



Understanding
consumers'
responses to
Bio-based
packaging

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Ik hoop dat u het leuk zal vinden om mijn werk te lezen,
Espero que disfrute leyendo mi trabajo,

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CONTENTS

Acknowledgments
Contents
Glossary

CHAPTER 1 INTRODUCTION

Introduction	8
1.1 Tetra Pak.....	10
1.2 Tetra Pak the pack that grows back.....	11
1.3 Context and problem definition.....	13
1.4 Scope and research objectives.....	15
1.5 Relevance of the study.....	17

CHAPTER 2 THEORETICAL BACKGROUND

2.1 Sustainable packaging.....	22
2.2 Consumer responses to bio-based packaging.....	23
2.3 Consumer responses to packaging sustainability.....	25
2.4 Packaging informational elements.....	28

CHAPTER 3 QUALITATIVE ANALYSIS

3.1 Qualitative data collection.....	34
3.2 Participants.....	37
3.3 Semi-structured interview.....	39
3.4 Stimuli.....	41
3.5 Analysis.....	45
3.6 Results.....	47
3.7 Conclusions.....	57
3.8 Implications.....	58
3.9 Limitations.....	61

CHAPTER 4 QUANTITATIVE ANALYSIS

4.1 Quantitative data collection.....	64
4.2 Method.....	66
4.3 Participants.....	68
4.4 Stimuli.....	70
4.5 Analysis.....	75
4.6 Results.....	77
4.7 Conclusions.....	91
4.8 Implications.....	92
4.9 Limitations and further research.....	98

CHAPTER 5 RECOMMENDATIONS

5.1 Recommendations for Tetra Pak.....	102
Reflection.....	108
References.....	110

GLOSSARY

BIO-BASED PACKAGING: Is a package which its materials are derived from natural resources. These resources are usually renewable such as wood, sugarcane, algae, rice, corn etc.

RENEWABLE RESOURCES: A feedstock is renewable when it is collected from resources which naturally grow back. A Bio-based feedstock can be called renewable as long as new crop cultivation balances harvesting.

PLANT-BASED PACKAGING: Is a synonym of bio-based packaging.

BIO-BASED CONCEPT: Refers to the whole bio-based alternative for the industry and consumers.

FOSSIL-BASED PLASTICS: Petrochemical or fossil plastics are made of fossil feedstocks like petroleum and natural gas.

BIOPLASTICS: Are different types of plastics made of renewable sources such as Bio-PE, PLA, PHA, BIO-PET or PTT.

SUSTAINABLE PACKAGING: Is a package which reduces the environmental impact and ecological footprint in different parts of its life-cycle.

GMO: Genetically modified organism, is a plant, animal or other organism whose genetic makeup has been modified.

GHG-EMISSIONS: Greenhouse gas emissions, are gases that trap heat in the atmosphere.

Co2 EMISSIONS: Carbon dioxide, enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, trees and wood products.

SUGARCANE: A tall grass which grows in tropical and warm regions. Is mainly used to produce sugar and energy. Furthermore, sugarcane is a renewable source currently used to produce bioplastics.



INTRODUCTION

1. INTRODUCTION

In the last decade, consumers have increased their consciousness for sustainable packaging alternatives (Schlegelmilch, Bohlen & Diamantopoulos, 1996). Hence, packaging sustainability plays an important role for consumers when evaluating product attributes. However, previous studies have demonstrated that there is a big gap between consumers' attitudes towards sustainable products and their consumption behaviour (Luchs, Naylor, Irwin, & Raghunathan 2010; Silayoi & Speece, 2007; Laroche, Bergeron & Barbaro-Forleo, 2001). The higher price of sustainable alternatives represents the biggest barrier for consumers (Luchs et al., 2010). Furthermore, a number of green claims, labels, and certifications in the market have led to some consumers' scepticism towards sustainable products such as green consumers (Zinkhan & Carlson, 1995).

Packaging made from renewable sources has become more important in our society every day.

Global brands are attempting to differentiate by reducing the dependency on fossil fuels and adding bio-based materials to their products (Reinders, Onwezen & Meeusen, 2017). Bio-based packaging has been recently introduced to the market and little is known about consumer responses. However, the concept has been considered an eco-friendly alternative (Yates & Barlow, 2013). Therefore, sustainable packaging findings from previous studies can contribute to analysing the bio-based packaging concept and the consumers' perceptions towards these alternatives.

The following research project intends to gain a deeper understanding of the reasons influencing consumers' purchase intentions towards beverage cartons with bio-based plastic. This project will show the results of two studies carried out in the Netherlands on beverage cartons with bio-based plastic. The first study is based on a qualitative approach which will discuss consumers'

preconceptions and perceptions on beverage cartons with bio-based plastics. The second study is an experimental approach aiming to identify which type of informational cues better represent the concept of beverage cartons with bio-based plastic in terms of clarity, understanding, and attractiveness. Finally, this research offers theoretical and practical implications as well as guidelines for the company Tetra Pak on how to position beverage cartons with bio-based plastic in the Dutch market.



1.1 TETRA PAK

Tetra Pak is a multinational founded in Sweden, which designs and produces carton packaging solutions and processing for the food industry in 170 countries around the world. Tetra Pak focuses on sustainable innovation of aseptic and chilled packaging for beverages to preserve them in good conditions for the consumption. Currently, Tetra Pak has 11 package families in its portfolio (figure 1) which offer different alternatives for its clients.

On the one hand, the aseptic solutions focus on retaining colour, texture, natural taste, and nutritional value for up to 12 months. On the other hand, Tetra Pak offers chilled solutions to protect fresh products for short term consumption. Tetra Pak provides its customers with end-to-end solutions which are based on processing, service solutions, maintaining food safety, operational performance and sustainability.



Figure 1. Tetra Pak - Product's portfolio

1.2 THE PACK THAT GROWS BACK

As part of sustainability, Tetra Pak focuses on being socially responsible across their value chain. Therefore, the company has set new goals which aim to improve its philosophy regarding sustainability and social responsibility. In 2015, Tetra Pak launched the first fully bio-based beverage cartons. The packaging is manufactured solely from renewable sources such as wood (to produce the carton) and sugarcane (to produce the plastic coating and the cap).

Tetra Pak is highly concerned about the end-life of their products. Hence, the new concept aims to tackle the full life-cycle of the packaging by using renewable sources to be produced and being fully recyclable. Currently, the company offers two options for bio-based packaging alternatives. In the chilled category (figure 2), the company has launched a fully renewable package. However, in the aseptic category (figure 3), the package is partially bio-based which means that only a certain percentage of the package comes from renewable sources. This is

related to the fact that the aseptic solutions use a layer of aluminium which is not bio-based yet.



Figure 2. Chilled cartons with bio-based plastic.



Figure 3. Aseptic cartons with bio-based plastic.

The beverage cartons with bio-based plastic that Tetra Pak offers to the market are very similar to the regular beverage carton packaging with fossil-based plastic. Its appearance and ease of use do not differ at all. However, the key concept is related to the renewability of the sources and the reduction of Co2 emissions during the production of the packages. Figure 4 and 5 illustrate the main differences between beverage cartons with bio-based plastics and beverage cartons with fossil-based plastics.

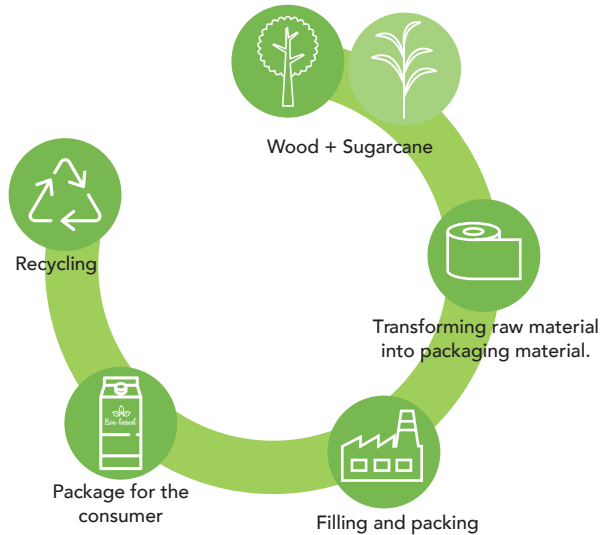


Figure 4. Bio-based beverage cartons' process

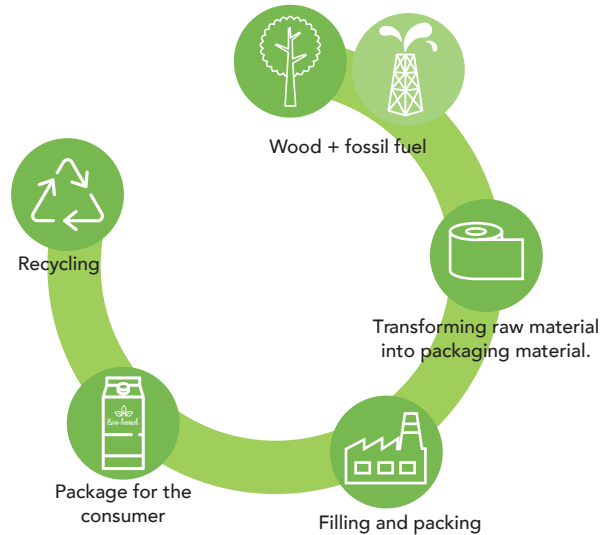


Figure 5. Conventional beverage cartons' process

1.3 CONTEXT AND PROBLEM DEFINITION

Bio-based packaging is a sustainable alternative to petrochemical plastic packaging because it reduces the dependency on fossil fuel resources and lowers CO₂ emissions. Some studies show that brands that use bio-based materials in their products will have a ¹ relative advantage in the market (Carus, Eder & Beckmann, 2014; Grimmer & Bingham, 2013; Reinders et al., 2017). Therefore, the popularity of bio-based materials is growing especially in the packaging industry. According to PlasticsEurope (2016) the demand for bioplastics in the packaging industry is almost 40% (1.6 million tonnes) of the total bioplastics market. The main advantage of bio-based packaging solutions is related to its origin. Bio-based materials come from sources of direct or indirect natural source (Molenveld, Van den Oever & Bos, 2015). Bioplastics can originate from sugarcane, corn, potatoes, wheat or vegetable oil (Department of Ecology, 2014). Furthermore, enterprises can choose

to have partially or fully bio-based packaging. It depends on the percentage of natural material that is involved in the production.

Despite the advantages that bio-based packaging offers to the packaging industry, there are several concerns regarding bio-based packaging since the topic is still premature (Sijtsema et al., 2016). Although technological advancement can contribute to reducing the cost of bio-based materials, at the moment the cost of bio-based packaging is higher than their fossil-based counterparts. In addition, there is still much debate about the benefits and environmental impact that bio-based materials may have (Álvarez-Chávez, Edwards, Moure-Eraso & Geiser 2012; Hottle, Bilec & Landis 2013). Literature is scarce regarding consumer responses towards bio-based packaging alternatives since only a few authors have studied the topic from the consumers' side (Reinders et al., 2017; Sijtsema et al., 2016;

¹ The relative advantage is the degree to which a new product is perceived as being better from the consumer's perspective in comparison with other alternatives (Karahanna et al., 2002; Roger 2003).

Walter, 2011). As a matter of fact, mainstream consumers often do not know the differences between bioplastics, conventional plastics and other sustainable alternatives such as biodegradable, compostable and recyclable due to its lack of information in the market (Van den Oever, Molenveld, Van der Zee, & Bos, 2017). Figure 6 illustrate the main differences between the concepts.






CONCEPT	DESCRIPTION	ADVANTAGE	DISADVANTAGES
 BIO-BASED	A package made from renewable sources (natural sources).	No oil dependence. Reduce carbon footprint.	Can be recycled or not depending on the type of material.
 RECYCLED	A package made of recycled materials.	Reduce the consumption of fresh raw materials.	Products from recycled waste may not have a good quality.
 BIODEGRADABLE	A package that can discompose into natural chemical elements by naturally occurring microorganisms (eg., fungi or bacteria)	Does not need fossil fuels to be recycled.	Need for industrial composters.
 COMPOSTABLE	A package which biodegrades in similar conditions as natural composting materials without generation any toxic residue or harm to the environment.	No waste at all.	Poor quality protection.
 RECYCLABLE	A package which its material can be recycled and needs to be disposed of in a specific bin.	Contributes preserving the natural sources.	The environmental cost should be at least in balance with the environmental benefit.

Figure 6. Differences of sustainable concepts

1.4 SCOPE AND RESEARCH OBJECTIVES

Research on bio-based packaging has been mainly focused on packaging fully made out of plastic. In order to be considered bio-based, a package needs to be made from renewable sources. Tetra Pak's beverage packages are categorized as carton packages, but polyethylene is used in different coatings of the package and the cap. Therefore, this graduation assignment has its focus on beverage cartons with bio-based plastic. Additionally, it will mainly explore consumers' responses towards this type of packaging in the Dutch market.

The graduation assignment will comprehend two main phases. A qualitative approach, using semi-structured interviews with consumers to gain in-depth insights on the consumers' preconceptions, personal values, purchase intentions and attitudes towards beverage cartons with bio-based plastic. The second phase of the project will involve a quantitative approach. An experiment will be carried out upon current design approaches of how to present the bio-based concept

through information displayed on the package. This approach will contribute developing generalizations about the findings to a wider population as well as understanding general patterns in the diversity of responses regarding bio-based packaging (Braun & Clarke, 2013). The research also attempts to add to the current findings in the literature.

Finally, this graduation assignment aims to offer Tetra Pak a consumer-centered approach of how to present the bio-based concept for Dutch consumers. However, the guidelines and findings of this study can later be used by designers and marketers in the packaging industry. Overall, this graduation assignment aims to answer the main research questions and sub-questions

HOW CAN CARTONS WITH BIO-BASED PLASTIC TRIGGER DUTCH CONSUMERS' PURCHASE INTENTIONS ?

QUALITATIVE APPROACH

How do consumers of beverage cartons perceive packaging with bio-based plastic compared to beverage cartons that have fossil-based plastic?

QUANTITATIVE APPROACH

What type of informational cues better represent the concept of beverage cartons with bio-based plastic for consumers in terms of clarity, understanding and attractiveness?

1.5 RELEVANCE OF THE STUDY

Maximizing the design guidelines to reach consumers and enhance purchase intentions towards bio-based packaging involves developing a deep understanding of different factors that might influence these purchase intentions. These findings can be accomplished through research. However, several findings about how to enhance purchase intentions for sustainable packaging alternatives can contribute to this study (Creyer, 1997; Magnier & Crié, 2015; Silayoi & Speece, 2007). This graduation project aims to apply the theory found in previous research as well as to provide specific guidelines for the packaging industry on how to introduce the bio-based concept to different types of consumers.

