservation, differing information in similar products from different brands or sub-brands on how to preserve food contained by a given type of packaging (flexible plastic, for example) may confuse consumers, as there would not be a clear reason for this differentiation. Thus, it would be interesting for brands to explain their motives in these cases. As already mentioned by Hebrok and Boks (2017) and Wikström *et al.* (2014), clear information in packaging is essential in order to minimise loss.

With regard to olive oil, observation without interaction suggests that loss might not be frequent in comparison to other categories (mainly paste-like food), as most containers are made in such a way that they facilitate pouring the liquid. This happens because most of them do not have pronounced curves, which is the case of some yoghurts and salad dressings. Nevertheless, it is understood that loss may occur in these types of products due to the size of their caps/spout dispensers or when they allow for the oil to run down the bottle. However, as caps are sealed, it is not possible to ascertain this only through observation.

It is believed that alternative methods to communicate data should be developed, such as using tags, QR codes (for less relevant information, as this may also be a limiting factor) or even texts on the back of labels. Barbosa (2014) believes that packaging can also be a platform for exposing objective information about actions in favor of the environment. Another alternative form of communication to help consumers select products according to their lifestyles is including information at the point of sale, introducing possible uses and preservation methods. It is also known that the size of typography used in the legal information (that which is determined by law) of a product is directly linked to the size of the package and the hierarchy of information as decided by the manufacturer.

Overall, the variety of packaging in the market is satisfactory and caters for different moments of consumption, which demonstrates the industry's concern of attracting consumers through usability and comfort. However, it has been noticed that some categories could offer a greater variety of products in smaller portion sizes, as is the case with ketchup, mayonnaise, mustard and salad dressing. These products do not last long, which could imply that they are to be consumed quickly, even though that might not be the case. This suggests the possibility of disposal after their expiration date or time indicated for consumption. It might be that manufacturers do not offer smaller portion sizes or more adequate packaging due to potential loss concerning the difference between manufacturing cost and selling price. Products which demand the use of more materials, changes in production lines or the use of new technologies require investment, which could then impact on their final price for consumers, who may not recognise their cost-effectiveness and refrain from buying altogether.

Finally, the potential for the designer to have an active role in the issue of food loss is evident, being an important agent in the production chain of packaging. Aspects like text placement, contrast of information with regard to background and packaging shapes are all worthy of care and attention by this professional. Admittedly, it is known that clients already require and bring information to be included in the package, but it is also believed that when designers create projects with attention to possible waste, they may identify aspects not previously perceived by clients and consequently suggest changes to layout and communication in order to help minimise loss. A case in point is the use of recycling symbols for all components of the package, which helps the identification by consumers, garbage collectors and recycling centres. Another example is adding more thorough suggestions of preservation, including the possibility of freezing food and the best methods for storing it. Clear and straightforward recommendations on consumption and warnings about food loss may also contribute to raise consumers' awareness of the problem.

## 6. CONCLUSION

It is possible to determine that solely observing packaging is not enough to draw conclusions with regard to fully emptying their contents. However, through observation, it may be suggested that packages that allow access to their containers' bottom (as is the case with yoghurts with a wide opening) and liquid products are easier to be fully consumed. In the case of pastes - specially those in

containers with many curves, right angles or limited access to the bottom - loss seems more likely.

It was also possible to conclude that packaging is essential in order to tackle the issue of food loss, mainly when packages are designed to cater for different moments of consumption and provide with efficient access to information. It is believed that communicative aspects and the possibilities of sharing information on a product and its preservation are yet to be fully exploited. Not all consumers are known to read and search for such information on packages, but it is also believed that this habit may be developed if information is clearly and didactically presented.

In conclusion, the discussion regarding changes and improvements to packaging due to food loss is extremely complex and entails different agents along the production chain, as well as economic, social, environmental, logistical, cultural and managerial aspects. However, small changes to the structure and information in packaging may influence consumers' behaviour with regard to identifying better packages for their types of consumption, as well as the various possibilities of storage and preservation, which allows for an overall reduction in food loss.

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