Currently, the benefits of bio-based packaging for consumers and the environment are still under discussion. Manufacturers have focused on investigating the physical properties, developing facilities, and life-cycle of bio-based materials compared to fossil-based materials (European

Bioplastics, 2015; Lagarón, López Rubio & José Fabra, 2016; Molenveld et al., 2015). However, bio-based packaging is considered a sustainable packaging alternative. Therefore, generalization of previous findings such as packaging ecological cues that trigger consumer preferences for sustainable alternatives will be considered (e.g., Magnier & Crié 2015; Steenis, Van Herpen, Van der Lans, Ligthart & Van Trijp, 2017) In addition, packaging verbal cues to communicate sustainability such as eco-labels will be analysed to understand to what extent these findings apply to the bio-based concept (e.g., Magnier & Schoormans, 2015; Pancer, McShane & Noseworthy, 2017).

This research aims to contribute to current literature by exploring consumers' preconceptions and perceptions on the bio-based concept. In addition, the study aims to build on literature by uncovering consumers opinions on the concept and providing statistical facts on consumers' preferences of communication for the bio-based concept to enhance

purchase intentions. Based on insights provided by the consumers, it is intended to improve the current ways of communication that the packaging industry is using to differentiate the bio-based concept from similar sustainable alternatives. Global brands do not only compete on implementing bio-based materials in the packaging but the way the concept is presented to their consumers. This means that the communication provided to consumers should be carefully designed. For the scope of this project only informational cues will be explored since they have been less studied in literature in comparison with visual cues. In addition, these informational cues are more suitable for Tetra Pak to communicate with their clients and consumers. However, findings of this study imply that brand managers should not only rely on the effectiveness of communication but also explore them in combination with other purchase intention drivers (e.g., personality traits, brand ethically, perceived benefits).

A scenic mountain landscape featuring a calm lake in the middle ground, surrounded by dense evergreen forests. In the foreground, a rocky path leads through lush green vegetation. The background shows steep, forested mountains under a cloudy sky with soft, golden light. A semi-transparent white box with a thin black border is centered over the image, containing the text "THEORETICAL BACKGROUND".

THEORETICAL
BACKGROUND

“Sustainable development is the pathway to the future we want for all. It offers a framework to generate economic growth, achieve social justice, exercise environmental stewardship and strengthen governance.”

Ban Ki-moon

2.1 SUSTAINABLE PACKAGING

Packaging sustainability is defined by consumers and manufacturers in different ways. While sustainability for consumers is mainly related to a positive impact for the environment, for the industry it means a market strategy which is based on the reduction of energy and footprint. Although consumers usually relate packaging with the main source of pollution (Bech-Larsen, 1996), convincing consumers to choose sustainable packaging alternatives is difficult. First, consumers lack knowledge in the definition of different terms in the sustainable field. Secondly, the number of green claims in the market had led to consumers' misconceptions of sustainability. Third, sustainability is not the most important feature for decision-making. Consumers usually evaluate different types of benefits such as product quality and price rather than packaging benefits (Steenis et al., 2017).

Packaging sustainability can be analysed from different perspectives. However, what triggers consumers' attention in packaging is the design structure which are the signals that allow consumers to infer sustainability

(e.g., verbal information, graphical information or materials). The materials and colours used in a packaging to evoke sustainability are key elements that consumers associate with environmental impact (Magnier and Crié, 2015). However, graphic elements and verbal cues are an explicit way to communicate sustainability. According to Connolly & Prothero, (2003) when consumers think about sustainable packaging they tend to associate it with recyclability. In addition, consumers usually assess the sustainability of a package based on stereotypes. For instance, glass is usually perceived as environmentally friendly due to the fact that it can be used multiple times. In contrast, plastic has a negative connotation due to its negative environmental impact and health effects (Hopewell, Dvorak & Kosior, 2009).

2.2 CONSUMER RESPONSES TO BIO-BASED PACKAGING

It is expected that in a short-term future bio-based production will improve and totally replace the dependence on fossil-based resources (Sijtsema et al., 2016). Although the concept seems to generate several benefits for the packaging industry, technology, and society, its complexity to be understood especially from the consumers' side has become the biggest barrier. Up to now, a few studies have been carried out to understand consumer responses towards bio-based packaging alternatives. From a general perspective consumers usually refer to bio-based packaging alternatives as environmentally friendly (Sijtsema et al., 2016). Therefore, brands which use bio-based packaging in their products are positively perceived by consumers (Carus et al., 2014). According to Reinders et al., (2017) the percentage of bio-based material in a package is important for consumers. The authors found that brands with fully bio-based (100%) enhanced purchase intentions. On the contrary, brands with partially bio-based materials are not

always better perceived than brands which do not use bio-based material at all. Consumers believe that when a brand displays the percentage of bio-based material on a package, the company has made a big effort to preserve the environment and this fact might stimulate purchase intentions (Grimmer & Bingham, 2013). Furthermore, a study conducted in the USA and Canada concluded that 85% the consumers in Canada and 77% of the consumers in USA were likely to purchase bio-based packing when the benefits of the package for the environment were told (Walter, 2011). Based on this finding, brands that claim the percentage and benefits of using bio-based materials on a package evoke stronger purchase intentions than brands which use partially bio-based packages.

However, some literature has focused on understanding in which conditions consumers feel attracted to bio-based packaging. Koenig-Lewis, Palmer, Dermody & McConnell (2014), has investigated consumers' emotional (e.g., happiness, optimistic, enthusiastic) and rational (e.g.,

environmental benefits) evaluations of bio-based packaging. The study emphasises that emotions and environmental concerns play an important role in predicting purchasing behaviours towards plant-based packages. Reinders et al., (2017) have found that the effect on purchase intentions is mediated by brand attitude and brand-induced emotions. This means that when a brand is perceived as eco-friendly, positive emotional responses arise from consumers. In addition, the author has stated that these effects are stronger for consumers that are environmentally conscious. Sijtsema et al., (2016) in a qualitative study of consumers' perceptions towards bio-based packaging in five European countries, have encountered that consumers do not have knowledge on the concept because of its complexity. However, once the concept is explained to consumers, positive, negative and mixed feelings (both) arise. For instance, a positive feeling is related to the environmental attributes of the concept whereas a negative feeling is related to the cost of the package. It could be concluded that consumers do not understand the advantages and disadvantages of purchasing bio-based packaging. Despite the great popularity of the topic especially in Europe, consumers are not familiar with bio-based packages and little is known about the concept. As a matter of fact, consumers do not understand the concept and its main advantages and disadvantages. Therefore, this study aims to understand consumers' responses towards bio-based packaging from a general perspective (preconception and perceptions) to

specific directions on how to create knowledge and understanding of the concept.

2.3 CONSUMER RESPONSES TO PACKAGING SUSTAINABILITY

A package is one way a brand communicates to consumers signals about the brand personality and product information (Orth & Malkewitz, 2008). However, the way a consumer perceives a package has been divided in literature in two main theories: The Gestalt theory in which the package is seen as a whole and the analytical theory in which specific elements are considered for consumer responses (e.g., verbal, graphical or structural elements) (Magnier & Crié, 2015). Analysing packaging as a whole might encounter difficulties when determining which specific elements are triggering the consumer's attention especially in packaging sustainability. In order to understand what type of elements are enhancing the sustainability of the package, it is essential to evaluate elements independently.

2.3.1 VISUAL ELEMENTS

Literature has divided the design elements of the package in different categories and ways to understand consumers' responses (Magnier & Crié, 2015; Rettie & Brewer, 2000; Silayoi & Speece, 2004; Underwood, 2003). These elements can be understood as discrete design elements such as colour, shape, size, image, logos and claims of a package (Magnier and Schoormans, 2015). According to Silayoi and Speece (2004) design elements can be divided in two categories: visual package elements (e.g., graphics, colour, shape, and size) and informational package elements (information provided and technology). Nevertheless, the essence of dividing elements in sub-categories, enable researchers to understand which of these elements specifically influence consumer responses.

Visual elements (e.g., colours, typography, images)

are the first stimuli that consumers perceive since they are processed quickly (Magnier & Schoormans, 2015) and are retained in the brain (Silayoi & Speece, 2004). Therefore, the way in which the visual elements are positioned in the package matters because it may make the difference between identifying and missing an item on the package (Duncan Herrington & Capella, 1995). Research on packaging sustainability has found that consumers rely on material to identify the sustainability of a package (Lindh, Olsson & Williams, 2016; Magnier & Crie, 2015). For instance, Steenis et al., (2017) have stated that altering packaging materials affects the perception on sustainability as well as perceived taste and quality of the product. Product pictures on the package and colour cues are another way to enhance sustainability. According to DeLong and Goncu-Berk (2012) the colour green is used in verbal and visual information to evoke sustainability. Consumers directly associated the colour green with the environment and several strategies have been developed around this concept such as 'green lifestyle' or 'green consumption'. Rokka and Uusitalo (2008) have found that consumers consider environmentally labelled packaging as the most important criteria in packaging sustainability to identify the concept. These findings, contribute to this graduation assignment to determine the key elements that might be considered introducing bio-based packaging for Dutch consumers.

2.3.2 INFORMATIONAL ELEMENTS

According to Silayoi and Speece (2004) informational elements are also important for consumers on decision-making. These elements are defined as written information to assist consumers on their choice. However, the authors state that the amount of information provided in the package matters since too much information or less information can lead to consumers' confusion. Informational elements can be understood in packaging sustainability as the environmental labelling, licensing agreements or general environmental claims (Magnier & Crié, 2015). Furthermore, verbal elements are considered concrete, direct and easily to be understood by consumers (Magnier & Schoormans, 2015).

The role of verbal elements is to reinforce the information of visual elements since both need to be used in order to provide clear information as well as explain the main differences and added value of a concept. However, in packaging sustainability little is known about the type of informational elements that need to be presented to consumers in order to enhance purchase intentions. This is essential because consumers lack knowledge on packaging sustainability. When consumers are asked to talk about packaging sustainability they tempt to over-emphasize on recyclability ignoring additional aspects in sustainable packaging (Steenis et al., 2017). However, it is important for consumers to understand

the reasons behind sustainability and additional benefits of purchasing these products. Silayoi and Speece (2004), state that time is a precious resource for consumers. Therefore, the product convenience (advantages of the product) presented in the package is a key element for decision making. Convenience can be combined with technological elements which the authors have defined as the technologies used in the package (e.g., sources, materials). By integrating both technologies and convenience of the product, consumers can have stronger arguments to choose for a specific product and thus a package. Additional informational elements in sustainable packaging such as labels are quite important for consumers. Rokka and Uusitalo (2008) have stated that consumers fail to understand the link between their buying decision and the environmental consequences if no environmental information is provided. Therefore, they suggest that designers and marketer can consider labels to communicate sustainability. However, labels are not always understood by consumers (D'Souza, Taghian, Lamb & Peretiatko, 2007). Through this research, it is intended to understand what type of informational elements are the most effective to communicate the bio-based concept to consumers and how they need to be displayed in order to enhance purchase intentions.

2.4 PACKAGING INFORMATIONAL ELEMENTS DESIGN

It is common that brands use different strategies in packaging communication to get consumers' attention. Illustrations, pictograms and photography are the most common ways for brands to communicate a message. However, for the scope of this study three main communication styles will be discussed; semiotics, infographics, and storytelling in packaging communication. In order to understand the composition of the three styles mentioned previously, it is essential to understand the role of images and words in packaging communication. Incorporating imagery in packaging communication guarantees accessibility to consumers since pictures are extremely vivid stimuli compared to words (Alesandrini & Sheikh, 1983; Mandler & Johnson, 1976; Underwood, Klein & Burke, 2001). Usually visuals are placed on the front surface of the package since it is considering the entire visual field for consumers (Schubert, 2005) Furthermore, consumers can understand better the benefits of the product though photography (Underwood et al., 2001).

The use of photography on the package increases the shopper's attention to a brand and influences consumer's decision-making (Alesandrini and Sheikh, 1983; Underwood et al., 2001). However, in order to deliver the right message to the consumer, the picture has to be well-produced enhancing the benefits of the product and evoking memorable and positive associations with the product (Underwood et al., 2001). Although images are a straightforward type of communication with the consumer, words are still needed to reinforce the message that the brand wants to deliver.

2.4.1 SEMIOTICS IN PACKAGING COMMUNICATION

Semiotics refers to the way in which people make sense of the world and reality via symbols (Lacey, 1998). Wu, Bao, Song, and Hu (2009) explain that symbols also play an important role in packaging communication since they can cause more resonance

than word marks. Symbols are understood as marks, signs or words that represent an idea or a concept. Symbols convey direct information in an effective way. The role of symbols in packaging communication is related to the fact that consumers associate symbolic meanings with products that they consume (Leigh & Gabel, 1992). Although symbols are usually universal, and consumers can easily portray meanings to an image, not every culture or person can interpret symbols equally. However, there are symbols that are easily understood due to its universal characterization such as letters which are symbols for sounds or numerals which are symbols for numbers. These associations have been defined in the literature as the signifier (the word, image or sound) and the signified (the concept or idea) (Hall, 1997). Symbols are a driver to communicate a concrete concept. For instance, the recyclable symbol is well known among all types of consumers. Consumers usually have positive perceptions when a package shows the recyclable symbol (figure 7) because they identify it as sustainable and feel encouraged to make a proper disposal of the package (Weinstock, 1998). Therefore, the role of a symbol on a package can influence a behaviour or create knowledge on the consumer. Therefore, in this study, it could be expected that consumers will find logos clearer and concrete compared to infographics and storytelling.



Figure 7. Recyclable symbol

2.4.2 INFOGRAPHICS

Infographics are a compilation of data and ideas to convey a complex message to an audience (Smiciklas, 2012). The information presented in infographic needs to be carefully designed since it should be structured and comprehensible for the reader (Zavadil & da Silva, 2014). It has been found in previous research that infographics engage consumers because the way the information is presented is easily memorized (Harrison, Reinecke & Chang, 2015; Borkin et al., 2013). Therefore, more and more companies use infographics for communicating strategies since it has become one of the most popular ways to communicate large data to diverse kinds of consumers (Bateman et al., 2010; Borkin et al., 2013). For instance, Nescafe has launched the concept 'Nescafe travel' which aims to immerse the consumer in an experience of different types of coffee from Brazil, Colombia, and Kenya

traveling through taste. The label has been made in the style of a plane ticket which emphasizes the idea (figure 8).

The role of aesthetics in infographics is to trigger the attention of the observer so the more the observer look at the infographic the more information he/she gets (Van Wijk, 2005). Hence, the information presented in the infographics needs to be linked guiding the observer to understand the whole concept in a short time. According to Lankow, Ritchie, and Crooks (2012) there are three steps to guarantee an effective communication in infographic; appeal, comprehension, and retention. Appeal implies that the audience gets easily engage in the infographic. Comprehension refers to the understanding and the created knowledge that the observer gets. Retention means that the information should be kept by the consumer by making it memorable. Therefore, in this study, it could be expected that consumers will find infographics easier to understand in comparison with logos and storytelling.



Figure 8. Nescafe travel experience

2.4.3 STORYTELLING

Through history, man has always used drawings to tell a story. A story usually takes place in a specific context, has an order and sequence which contains words, images, photos etc. (Kosara & Mackinlay, 2013). However, storytelling can be divided into two main streams: the stories which combine visualization and data and the narrative stories that coincide with time (previous or future events) (Kosara & Mackinlay, 2013). Storytelling is used nowadays especially in marketing and social media because consumers are curious about the reasons behind a product or a brand. Storytelling is used as a narrative to communicate important marketing strategies of a brand. For instance, the English brand William Whistle has created a character which consumers can identify with. William Whistle is an English tea and coffee merchant who travels around the world discovering exotic flavours for his products. Storytelling has a positive effect on consumers' responses since they feel more persuaded about the message a brand is trying to convey. This is an important fact for brands to consider because through storytelling the image of a brand and its position on the consumer mind can be reinforced (Lundqvist, Liljander, Gummerus & Van Riel, 2013). However, little is known in packaging design about consumer responses towards storytelling. In this study, we could expect that storytelling will be more attractive to consumers than logos and infographics.



Figure 9. William Whistle storytelling



**QUALITATIVE
ANALYSIS**

“We cannot but feel uneasy about the losses caused by humanity themselves. Apart from the losses of life and property in destructive wars, the environment and natural resources are also being destroyed by human hands.”

Nong Duc Manh

3.1 QUALITATIVE DATA COLLECTION

The aim of the following study is based on four topics. First, this study aimed to explore the preconceptions and assumptions that consumers had about bio-based packaging as well as responses and recommendations after being introduced to the topic. Second, it was intended to uncover consumers' opinions on the advantages, disadvantages, and similarities that beverage cartons with bio-based plastics offer compared to beverage cartons with fossil-based plastics. Third, it was necessary to understand what consumers know about environmentally friendly packaging alternatives in the market and how they perceive them since the bio-based packaging is part of the sustainable alternatives. Finally, to contextualize consumers, it was essential to understand how they perceive beverage carton packages in comparison to other packaging alternatives on the market. The reasons to choose beverage carton packages were also explored in this stage. Figure 10, illustrates the process in which the smallest circle was the core

purpose of the approach and the bigger circles the more general objectives.

A few experiments have been carried out regarding consumers' opinions and experiences with bio-based packaging. It has been proven that when a package is fully bio-based (100%), the purchase intentions are stimulated rather than when the package is partially bio-based (Grimmer & Bingham, 2013; Sijtsema et al., 2016; Reinders et al., 2017). Furthermore, Hartmann et al., (2005) stated that the way to enhance purchase intentions for brands using bio-based materials is through the positive evaluation of the brand. Therefore, the relationship between brand evaluation and bio-based materials has been analysed in a previous study. It has been determined that the purchase intention towards bio-based products depends on consumers' feelings and rational deliberations towards a brand (Reinders et al., 2017). In addition, Kainz (2016), stated that bio-based claims are evaluated differently for different types of products. Fruits, vegetables, and hygienic products

are more suitable for bio-based packaging because consumers could think that the plant-based materials have a positive influence on the content (Almenar Samsudin, Auras & Harte, 2010; Reinders et al, 2017). Nevertheless, current studies have not explored yet consumers' preconceptions and opinions about different types of bio-based packaging alternatives (e.g. carton packages with bio-based plastic coating) but only packages fully made of plastic using bio-polymers.

This qualitative research has been set up intending to further explore consumers' feelings, emotions, experiences and responses towards beverage cartons with bio-based plastics. The method used for this study is the interview. Through an interview it is possible to understand people's perspectives on a topic to build a theory (Patton, 2002). For this research project, the interview suits the goal of the study which is based on an exploratory approach understanding what consumers know and what they assume about bio-based packaging. A categorization of data gathered was done and the main findings will be presented in this chapter.

The results of this study will contribute to the generation of guidelines on how to approach consumers of non-bio-based packaging alternatives from a marketing perspective. This section will discuss the procedure, results, conclusions, implications, and limitations of the information gathered through the interviews. The research question of this study has

been formulated as follows:

How do consumers of beverage cartons perceive packaging with bio-based plastic compared to beverage cartons that have fossil-based plastic? (e.g. Juices, dairy products, soups, etc.)

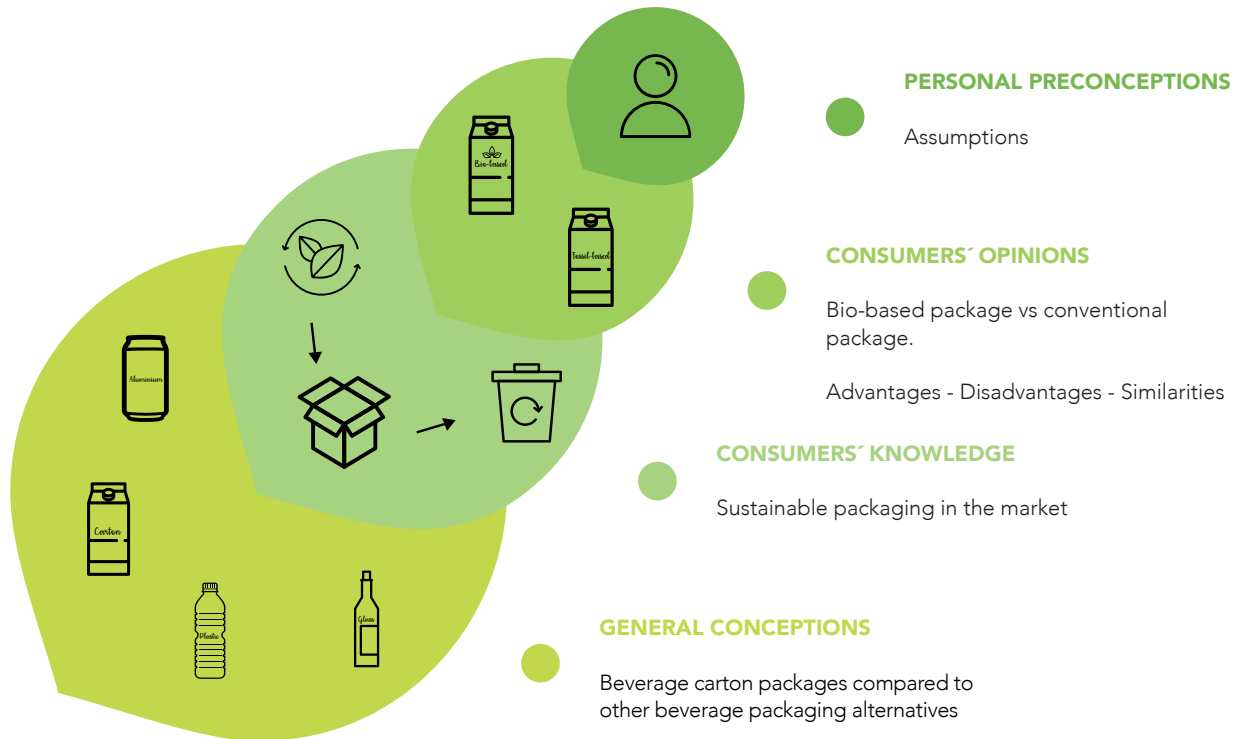


Figure 10. Research goals - from general (big circle) to specific goals (little circle)

3.2 PARTICIPANTS

In order to explore consumers' opinions about bio-based packaging, 10 semi-structured face-to-face interviews were carried out. The participants should have experience with beverage cartons because the interview was focused on beverage carton packages. Since the project aims to identify a new target group in the market, the sampling intended to be as varied as possible in terms of participants' backgrounds, education, marital status, gender and location. Only Dutch participants were considered since the research aimed to uncover findings in the Netherlands. Finally, the age range was diverse because it is necessary to understand the difference between cases and opinions. Therefore, participants from 20 to 70 years of age were considered.

The interviews were recorded with the consent of the participants and the recordings were transcribed. However, it was agreed that the identity of the participants was going to be anonymised. Therefore, each participant got a code with the letter P which

stands for the word participant and the initials of their name and surname respectively. e.g. [P-FB]. In the following analysis, several quotes have been taken from the original interviews to point out important facts. Since there were 10 participants in total, when a category is mentioned, the number of participants that gave the same or a similar answer will be indicated by a number, e.g. (4/10). That means four out of ten people. Table 1 describes the characteristics of the participants.

	Gender	Age	Location	Marital status	Profession
PARTICIPANTS					
[P-RL]	F	23	Utrecht	Single	Student
[P-CF]	F	31	Delft	Single	Teacher TU Delft
[P-CvL]	F	33	Dongen	Married	Administrative assistant
[P-KvT]	F	44	Groningen	Married	Housewife
[P-IS]	F	58	Apeldoorn	Divorced	Account manager
[P-FB]	M	28	Gouda	Single	Transporter planner
[P-RS]	M	33	Vlijmen	Married	Finance consultant
[P-Dk]	M	56	Haarlem	Divorced	Pilot of the Dutch airforce
[P-PvD]	M	63	Den Haag	Divorced	Entrepreneur
[P-IS]	M	70	Rotterdam	Married	Entrepreneur

Table 1. Participants' characteristics

3.3 SEMI-STRUCTURED INTERVIEW

The interview guide intended to list the most relevant aspects to be discussed during the interview. In this type of interview structure, the interviewer can freely probe depending on the answers of the participant to enrich the analysis. According to Patton (2002) the interview guide should enable the interviewer to order the topics from the general ones to the specific area of study. In this way, participants will be able to answer the same questions to increase the comparability of responses between them. Therefore, the interview guide was divided according to four sub-research questions presented as follows:

1. How do consumers perceive beverage cartons?
2. How do consumers recognize sustainable packaging among other types of beverage packaging?
3. What are the preconceptions that consumers have about bio-based packaging?

4. How do consumers perceive packaging with bio-based plastics compared to packaging with fossil-based plastics?

Each section had questions regarding the main topic. The topic guide can be found in Appendix 1. The first section explores the reasons and arguments that consumers have to choose beverage carton packages, the purchasing frequency and the product selection criteria in the supermarket. Followed by this section, participants were encouraged to think about sustainable packaging alternatives in the market, share their personal experiences and general thoughts about these alternatives.

Once participants were familiar with the topic, they were asked to explain their opinion on bio-based packaging and other sustainable concepts. Finally, a brief explanation of the concept was introduced to participants illustrating the main differences between beverage carton with bio-based plastic

and beverage carton with fossil-based plastic. After these explanations, participants were encouraged to come up with comparisons, advantages, disadvantages, and similarities between beverage carton with bio-based plastic and beverage carton with fossil-based plastic. Additional aspects, such as willingness to purchase bio-based packaging and recommendations for brands to make the product more appealing to consumers were discussed. Two pilot interviews were carried out to refine and verify the consistency of the interview guide

3.4 STIMULI

3.4.1 SAMPLE A

Although only a few studies have been conducted to determine the interactions between the bio-based polymers and the food products, it has been found that bio-based packaging has a potential for biological products because of its price and market niche (Petersen et. al., 1999) Therefore, in the section of preconceptions on bio-based packaging, a biological soya milk was chosen as a stimulus to identify whether consumers will make the same association and which attributes were communicating a positive or negative relationship. Figure 11, illustrates the sample showed to the participants.



Figure 11. Alpro's biological soya milk.

3.4.2 SAMPLE B

Participants were asked to come up with definitions for renewable sources. This is perhaps a keyword which remarks the main difference between fossil-based and bio-based plastics. In addition, a stimulus was presented to contextualize the participant to see how they related the sample with the question. In order to avoid bias and let participants come up with their own definitions, this sample was chosen strategically since it is written in Swedish that the package is made out of plants. Figure 12, illustrates sample B.



Figure 12. Package made from renewable resources

3.4.3 VISUAL

To provide a holistic view of what the bio-based packaging concept stands for, it was necessary to illustrate the process, so consumers could notice the main differences with other sustainable concepts. In Tetra Pak's bio-based packaging concept both carton and plastic come from renewable sources. For consumers, it was necessary to understand what renewability means in this case and to what extent sugarcane makes a difference to the final product. Figure 13, illustrates the difference in the process when the package uses bio-based plastic and when it uses fossil-based plastic.

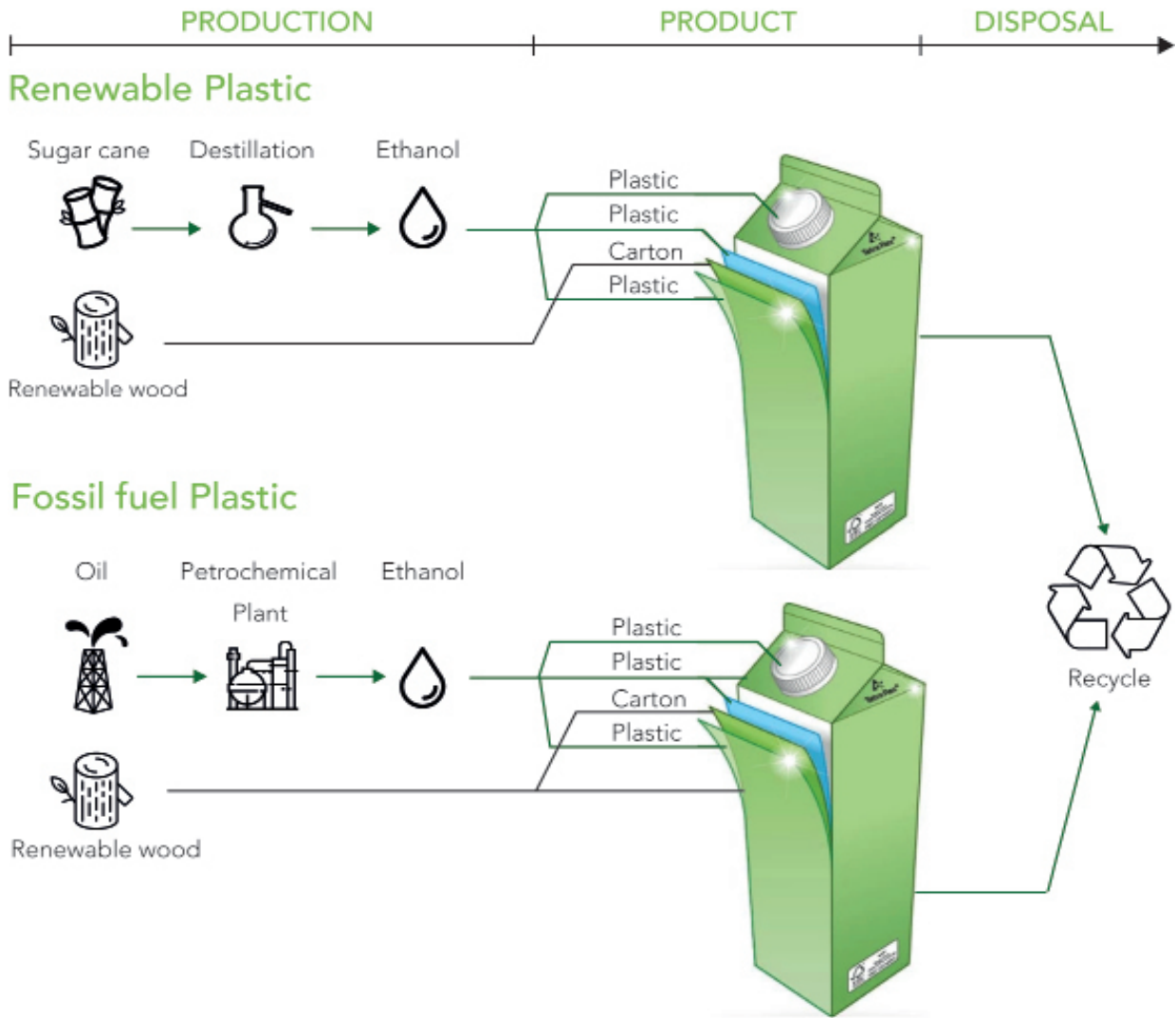


Figure 13. Main differences between beverage cartons with bio-based plastic and conventional beverage cartons.

3.4.4 SAMPLE C, D - E, F

Followed by the visual, participants were asked to compare four different samples in which C and D were bio-based and E and F were regular beverage carton packages. By doing so, it was intended to analyse what kinds of attributes would enable consumers to identify bio-based packaging in the market compared to non-bio-based packaging. Figure 14, illustrates the different samples used in this section.



C



D



E



F

Figure 14. Bio-based packaging (C-D) vs non-bio-based packaging (E-F)

3.5 ANALYSIS

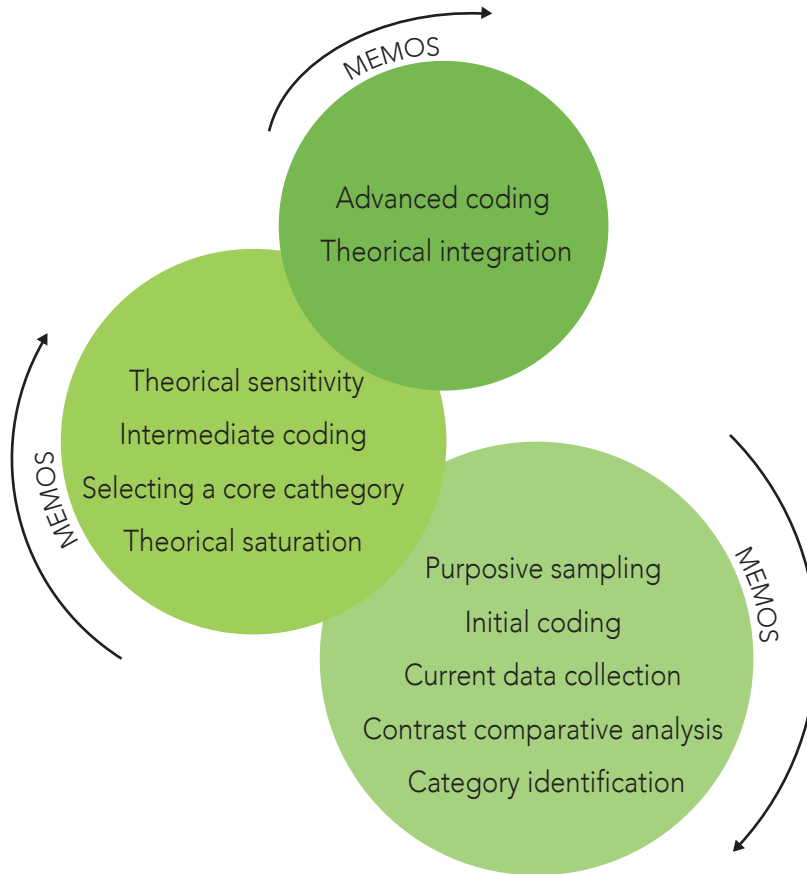


Figure 15. Essential grounded theory method by Briks and Mills (2015)

Following the essential grounded theory method, the data gathered in the interviews were initially coded (Birks & Mills, 2015). Based on some memos collected during the interviews which explained the relations that each participant expressed, the most remarkable quotes were selected to be analysed and coded. Once the quotes were selected and coded, statement cards were developed to redefine the quotes by using descriptive codes which are interpretations of the data gathered. The statement cards, in this case, created a better understanding of the interpretation due to the amount of data collected (Sanders & Stappers, 2012). Appendix 2, illustrates part of the process of the initial coding. The cards were sorted based on the interview structure to create initial clusters. However, new categories emerged, and some codes were reallocated.

Based on the initial categories, an intermediate coding was generated to link the relationship of different clusters. In this way, the interpretation of data becomes more abstract generating a more specific overview of the categories. Once the categories were defined, the core ones were identified to verify the theoretical saturation which is the phase in where there is no new data emerging (Birks and Mills, 2015). Figure 15, illustrates the essential grounded theory method followed for the data analysis of this study.

3.6 RESULTS

Findings from available studies have demonstrated that consumers' lack knowledge on sustainable concepts (Nordin & Selke, 2010; Young, 2007). It has been evidenced throughout this study since participants were constantly making misinterpretations of the terminology used in this field. As a matter of fact, a variation of connotations and definitions about the bio-based concept emerged. Taking into consideration these main findings, four categories have been created and will be further discussed in this section. The categories are discussed from the general aspects to the specific ones to understand the causes of the arguments provided by the participants. However, to have an overview of what each category implies a mind map has been developed to illustrate the links and relationships between the categories and the statements. Each statement has been developed based on the number of times that participants repeated the facts. More detailed information of the clusters and its links is presented in Appendix 3.

3.6.1 CONSUMERS' SELECTION CRITERIA

Several studies have pointed out that consumers and industrial manufacturers have increased their awareness in sustainable packaging alternatives (Nordin & Selke, 2010). Although participants manifested their concern about environmental issues due to packaging, none of them currently consider sustainability as an important product attribute. Consumers' choices for beverages are based on different principles such as the price which was mentioned as the main choice driver. Brands also play an important role in consumers' choices because they have experienced them previously and in some cases, it was directly related to quality

Importance of price (7/10)

[P-CvL] "I pay more attention to the price. That is the most important also when you have a big family."

Brand preference (4/10)

[P-IS] "Yeah I do prefer different brands for different products for instance...Not for milk! Then I buy everything what's in the fridge. Well...I buy the A brands."

Consumers are not aware of choosing a specific type of packaging especially if the packaging has sustainable attributes since packaging is less relevant in a purchase decision. However, ease of use and information about the content are some of the aspects that almost every participant considered when choosing a beverage packaging.

Ease of use (5/10)

[P-CvL] "Yeah...and that the children can manipulate it as well...and my husband because he has problems opening packages ahahaha."

Content information (10/10)

[P-FW] "I look at the contents and things like fat, carbohydrates, ingredients..."

3.6.2 CONSUMERS' EXPERIENCES AND PRECONCEPTIONS TOWARDS ENVIRONMENTALLY FRIENDLY PACKAGING

In this section, consumers were asked to identify environmentally friendly packaging in the market from

their perspective. Moreover, beverage cartons were introduced at this point to generate comparisons in terms of sustainability among other types of packaging. Participants were constantly associating all the recycling initiatives as environmentally friendly, especially regarding glass due to its recycling facilities.

Recycling initiatives are environmentally friendly (5/10)

[P-CF] "...plastic you can also recycle like you can bring your plastic bottles back to the shop and get your money back. In that sense they give the feeling they are recycling the product again..."

Glass is better for the environment (6/10)

[P-KvT] "Oh glass is also recyclable, but I don't know what they do exactly when they recycle...glass is easier to recycle than drink cartons."

Participants mentioned that usually environmentally friendly packages are more natural in their look, for instance, when packages show the properties of the material (green or brownish colours, minimalistic looks and fewer material used in the package are a clear synonym of eco-friendliness).

Material look (2/10)

[P-RL] "Maybe from paper you can see it...like recycled paper has a bit of this brownish colours."

Colours (3/10)

[P-CF] "Maybe if they place a logo on it or less colours like really basic colours then is eco-friendlier."

Fewer Material (2/10)

[P-RS] "Ehhh...I think that carton is very environmentally friendly because is natural, not so heavy and easy to recycle."

Participants identify the effort of different brands in the market to make a difference taking sustainability as an innovative driver. However, the terminology and concepts are confusing because consumers don't understand the main differences between them. In addition, the overwhelming number of green products, labels, and marketing are misleading consumers' understandings.

Greenwashing (6/10)

[P-FW] "A cow is bio already. So, what's bio about the cow? I don't know they make all kinds of stories. They put on this pack stories like 'Oh this is from farmer Jan and he always goes out walking with his cows every day in his fresh meadows'...I don't believe all these bla bla stories. It's marketing and I am not going to pay extra for marketing."

Saturation of information (6/10)

[P-IS] "Actually! when there are so many signs in the packages like 'This is good for you', 'This is environmentally friendly' then I get a bit suspicious..."

For this research, participants should have ever bought beverage cartons. However, two participants said that they do not buy beverage carton packages because the quality is not as good as in plastic bottles. Moreover, the intrinsic attributes were better perceived in plastic bottles.

Plastic evoke better quality (4/10)

[P-RS] "Plastic...I think the presentation in plastic bottle is better and also the taste...in carton it's different...I don't know if it's true, but it seems different to me."

[P-DK] "No... UNLESS the quality...if there are 3 orange juices, the best is usually in plastic then I buy orange juice in plastic."

Additional reasons such as drink categories were the main reason for consumers to choose beverage carton packages. For instance, dairy products are usually packed in beverage carton packages. Regarding beverage carton alternatives participants usually choose chilled options because are perceived as fresh. Consumers also identified aseptic options as convenient due to its durability.

Brand alternatives (4/10)

[P-CF] "Why? because the brands that I know are selling their products in that package, but I buy usually Optimel for yogurt...they always have carton packages so that's the reason why."

Chilled packages have fresh content (4/10)

[P-RS] "...in the fridge and for me is fresher than when is outside...quality is better. The long expiration date they put a lot of additives and that's not healthy."

3.6.3 BIO-BASED PLASTIC VS FOSSIL-BASED PLASTICS

The following section has been divided into two parts: the first part aims to explore the preconceptions of consumers about the bio-based concept. The second part focuses on identifying perceived advantages, disadvantages, similarities and differences between cartons with bio-based plastic and cartons with fossil-based plastics. The following illustration shows the associations that consumers made about the bio-based concept (figure 16).

When participants were asked to come up with definitions for the bio-based concept several definitions arose. In this case, participants believed that there is a relationship between bio-based packaging and biodegradable. However, this was not the only association, since many participants also believed that bio-based packaging has a strong relationship with recyclability. Combinations between biodegradable and recyclable were also discussed. Finally, only a few participants assumed that bio-based packaging referred to natural sources from where the package was made of.

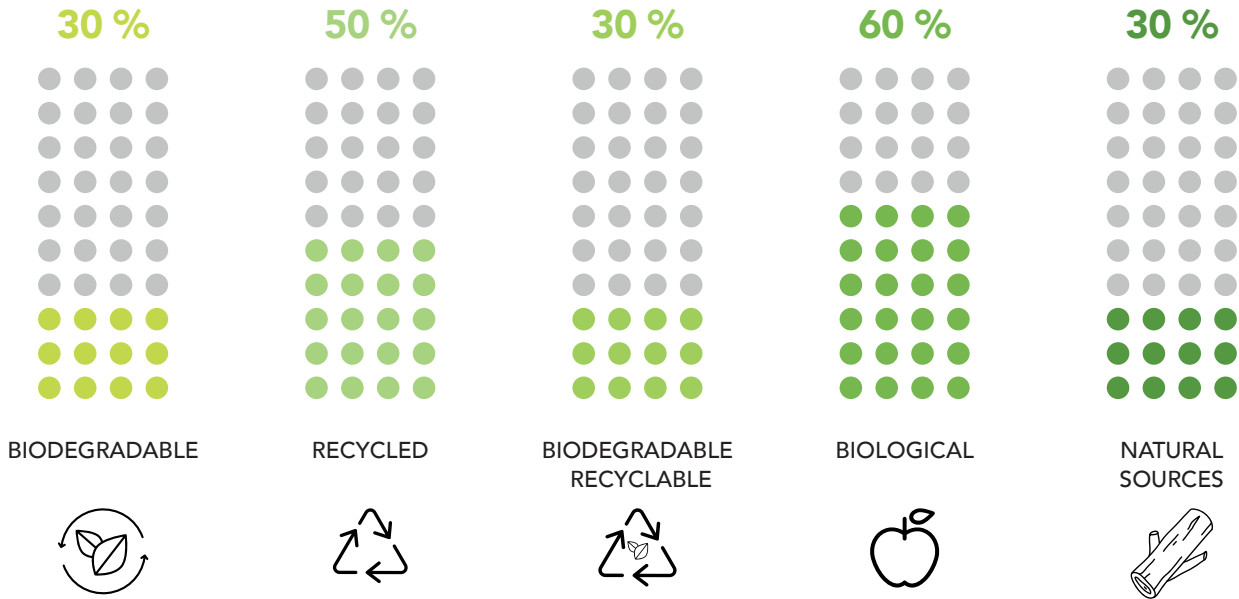


Figure 16. Consumers associations for bio-based packaging concepts

3.6.3.1 BIODEGRADABLE (3/10)

Consumers have the idea that packaging represents waste and is the main contributor of pollution. Therefore, biodegradable properties are positively connoted.

[P-IS] "... I can see...I don't know about the word, but I can see...For example the eggs I buy the bio-eggs they are in cartons...well I think they are very eco-friendly...because in the garden... Well I don't do that but for instance, they melt...they go into the ground and I can't see any more of them."

A few consumers directly associated bio-based as biodegradable. Although participants considered biodegradable was environmentally friendly due to its degrading abilities. They related it with poor quality protection especially in beverage packaging for the same reason.

[P-KvT] "Well I think that packaging biological ... is good for the environment but the issue is how long will the products inside will be good?"

[P-FW] "...Or that they are biodegradable. I haven't seen them. I think that if they were biodegradable and I have my juices and they are staying there for 2 years maybe at once the package is gone then my shelf is wet..."

3.6.3.2 RECYCLED (5/10)

Several participants thought that bio-based packaging was made of recycled materials or perhaps the package was being used one more time. This was positively related since previously participants mentioned that all recycling initiatives were environmentally friendly. In addition, it's one of the terms that participants were more familiar with.

[P-PvD] "Because bio-based is made from products you can recycle."

[P-FB] "Because I think that should be good for the environment...Ehhh...yeah...maybe that you can recycle the product easy or something like that..."

3.6.3.3 BIODEGRADABLE AND RECYCLABLE (3/10)

On the other hand, some participants assumed that bio-based was a different packaging alternative which was made of recycled material, but its end-life was related to the fact that it could degrade. According to them, the packaging would be totally sustainable because it is tackling both the beginning and end-life of the package.

[P-CvL] "That is a product that easily comes back to the nature...or maybe can be easily reused for another product."

[P-RL] "If you can combine those two like recycle it really well and make the beginning really well then you have a good...really environmentally friendly product."

3.6.3.4 BIOLOGICAL & BIO-BASED (6/10)

Some other participants assumed that companies that offer biological products in the market usually use environmentally friendly packaging.

[P-IS] "Yeah, yeah that's all right... But most of the time when the product is bio the package is too."

Participants expressed that biological products trigger positive feelings towards the product because biological is usually healthier or natural. In some cases, participants mentioned that the word 'BIO' is instantly positively associated regardless of the meaning.

[P-CF] "Everybody knows bio means something with the environment or something healthy, so it doesn't mean that you understand what it is, but you have the feeling is really...higher quality product...you link it to very natural materials or better food..."

Plastic feeling (3/10)

When sample A was introduced some participants emphasized that the plastic feeling of the package was a negative indicator since they expected that an environmentally friendly product does not have plastic at all. Therefore, they assumed that the content was biological but there was no relationship with the packaging.

[P-PvD] *"Because it's just the soya and I know already the Alpro...they are bio...but package is a little bit too plastic so no."*

[P-FB] *"When I see how it looks I don't think so. Because I think there is a lot of plastic in it but I don't know for sure."*

3.6.3.5 NATURAL SOURCES (3/10)

A few participants tried to think about the term bio-based as a separate word which led them to assume that the concept is related to the sources where the package comes from.

[P-RL] *"...it's made of... is bio-based so it's based of ...maybe is plant-based so it's something made by plant..."*

3.6.3.6 OTHER CONSUMERS' PERCEPTIONS

Renewable sources

The renewability of the sources in the bio-based concept is perhaps the key differentiator among other sustainable packaging concepts. Therefore, when sample B was introduced, it was intended to elicit different types of definitions for the word in order to understand whether consumers think this is an important attribute or not. However, participants related the concept with recycled or reused when the sample was showed.

Reused (3/10)

[P-KvT] *"This one is plastic on the outside (B)...So it's recycled... If this one (B) is recycled from this one (A)...I think that's what it means..."*

Recycled (5/10)

[P-PvD] *"That means you can use it again...easy to recycle...they are reusing this package once again."*

3.6.3.7 DIFFERENCES AND SIMILARITIES

Once participants made assumptions of the terms mentioned previously, an explanation of the bio-

based concept of Tetra Pak was introduced. In general, participants couldn't see or feel any differences between the packages (samples C, D, E, F). However, some participants pointed out that sample C was more environmentally friendly because it did not have a plastic cap. In addition, some consumers expressed their worry about sample E because they assumed the words 'Fair trade' not only referred to the content but the sustainability of the package as well.

No differences (10/10)

[P-RS] "The material seems to be the same but now I know the process ahaha so...It's just the same."

Fewer materials (2/10)

[P-CF] "Like for example D does not have a plastic lid, in that sense it's more bio-based for me. Also, example C has less colours than E and F."

3.6.3.8 ADVANTAGES

In general, participants agreed that the main advantages of bio-based alternatives are the reduction of oil dependence as well as using more sustainable sources. Furthermore, some participants assumed that since this is a new alternative available in the market, the quality of protection of the beverages will be better.

Better for the environment (7/10)

[P-RL] "...is not made of oil which I think is really good because umm.... the world now is like so dependent on oil for everything and it has its own story that oil causes wars..."

Recycled better (2/10)

[P-CF] "Ummm...I think maybe because...it has different layers...I think they already tested and maybe they improved it in such a way that you can keep the product much longer..."

3.6.3.9 DISADVANTAGES

Participants assumed that as many other sustainable packaging alternatives available on the market, bio-based packaging was going to cost more.

More expensive (10/10)

[P-DK] "It might be more expensive for the producer and thus for the consumer."

[P-FB] "Maybe costs more than oil. Otherwise they wouldn't... why not everybody should use this sugarcane? so I think is more cost for the producer and also consumer."

Moreover, the plastic feeling of the packaging was a bad indication because consumers thought that the recycling process was quite difficult when the carton

and the plastic were merged. Therefore, several doubts about the recycling process of this type of packaging arose.

Recycling process (3/10)

[P-FW] "... These milk packs and juice packs they have a plastic coating inside or some metal. Then I think I am not so sure about the possibilities for recycling..."

Several participants considered that most of the materials recycled in the Netherlands are burned. In this sense, participants thought the bio-based concept will still need to tackle this issue.

[P-FW] "Yeah what happens? I don't know? You said it can be recyclable. I don't believe it. When I see this is general waste and goes to a sorting station and I think is all going to be burned."

Participants were also confused about the sorting process. In the Netherlands, beverage carton packages are disposed of in the same container as plastics (PMD). Therefore, participants assumed that when bio-based packaging is a more sustainable alternative, it shouldn't be disposed of the same container as regular beverage carton packaging.

Sorting (3/10)

[P-CvL] "If I throw away bio-based packaging? I think is ok because it will be used again but it can be recycled as the regular ones? Like the plastic

packages? in the PMD?...So I guess you throw them like the other ones."

3.6.4 CONSUMERS' OPINIONS AND RECOMMENDATION

Finally, participants were asked whether they would purchase bio-based packaging or not. Almost all the participants mentioned that they would be willing to buy bio-based packaging. However, when bio-based packaging is more expensive than non-bio-based packaging they will go for the cheapest alternative.

Willingness to buy bio-based packaging (10/10)

[P-CvL] "If it's higher no... because I already pay a lot for taxes for recycling and I already recycle at home that is extra work for us...so I don't understand why we have to pay more for something we already help a lot."

Although participants could identify the benefits of bio-based packaging alternatives, they still think that the differences between non-bio based and bio-based are not too different. Besides the price barrier, consumers mentioned other factors which can be important when choosing bio-based alternatives such as mood or personal values. In addition, some participants pointed out that the frequency of use is an important matter because when a product is bought frequently it would imply more costs.

However, if the product is bought once in a while, a bio-based packaging is suitable.

Mood (1/10)

[P-RL] "Uhh... That's difficult...really depends on my mood you know...Sometimes I am in a really cheap mood, so I just buy the cheapest one and sometimes like 'Ok yeah I'm gonna do sustainable'"

Frequency of use (2/10)

[P-CF] "...It also depends...If you have to buy this product (D) everyday then is a lot, is like 30 Euros extra every month...depends of the frequency of the use of the product so..."

Consumers also suggested that brands should use a straightforward language and be clear about the meaning of the concepts since most of the people are not familiar with sustainable terms. For some consumers, it is important to understand what are the main differences between the concepts discussed in this session. Therefore, they expect that brands can easily communicate their messages by using clear language.

Clear language (6/10)

[P-DK] "... 'This packaging is made by planting new trees' be clear! talk simple language because now you are talking about biodegradable, recyclable which are too complex words for the Dutch average person."

Nevertheless, some other participants thought that it

was not their responsibility to choose for sustainable alternatives and brands shouldn't give them options to choose between bio-based packaging and non-bio-based packaging.

No choice alternatives (3/10)

[P-FW] "I think that when they really have bio-based packaging I don't want to pay extra. If it's really like that then they should change all the packaging into bio-based at once, so I don't have to choose anymore!"

3.7 CONCLUSIONS

To have a demand in bio-based packaging, consumers need to understand the importance of the concept. There are big gaps in what consumers interpret in sustainable aspects and the real meanings. Therefore, a brand aiming to position bio-based packaging in the market needs to consider the way in which information is presented to the consumer in terms of visual cues and information display on the package. Although consumers understood the added value of the concept in terms of sustainability, they were not willing to pay extra for bio-based packaging alternatives. Hence, the benefits that the concept presented should be evident for consumers to enhance purchase intentions. Finally, consumers are not aware of the concept and additional marketing strategies such as promotion through different channels will ensure that consumers get more familiar with the topic. Based on the previous analysis of this study, some recommendations have been developed to tackle the problems presented.

3.8 IMPLICATIONS

3.8.1 PACKAGING ECOLOGICAL CUES

The bio-based carton packaging has special attributes that other ecological packaging concepts lack. For instance, the fact that consumers associate carton as an environmentally friendly material and the fact that the plastic is derived from sugarcane enhances the strength of the concept. Silayoi and Speece, (2007) have stated that mentioning the technological advantages of a package (e.g., the resources used to produce the materials of the package) to consumers is important to differentiate. Therefore, it is recommend that these advantages should stand out not only on the package but the marketing around the concept, so consumers can understand better the differences with other bio-based concepts.

Several consumers related negatively the plastic feeling and glossiness of the carton packages which

led them to think that the bio-based concept was not as sustainable as it seemed to be. However, consumers expressed their sympathy for packages that evoked the naturalness via its structure such as reduction of materials, colours, textures etc. because these attributes seemed to be more environmentally friendly. **In this sense, bio-based packaging materials could be more evident in order to enhance the positive associations that consumers have about wood and sugarcane (e.g., renewability and recyclability).**

Graphics and colours play an important role in consumers' choices. Although consumers stated that they were never aware of the packaging, other studies have proven that they do it unconsciously triggered by different types of attributes on the package (Mueller, Lockshin, Louviere, 2010). The response towards graphic elements depends as well on the level of involvement with the product (Vakratsas & Ambler, 1999). If the consumer has a low involvement with the product, then the graphics and colours

become more relevant for the decision-making. Whereas if the involvement is high the visuals are less important, but information of the product is more relevant (Kupiec & Revell, 2001; Priluck & Wisenblit, 1999). Therefore, it is advisable that brands that wish to introduce bio-based packaging for different target groups consider illustrating the sources that the package is made of (e.g., wood and sugarcane) as well as provide further information about the concept on the package.

The terminology used to communicate a message to consumers, needs to be as clear as possible. According to Walter (2011) brands are advised to ensure that their bio-based concept is communicated in a clear and accessible way especially for consumers that are not familiar with the topic. Hence, communication should be carefully designed and tested among consumers to ensure the effectiveness of the concept (Reinders, 2017). Furthermore, it has been proven that while sustainable packaging for the industry is related to the reduction of energy and environmental footprint, for consumers it means that a package is recyclable (Nordin & Selke 2010). Throughout this study on several occasions, consumers referred to the term recyclable to define different sustainable terms. Therefore, the introduction of the correct meaning of the bio-based concept was relatively complex to understand for consumers. It is recommended that the words referring to the bio-based concept are less abstract such as 'package 100% made of plants' instead of bio-based packaging. Figure 17, illustrates the strategy of Heinz to enhance the message of the

plant-based bottle.



Figure 17. Heinz - Plant-based bottle

3.8.2 PERCEIVED BENEFITS

Each consumer has different types of criteria to choose a product. However, in this study price was perhaps the most relevant aspect especially regarding packaging. Magnier and Crié (2015) stated that there are different types of perceived benefits which can enhance consumers' attractiveness towards a product. The bio-based concept could consider combining important benefits such as price and quality or quality and health benefits. For consumers, the fact that the package is sustainable

is not a sufficient reason to purchase a product. According to Carus (2014) emotional performance represents the possibility of assessing a value of a product for its nature. For instance, the lower CO2 emissions or the use of renewable sources might trigger a positive feeling in the consumers enhancing purchase intentions. **Therefore, it is suggested that if bio-based packages display in the package emotional cues such as that the protection of the content has been improved, the willingness to pay higher prices will increase.** However, the positive effect of bio-based properties for food is still under discussion (Alvarez et al., 2012).

3.8.3 GREEN MARKETING

Green marketing is a strategy to promote green products aligned to different target markets to gain a competitive advantage (Cherian & Jacob, 2012). In today's world, marketing has evolved in different aspects especially since it has been expanding into the digital world. Online social behaviour has changed the way consumers interact, behave and perform activities (Tiago and Verissimo, 2014). The digital world has allowed consumers to share knowledge, information, promote different cultural topics etc. (Budden, Anthony, Budden, & Jones, 2011). **Therefore, it is recommended that the information presented to consumers to promote the bio-based packaging concept should be aligned with present**

trends. For instance, the trend 'honestly speaking' focuses on showing consumers the transparency of the processes and claims that brand generates. **In this way, the bio-based packaging concept could use a link between the package and digital information to have further explanations of the concept and the benefits.** By doing so, consumers will have a broader knowledge of the topic and new segments can emerge. Figure 18, illustrates the example of Tony's Chocolonely that focuses on showing consumers their transparency in child free slavery through logos and info graphics on the package.



Figure 18. Tony's chocolonely campaign

3.9 LIMITATIONS

There are some limitations in which the findings of this study can be extended in future research. First, a previous study has stated that the effect of introducing packages with bio-based materials was stronger for people who were more environmentally conscious since this personality trait might be an interesting segment for brands which aim to introduce bio-based packaging to the market (Reinders et al., 2017). However, this study aims to identify new target groups which allow the concept to be positioned in the mainstream market. Therefore, the participants' profile of this study aimed to be diverse. Further studies, could explore what environmentally conscious consumers perceive and understand about carton beverage packages with bio-based plastics.

Furthermore, previous studies have stated that consumers felt positively inclined towards products which were fully bio-based (100%) because it stimulated purchase intentions (Grimmer & Bingham, 2013; Reinders et al., 2017). Nevertheless, in this study it has not been mentioned that Tetra Pak's bio-based package are partially bio-based.

Further research could build on literature to reinforce whether the percentage of bio-based materials used in the beverage cartons determines a different perspective in consumers' opinions. In addition, further studies may point out the life-cycle of the carton beverages. For instance, besides the amount of bio-based materials used on the package, it could be mentioned that it could be recycled. This is important to take into consideration since consumers in this study expressed that when the package was fully environmentally friendly, benefits were more evident. Finally, the interviews were carried out in English which made it harder for some consumers to understand the terminology used in the bio-based packaging concept. Some participants had little knowledge of the English words used during the interview which discouraged them to speak freely. For the following study, it is recommended to use the Dutch language to communicate directly with consumers. Therefore, it will be easier for them to understand and freely answer the questions.



QUANTITATIVE
ANALYSIS

"There is no such thing as 'away'. When we throw anything away it must go somewhere."

Annie Leonard

4.1 QUANTITATIVE DATA COLLECTION

According to the findings explored in the qualitative phase of this study and the theoretical background, it was concluded that consumers lack knowledge on the bio-based packaging concept (Carus, 2014; Reinders et al., 2017; Sijtsema et al., 2016). Therefore, consumers intend to be sceptical about the concept. In addition, it has been proven in the literature that consumers care about the environment and they are willing to contribute by purchasing environmentally friendly packages (Luchs et al., 2010). However, there is a discrepancy between what consumers think and do. It is important that consumers understand the benefits of the bio-based concept since it is abstract and difficult to directly relate with personal benefits (e.g., healthy lifestyle) but instead its benefits are directly related to the environmental impact. As a matter of fact, in a previous discussion of this study, it was determined that the use of informational cues as well as visual cues are essential to assist consumers on their decision-making for bio-based packaging.

Informational cues on packaging are relevant according to the following study to explain to consumers in a direct and straightforward way the added value that the bio-based packaging has among other sustainable concepts. Three types of informational cues have been considered for this study due to its capacity to communicate to consumers in different ways. First, semiotics has been considered due to its ability to represent ideas in a concrete way by using a combination of specific words and drawings (e.g., logos or symbols) (Leigh & Gabel, 1992). Therefore, in this study, it could be expected that consumers will find logos more clear and concrete than infographics and storytelling. Secondly, infographics have been considered in this study as well, due to their ability to convey a complex message by organizing the information in a hierarchical way to be easily understood (e.g., the bigger the element or word the more relevant it is) (Smiciklas, 2012). Hence, in this study, it could be expected that consumers will find Infographics easier to understand in comparison with logos and

storytelling. Finally, storytelling has been included in this study due to its ability to immerse the reader in a specific context through narratives and drawings explaining a concept (Lundqvist et al., 2013). Therefore, it could be expected in this study that storytelling will be more attractive to consumers than logos and infographics.

To further explore the effect of the informational cues mentioned above on consumers of beverage carton packages, a quantitative study has been set up. The following study aims to provide clear guidelines on how to present information about the bio-based concept to the Dutch consumers. The design of three different types of informational cues (logos, infographics and, storytelling) was a between-subjects factor, with three independent groups. One group being assigned to the logos condition, the other being assigned to the infographics condition and the last one assigned to the storytelling condition. A data analysis has been made and the main findings will be presented in this chapter.

4.2 METHOD

The following study is a quantitative and between-subjects study that has been carried out through an online questionnaire for each condition (logos, infographics, and storytelling). The questionnaires were made using the platform “Toluna Surveys”. Participants were presented with three different types of designs within each condition to assess how clear, how understandable, and how attractive the informational cues communicating the bio-based concept were. Additional aspects were assessed such as product perception and purchase intentions to have a holistic view of how consumers perceive beverage carton packages with bio-based plastic. The following figure (19) illustrates an overview of the experiment set up. Appendix 4 shows the different questionnaires with each stimulus respectively. Based on the above this study aims to answer the following research question:

What type of informational cue better represents the concept of beverage cartons with bio-based plastic for consumers in terms of clarity, understanding and attractiveness?

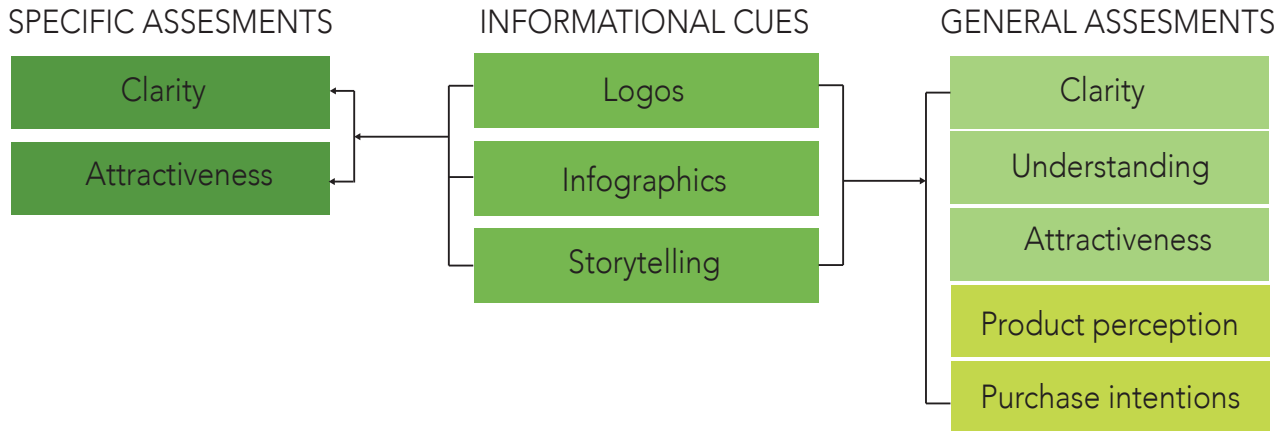


Figure 19. Quantitative framework

4.3 PARTICIPANTS

The data was collected in November 2017 through “Toluna Surveys”. A total of 528 participants were chosen and were equally distributed across the conditions. The samples comprised 228 males and 300 females aged between 18 and 64 years old ($M = 43,00$ $SD = 13,30$) with the Dutch nationality and different types of educational backgrounds. Specifications about nationality, age and gender were set in the platform to have equal distributions across the conditions. The whole experiment was carried out in the Dutch language to make the concept as clear as possible for the participants and avoid confusion in the terms used to explain the concept and meanings. For the purpose of the analysis of this study, the participant’s characteristics were grouped as followed in terms of age; group 1 = participants from 18 to 34 years old; group 2 = participants from 35 to 54 years old and group 3 = participants from 55 and above. In addition, educational levels were also grouped based on the Dutch education system as follows; Low education = without education, primary

education, LBO, MAVO/VMBO; Middle education = MBO, HAVO, VWO; High education = HBO, WO, university bachelor, university master, post-university studies. Table 2 provides a description of the participants.

	LOGOS		INFOGRAPHICS		STORYTELLING		Chi-square	Df	p -value	Total
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage				
AGE							.270	4	.992	
18-34 years old	51	29.5	53	29.1	49	28.3				153
34-54 years old	78	45.1	83	45.1	82	47.4				243
55 and above	44	25.4	47	25.8	42	24.3				133
Total	173		182		173					
GENDER							.210	2	.900	
Women	99	57.2	101	55.5	100	57.8				300
Men	74	42.8	81	44.5	73	42.2				228
Total	173		182		173					
EDUCATION							3.863	4	.425	
Low education	27	15.6	43	23.6	34	19.7				104
Middle education	80	46.2	77	42.3	73	42.2				230
High education	66	38.2	62	34.18	66	38.2				194
Total	173		182		173					
TOTAL PARTICIPANTS	528									

Table 2. Participants characteristics.

4.4 STIMULI

Participants were randomly assigned to one of the following three conditions: (1) logos; (2) Infographics; and (3) Storytelling. Each condition presented 3 different alternatives (Sample A, Sample B, and Sample C) of configuration and wording for beverage cartons using bio-based plastic. The terms used to describe the bio-based concept remained the same on each condition in order to make them comparable. However, the design of the graphical elements varied depending on the type of informational area to identify how clear, understandable, attractive and persuasive the designs were.

In order to provide specific information about the carton packages with the bio-based plastic that Tetra Pak uses, three key elements were carefully chosen; the raw materials used to produce the packages, the recyclability of the package (fully recyclable) and the environmental benefit for the planet and the consumer. First, Tetra Pak's carton packages are made of wood and sugarcane. Therefore, the informational

cues should communicate it implicitly, explicitly or both in some cases to reinforce the message. Sample A, in all the conditions, mentions the words sugar cane and wood (suikerriet en hout) in order to make consumers familiar with the materials. Sample B, in all the conditions, illustrates the sugarcane but uses a more general description implying that the package is made from natural resources (Plantaardige Grondstoffen). Sample C, in all the conditions, attempts to be more general by telling consumers that the package is environmentally friendly and uses plants to be produced (Plantaardig). The aim of these samples was to identify which wording and designs are more suitable to describe the bio-based concept of Tetra Pak packages. Figure 20 shows the summary of the aspects chosen for the visual cues' design. Each sample was shown to the participants with an example of how it will be displayed in the package.



NATURAL SOURCES

Suikerriet en hout - Sugar cane and wood

Plant aardige grondstoffen - Plant resources

Plant aarding pak - Package made of plants



RECYCLABILITY

100% recyclable



BENEFITS

Better for the environment

Better for the consumer

Figure 20. Key elements for the informational cues

4.4.1 LOGOS

Since the design of the logo alternatives should communicate the bio-based concept in a direct and straightforward way, elements such as the sugarcane and the leaves of the trees were used to evoke the naturalness of the sources. The arrows in the logo, communicate the renewability of the sources as well as the recyclability of the package. Each sample explains in words the concept using the different alternatives mentioned previously. Figure 21 illustrates the three samples used in the logo condition.



Figure 21.1 Sample A



Figure 21.2 Sample B



Figure 21.3 Sample C



Figure 21.1.1 Sample A on the package



Figure 21.2.1 Sample B on the package



Figure 21.3.1 Sample C on the package

4.4.2 INFOGRAPHICS

The design of the infographics aim to communicate the concept by illustrating the materials used to produce the bio-based packaging in its natural context. In addition, specific words were placed to further explain the visuals. The importance of the words and the graphical elements were highlighted by altering the size of the fonts and the drawings. Figure 22 illustrates the three samples used in the info graphic condition.



Figure 22.1 Sample A



Figure 22.2 Sample B



Figure 22.3 Sample C



Figure 22.1.1 Sample A on the
package



Figure 22.2.1 Sample B on the
package



Figure 22.3.1 Sample C on the
package

4.4.2 STORYTELLING

The storytelling visuals aim to use different characters evoking sustainability in order to persuade consumers by informing them about the benefits of the bio-based package. Therefore, an informal language is used so consumers can easily understand the message provided. Natural elements such as the leaves are a recurring pattern in each sample to reinforce the sustainability of the package. Figure 23 illustrates the three samples used in the storytelling condition.



Figure 23.1 Sample A

Figure 23.1 Sample B

Figure 23.1 Sample C



Figure 23.1.1 Sample A on the package



Figure 23.1.1 Sample B on the package



Figure 23.1.1 Sample C on the package

4.5 ANALYSIS

4.5.1 DATA TRANSFORMATION

Initially it was intended to have 200 participants per condition since it was aimed to keep the samples comparable. After gathering the results, a sample of 607 participants was obtained. However, in order to fill in the questionnaires participants were asked to determine how often they purchase beverages in carton packages. This question was important to follow up in the questionnaire since participants need to be familiar with the packaging appearance, price and types of content. Therefore, 63 participants who chose the option 'less often' were removed from the data analysis for a total sample of 544 participants. The figure (24) shows the percentages of the options chosen by the participants.

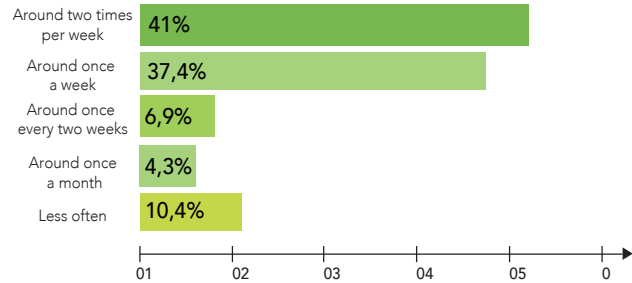


Figure 24. Beverage cartons purchase frequency

4.5.2 RESPONDENT BIAS

It was identified that 16 participants were answering all the scale questions (for purchase intentions, general clarity, and general attractiveness) in the lowest values of the scale. Furthermore, they represented a big difference in comparison with the rest of the participants' answers. These participants were respondent bias. This means that the participants were not willing to provide an accurate answer to the questionnaire. Therefore, they were removed and a total of 528 participants remained.

4.5.3 MEASURES

Different types of questions were formulated through the questionnaire. For packaging attributes, based on the work of Magnier & Cri e, 2015, consumer's knowledge and definitions for bio-based as well as clarity within groups, eight items were analysed as nominal data with multiple choice questions. For product perception and understanding, four items were analysed as ordinal data with multiple choice questions. For a second part of product perception and purchase intentions, three items were analysed as interval data using a five-point Likert scale; '1= Certainly not, 5= Certainly yes' adapted from Reinders et al., 2017. For general clarity of the concepts, three items were analysed as interval data using a five-point Likert scale; '1= Not at

all, 5= certainly yes'. For general attractiveness, one item was analysed as interval data using a five-point semantic differential scale; (I find them very bad/ I find them very good). Finally, for attractiveness within groups, one item was measured as interval data using a range of high and low scores; '1= the most favourite sample and 3= the least favourite sample) per group.

4.6 RESULTS

4.6.1 PACKAGING ATTRIBUTES

Packaging elements

Participants were asked to assess what type of elements in carton packages participants pay attention to in a multiple-choice question. The following options were presented; brand name, visual colours, content information and environmental labels. Overall, **content information has been chosen as the type of element that participants pay most attention to (48.7%)**, followed by brand name (35.2%), visuals and colours (11.6%) and environmental labels (4.5%).

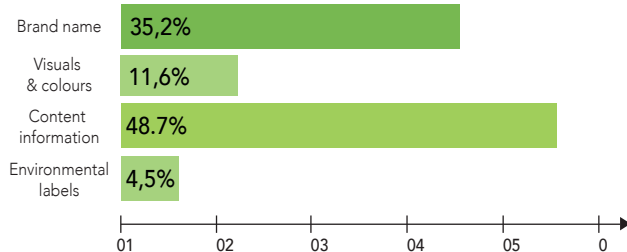


Figure 25. Packaging elements

Environmentally friendly packaging elements

Participants were asked to determine how they recognize that a beverage carton package is environmentally friendly. A multiple-choice question was presented as follow; through the materials of the package, through the graphic elements of the package (e.g., colours, fonts, etc.), through the labels of the package and through additional information provided in the package. Overall, **the most common way participants identify a beverage carton package that is environmentally friendly is through the labels on the package (42.4%)**, followed by additional information provided on the package (25.8%), the materials of the package (16.5%) and the graphic elements of the package (15.3%).

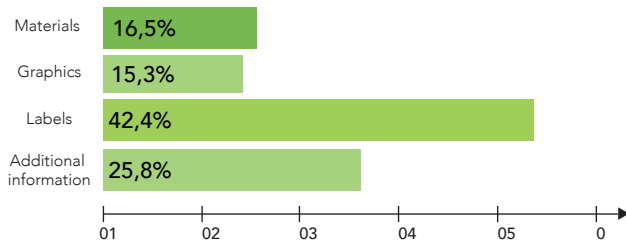


Figure 26. Environmental elements

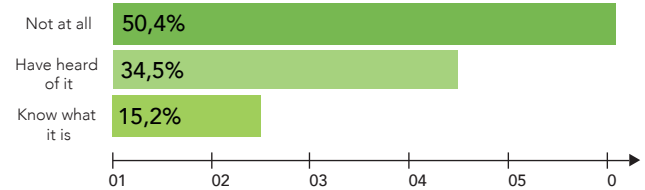


Figure 27. Familiarity with the bio-based concept

4.6.2 CONSUMER'S KNOWLEDGE AND DEFINITIONS ABOUT THE BIO-BASED CONCEPT

Familiarity with the bio-based concept

In this section, it was intended to identify whether participants are familiar or not with the bio-based concept. Three different alternatives were provided in a multiple-choice question developed as follow; Not at all, I have heard about it, but I don't know what it means or, I have heard about it and I know what it means. In general, **most of the participants were not familiar at all with the concept (50.4%)**, some of them have heard about it but do not know what it means (34.5%) and a few have heard about it and know what it means (15.2%).

Definitions for bio-based

Participants were introduced to the definition of the bio-based concept for Tetra Pak's beverage carton packages:

Bio-based packaging is a package made of plants (renewable resources). In Tetra Pak's carton packages, carton is made from renewable wood and plastic is made from oil. However, in the bio-based concept, plastic is made from sugar cane. This is a better alternative for the environment and for you.

Followed by this description a multiple-choice question with an open-ended possibility was formulated to identify which wording alternatives would best suit the description of the bio-based concept. The following options were presented; plant-based package, natural package, package made of natural sources, package made of renewable plants, other. Overall, **plant-based package was chosen as the wording that better suits the bio-based concept (32.2%)** followed by package made

of natural sources which has been slightly lower (31.4%), then natural package (23,9%) and package made of renewable plants (11,6%).

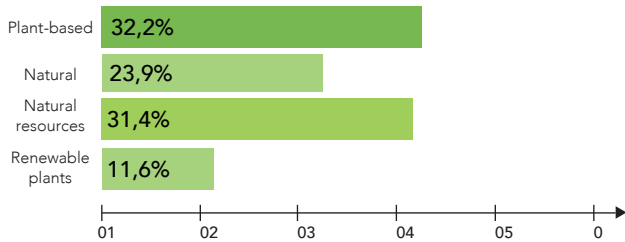


Figure 28. Definitions for bio-based

A few participants (.9%) provided a different alternative mentioned below:

- 'Duurzaam recyclebaar' - Sustainable and recyclable.

- 'Milieuvriendelijke verpakking' - Environmentally friendly packaging.

- 'Verpakking gemaakt van planten die recyclebaar zijn' - Made of plants that are recyclable.

- 'Verpakking van hernieuwbare grondstoffen, beter voor het milieu' - Packaging made of renewable resources, better for the environment.

4.6.3 PRODUCT PERCEPTION

Content protection

This section intended to identify how participants thought the bio-based package protected the content. Three different alternatives were provided in a multiple-choice question developed as follow; less than the conventional one, the same as the conventional one, better than the conventional one. In general, most of the participants thought that **the bio-based package protected the content the same as the conventional package (77.5%)**, some of them thought the protection was better than the conventional package (13.4%) and only a few participants thought that it protected the content less than the conventional package (9.1%).

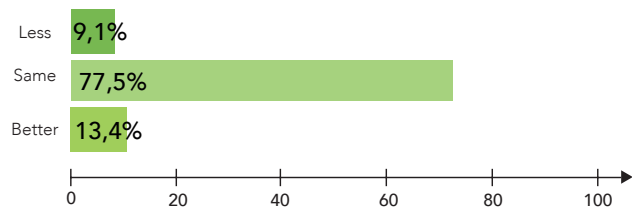


Figure 29. Product protection

A Kruskal-Wallis H test was conducted to evaluate differences among the three conditions on protection of the content. The test, which was corrected for tied ranks, was not significant ($\chi^2 = (2) = .599$, $p = .741$). Therefore, there are not significant differences between conditions and perception on the content protection.

Bio-based price

Participants were asked to assume what the price for a product with a bio-based package would be compared to the conventional one. Three different alternatives were provided in a multiple choice question developed as follow; a lower price than the conventional one, same price as the conventional one, a higher price than the conventional one. Overall, **participants thought that a product with a bio-based package had a higher price than the conventional one (54.0%)**, followed by the same price as the conventional one (36.9%) and a lower price than the conventional one (9.1%).

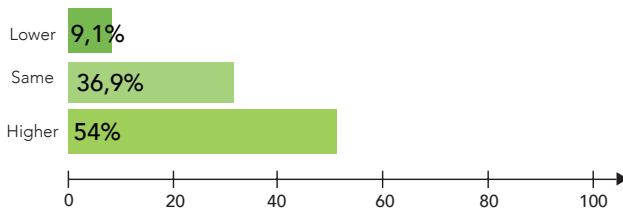


Figure 30. Bio-based price

A Kruskal-Wallis H test was conducted to evaluate differences among the three conditions on price perception. The test, which was corrected for tied ranks, was not significant ($\chi^2 = (2) = .683$, $p = .711$). Therefore, there are not significant differences between conditions and price perception.

Bio-based information on the package

Stimuli were presented to participants on each condition (sample A, sample B and sample C). Based on the visuals, participants were asked to tell if they would pay attention to the bio-based informational cues displayed on a package using a five-point Likert scale (1= **Certainly not**, 5= **Certainly yes**). Overall, **participants said that they probably would pay attention to the visuals displayed on a bio-based package (53.4%)**, followed by participants who certainly would pay attention to the visuals displayed on the bio-based package (24.6%). However, a few participants have said that they would maybe pay attention (14.85%) followed by participants that have said that they probably would not pay attention (7.4%).

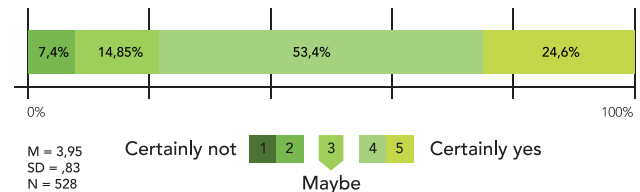


Figure 31. Attention to bio-based information

A Kruskal-Wallis H test was conducted to evaluate differences among the three conditions on attention to the information displayed on the package. The test, which was corrected for tied ranks, was not significant ($\chi^2(2) = .395, p = .954$). Therefore, there are not significant differences between conditions and attention to the bio-based information displayed on the package.

Additional tests were conducted to determine whether age, gender and educational level made any difference on attention to the information displayed on the package. A Kruskal-Wallis H test showed that there was a statistically significant difference in attention to the information displayed on the package between the different age groups ($\chi^2(2) = 9.78, p = .008$). A post-hoc Bonferroni correction for multiple tests was done to identify the differences. Results indicate that there is a significant difference between people from 55 years old and above and people from 35 to 54 years old (MD= 46.86 SD= 15.01, $p = .005$). No other significant differences were found. Hence, people from 55 years old and above tend to pay more attention to the information of bio-based displayed on the package than people from 35 to 54 years old.

Furthermore, a Kuskal-Wallis H test showed that there was a significant difference between educational levels ($\chi^2(2) = 11.14, p = .004$). Results of Bonferroni's correction for multiple tests showed that there was a significant difference between people with high

education and people with middle education (MD= 45.20 SD= 13.55, $p = .003$). No other significant differences were found in this analysis. Therefore, it could be concluded that people with high education tend to pay more attention to the information of bio-based displayed on the package than people with middle education.

4.6.4 PURCHASE INTENTIONS

Environmental impact

Participants were asked to determine whether the environmental impact would be important when purchasing a beverage carton package. A five-point Likert scale was used (1= certainly not, 5= Certainly yes). Overall, participants said that the impact of the environment was probably important for them when purchasing a beverage carton package (44.3%), followed by participants who certainly thought that the impact of the environment was important when purchasing a beverage carton package (25.6%). However, a few participants think that it was maybe important (16.3%) followed by participants that think that it was certainly not important (11.6%).

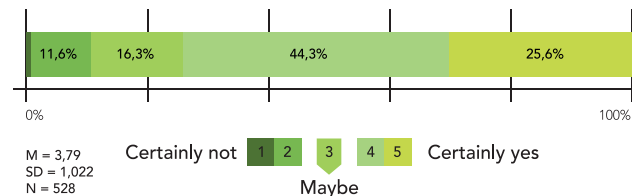


Figure 32. importance of the environmental impact

A Kruskal-Wallis H test showed that there were not statistically significant differences in environmental impact when purchasing a beverage carton package between the conditions ($\chi^2(2) = .652$ $p = .722$).

Additional tests were conducted to determine whether age, gender and educational level were different when considering the environmental impact. There was a statistically significant difference between the groups of age in consideration of the environmental impact ($\chi^2(2) = 10.03$ $p = .007$). Results of Bonferroni's correction for multiple tests showed that there was a significant difference between people from 55 years old and above and people from 35 to 54 years old ($MD = 38.44$ $SD = 15.54$, $p = .040$). In addition, people from 55 years old was significantly different from people from 18 to 34 ($MD = 52.13$ $SD = 17.08$, $p = .007$). Therefore, people from 55 years old and above tend to consider more the environmental impact when purchasing beverage cartons. No other significant differences were found.

There was a statistically significant difference in education as well ($\chi^2(2) = 46.41$ $p = .003$). A post-hoc Bonferroni correction for multiple tests was done to identify the differences. Results indicate that there is a significant difference between people with high education and people with middle education ($MD = 46.41$ $SD = 14.03$, $p = .003$). No other significant differences were found. Hence, people with high education tend to consider more the impact of the environment when purchasing beverage cartons.

Willingness to purchase

Participants were asked to tell whether they are willing to purchase a bio-based package once they understand the concept. A five-point Likert scale was used (1= certainly not, 5= certainly yes). Overall, participants said that they would probably purchase beverage cartons with bio-based plastic when they understood the concept (47.4%), followed by participants who certainly would purchase it (27.7%). However, a few participants said that they would maybe purchase beverage cartons with bio-based plastic when they understood the concept (17.9%). A few participants said that thought that they would certainly not purchase beverage cartons with bio-based plastic (6.9%).

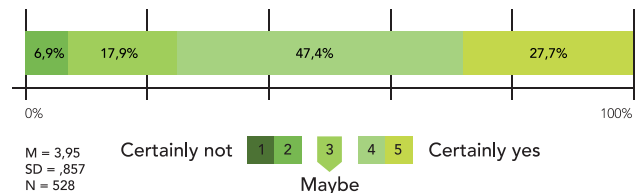


Figure 33. Purchase intentions

A Kruskal-Wallis H test showed that there were not a statistically significant differences in purchase intentions of beverage carton packages between the different conditions ($\chi^2(2) = .652$ $p = .722$).

Additional tests were conducted to determine whether age, gender and educational level were different in purchase intentions. There was a statistically significant difference between age groups in purchase intentions ($\chi^2(2) = 12.82$ $p = .002$). Results of the Bonferroni correction for multiple tests showed that there was a significant difference between people from 55 years old and above and people from 35 to 54 years old ($MD = 57.52$ $SD = 16.80$, $p = .002$). In addition, people from 55 years old was significantly different from people from 18 to 34 ($MD = 43.75$ $SD = 15.30$, $p = .013$). Hence, people from 55 years old and above tend to have higher purchase intentions than people from 35 to 54 and people from 18 to 34. No other significant differences were found.

For education, there was a statistically significant difference as well in purchase intentions ($\chi^2(2) = 10.26$ $p = .006$). A post-hoc Bonferroni correction for multiple tests was conducted to identify the differences. Results indicate that there is a significant difference between people with high education and people with middle education ($MD = 43.40$ $SD = 13.82$, $p = .005$). No other significant differences were found. Therefore, it could be concluded that people with high education tend to have higher purchase intentions on beverage cartons with bio-based plastic once they understand the concept.

4.6.5 CLARITY

Communication of the concept

Participants were asked to determine whether the samples presented fulfilled the aim to communicate the bio-based concept. A five-point Likert scale was used (1= Not at all, 5= certainly yes). Overall, participants said that the visuals communicated the bio-based concept (57.8%), followed by participants who certainly thought that the visuals communicated the bio-based concept (26.7%). However, a few participants did not have an opinion (9.8%) followed by participants who thought that the visuals did not communicate the concept at all (5.7%).

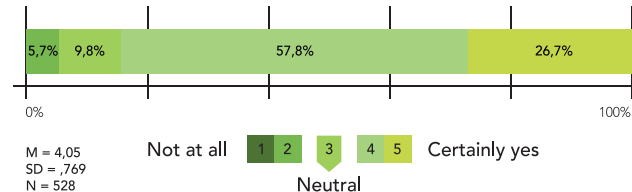


Figure 34. Communication of the concept

A Kruskal-Wallis H test showed that there were not statistically significant differences in communication of the bio-based concept through the visuals between the different conditions ($\chi^2(2) = .447$ $p = .800$).

Additional tests were conducted to determine whether age, gender and educational level are different from each other per group. However, no other significant results were found.

Recyclability of the bio-based package

Participants were asked to determine whether the recyclability of the bio-based package was clear in the samples presented. A five-point Likert scale was used (1= Not at all, 5= certainly yes). Overall, participants said that the recyclability of the package was clear in the visuals (54.7%), followed by participants who certainly thought that the recyclability of the package was clear in the visuals (27.3%). However, a few participants thought that the recyclability of the package was not clear (9.7%) followed by participants who did not have an opinion (8.3%).

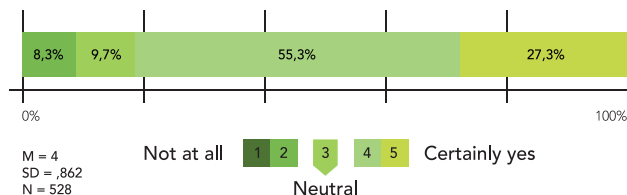


Figure 35. Recyclability of the package

A Kruskal-Wallis H test showed that there were not statistically significant differences in communication of the recyclability of the bio-based package between the conditions ($\chi^2(2) = 3.47$ $p = .177$).

Additional tests were conducted to determine whether age, gender and educational level showed differences in the perception of the recyclability of the package. There was a statistically significant difference between the age groups ($\chi^2(2) = 8.15$ $p = .017$). Results of Bonferroni's correction for multiple tests showed that there was a significant difference between people from 55 years old and above and people from 35 to 54 years old (MD= 42.51 SD= 16.32, $p = .028$). In addition, people from 55 years old was significantly different from people from 18 to 34 years old (MD=36.78 SD=14.86, $p = .040$). Hence, people from 55 years old and above tend to think that the recyclability of the package is clearer on the visuals compared to the other age groups. No other significant differences were found.

Natural resources

Participants were asked to determine whether the visuals suggested that the package was made from natural sources. A five-point Likert scale was used (1= Not at all, 5= certainly yes). Overall, participants said that the visual suggested that the bio-based package was made of natural resources (54.2%), followed by participants who certainly think that the visuals suggested that the bio-based package is made from natural sources (32.2%). However, a few participants do not have an opinion (8.7%) followed by participant who certainly think that the visual do not suggest that the bio-based package is made of

natural sources (8.3%).

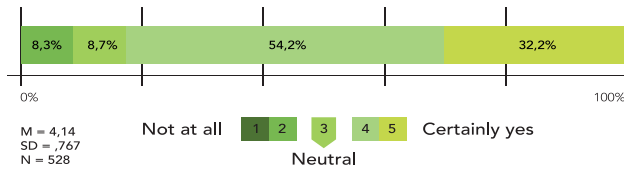


Figure 36. Communication of the natural resources

A Kruskal-Wallis H test showed that there was a statistically significant difference in clarity of the sources used to produce the bio-based package in the visuals between the different conditions ($\chi^2(2) = 7.70$ $p = .021$). Results of Bonferroni's correction for multiple test showed that **there was a significant difference between infographics and storytelling in the clarity of the natural resources communicated in the visuals** (MD=37.91 SD= 14.55, $p = .028$). No other significant differences were found in this analysis. Therefore, it could be concluded that infographics better communicate the use of natural sources on the bio-based package.

Additional tests were conducted to determine whether age, gender and educational level differ in clarity of the natural resources used in the package. There was a statistically significant difference between the age groups ($\chi^2(2) = 7.67$ $p = .022$). Results of the Bonferroni correction for multiple tests showed that there was a significant difference between people from 55 years old and above and people from 35 to 54 years old (MD= 40.98 SD= 14.79, $p = .017$). Therefore, people from 55 years old and above tend to find the

visuals clearer in the resources used to produce the bio-based package. No other significant differences were found in this section.

4.6.6 CLARITY PER CONDITION

Participants were asked to evaluate the samples (sample A, sample B and sample C) in each condition (logos, infographics and storytelling) in terms of clarity.

Representation of the concept

Participants were asked to determine which sample better represents the bio-based concept. Overall in the group logos, participants thought that **sample B better represented the bio-based concept (43.4%)**, followed by participants who choose sample A (35.8%) and sample C (20.8%).

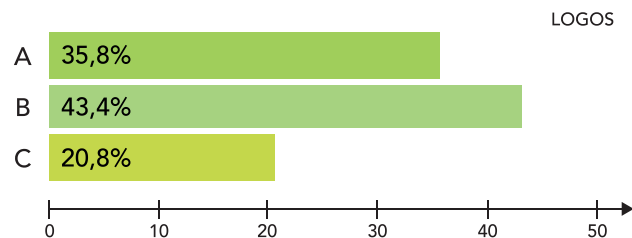


Figure 37. Representation of the concept

In the infographics' group, participants thought that sample A better represented the bio-based concept (44.5%), followed by participants who choose the sample B (33.0%) and sample C (22.5%).

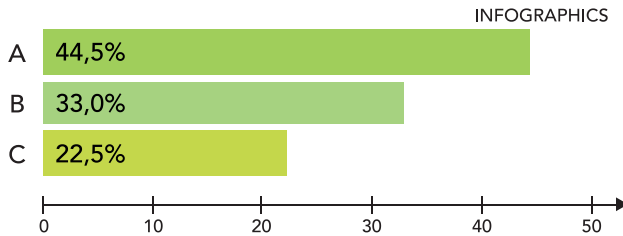


Figure 38. Representation of the concept

In the group storytelling, participants thought that sample B better represented the bio-based (42.8%), followed by participants who choose sample A (34.1%) and sample C (23.1%).

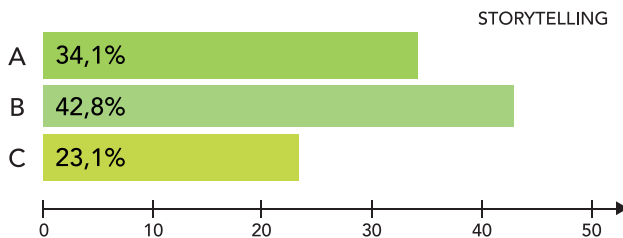


Figure 39. Representation of the concept

Wording

Participants were asked to determine which sample used clearer wording to describe the bio-based concept. In the group logos, participants thought that sample B used clearer wording - 'plantaardige

grondstoffen' - 'made from plant resources' (48%), followed by participants who thought sample A used clearer wording 'suikerriet en hout' - 'sugar cane and wood' (31,8%) and sample C 'plantaardig pak' - 'package made of plants' (20.2%).

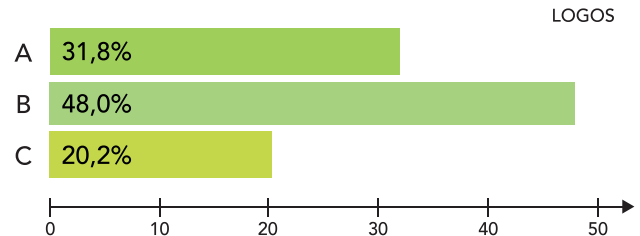


Figure 40. Wording

In the infographics' group, participants thought that sample A used clearer wording 'suikerriet en hout' - 'sugar cane and wood' (48%), followed by participants who thought sample B used clearer wording 'plantaardige grondstoffen' - 'made from plant resources' (31,8%) and sample C 'plantaardig pak' - 'package made of plants' (20.2%).

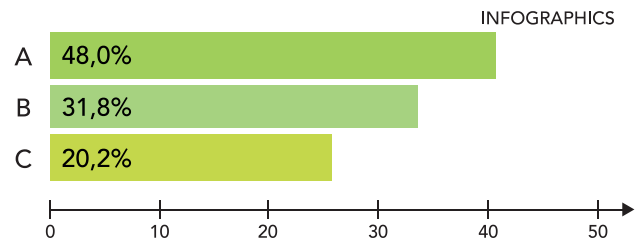


Figure 41. Wording

In the group storytelling, participants thought that sample B used clearer wording 'plantaardige grondstoffen' - 'made from plant resources' (47.4%), followed by participants

who thought that sample A used clearer wording 'suikerriet en hout' - 'sugar cane and wood' (31.2%) and sample C 'plantaardig pak' - 'package made of plants' (21.4%).

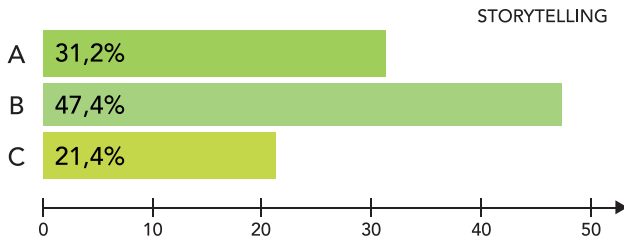


Figure 42. Wording

Recognition

Participants were asked to determine which sample is easier to recognize. In the group logos, participants thought that sample B is easier to recognize (42.2%), followed by participants who chose sample A (30.1%) and sample C (27.7%).

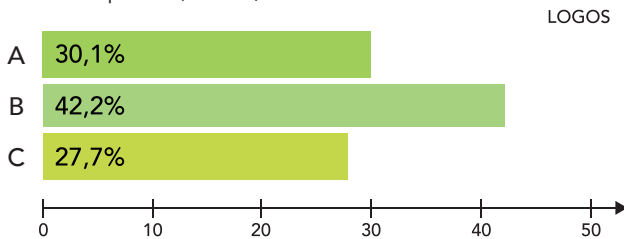


Figure 43. Recognition

In the infographics' group, participants thought that sample A is easier to recognize (43.4%), followed by participants who chose sample B (34.1%) and sample C (22.5%).

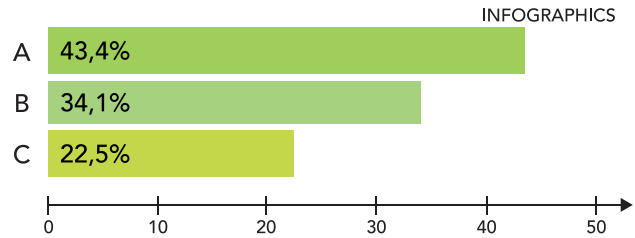


Figure 44. Recognition

In the group storytelling, participants thought that sample B is easier to recognize (38.7%), followed by participants who chose sample C (32.9%) and sample A (28.3%).

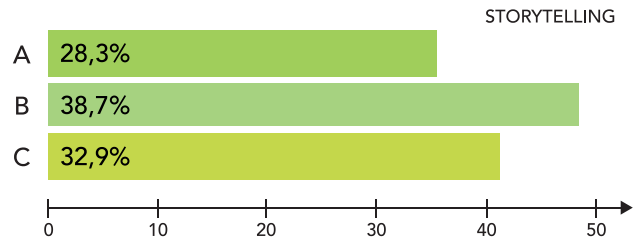


Figure 45. Recognition

In general, sample B in both logos and storytelling better communicates and represents the bio-based concept. Nevertheless, sample A was chosen as the sample which better communicates and represents the bio-based concept in the infographics and slightly close to Sample B selection in the storytelling groups. Sample C on the contrary, was the least chosen by participants in all the conditions.

4.6.7 UNDERSTANDING

Percentage of bio-based material

In this section participants were asked to tell (based on the visuals) if they perceived that the bio-based package is; 'partially made from plants', 'mainly made from plants', 'fully made from plants'. Overall, **participants thought that the bio-based package was mainly made from plants (41.1%)**, followed participants who thought it was fully made from plants (39.8%) and participants who thought it was partially made from plants (19.1%).

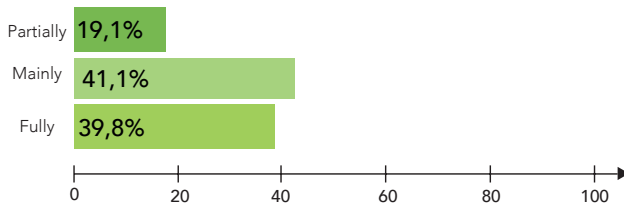


Figure 46. Bio-based percentage

A Kruskal-Wallis H test was conducted to evaluate differences among the three conditions on understanding of the amount of bio-based material on the package. The test, which was corrected for tied ranks, was not significant ($\chi^2(2) = 3.24$ $p = .198$). Additional tests were conducted to determine whether age, gender and educational level are different in understanding of the percentage of bio-

based material used on the package. However, no other significant results were found.

Disposal of the package

Participants were asked to indicate in which type of container they would dispose of the bio-based package; 'organic waste', 'rest waste', 'plastic (or PMD) collection'. Since only one option from the alternatives provided is correct (Plastic (or PMD) waste), the data was recoded into scores as followed; 0 = organic waste and rest waste; 1 = plastic (or PMD) waste). Overall, in all the conditions, participants thought that the bio-based package should be disposed of in the organic waste and the rest waste (89.6%) rather than the plastic (or PMD) waste (10.4%).

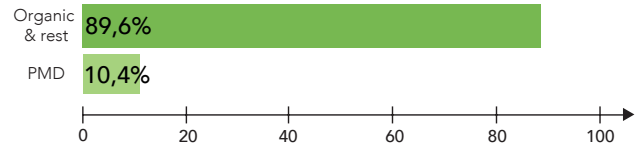


Figure 47. package's disposal

A Kruskal-Wallis test was conducted to evaluate differences among the three conditions (Logos, infographics and storytelling) on how to dispose of the bio-based package. The test, which was corrected for tied ranks, was not significant ($\chi^2 = (2) = .148$ $p = .992$).

Additional tests were conducted to determine whether age, gender and educational level are different in understanding how to dispose of the bio-based package. However, no other significant results were found.

4.6.8 ATTRACTIVENESS

General attractiveness

Participants were asked to tell what they thought about the samples in general to determine how attractive the visuals were. A five-point semantic differential scale was used (I find them very bad/ I find them very good). Overall, participants have said that they find the visuals good (55.3%), followed by participants who think that the visuals are very good (23.5%). However, a few participants that find the visuals nor good nor bad (16.7%) and participants who find them very bad (4.5%).

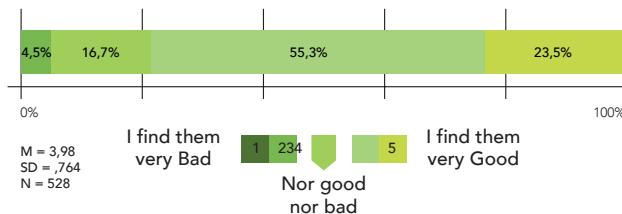


Figure 48. General attractiveness

A Kruskal-Wallis H test was conducted to evaluate differences among the three conditions and attractiveness of the visuals. The test, which was corrected for tied ranks, was not significant ($\chi^2(2) = .210$ $p = .900$). Additional tests were conducted to determine whether age, gender and educational level are different in attractiveness of the visuals. however, no other significant results were found.

Favourite sample

Participants were asked to rank the visuals on each condition from the most favourite to the least favourite. (1= the most favourite 3= the least favourite). A non-parametric Friedman test of differences among repeated measures was conducted for the group logos and rendered a Chi-square value of .000. The storytelling group was also significant with a Chi-square value of .027. However, the infographics group was not significant. A Bonferroni post-hoc test was conducted to see the differences among the groups. In the logos group, there was a significant difference between B and C (MD=.21 SD=.088, $p=.045$). However, there was no difference between B and A. In the storytelling group, there was a significant difference between sample B and A (MD=.31 SD=.086, $p=.001$). However, the difference between B and C was not significant. All things considered, sample B was the most favourite for participants in the logos and storytelling conditions.

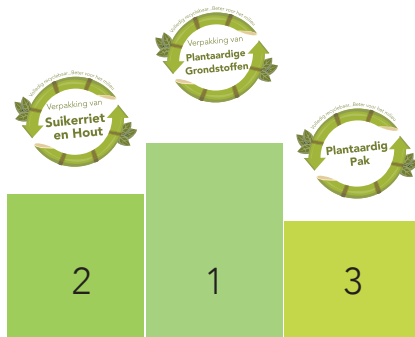


Figure 49.1 Ranking logos

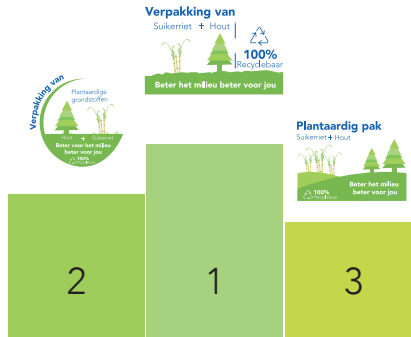


Figure 49.2 Ranking infographics



Figure 49.3 Ranking storytelling



Figure 49.4 Favourite samples chosen by the participants

4.7 CONCLUSIONS

This study is an initial investigation of how Tetra Pak could implement visual signs to explain to consumers the differences between conventional beverage carton packages and beverage cartons with bio-based plastic. The study has shown the understanding, evaluation, and acceptance of the bio-based concept from the consumers' point of view in different ways. Three main findings have been identified in this research. First, the study evidenced that consumers did not know what bio-based means. However, in general, consumers have shown a positive attitude towards beverage cartons with bio-based plastic. Second, the study has shown that consumers were environmentally conscious and were willing to purchase beverage cartons with bio-based plastic once they understood the concept. Finally, the study evidenced that there were not big differences between the compositions of logos, infographics, and storytelling regarding understanding, clarity, and attractiveness. However, consumers preferred sample B and A, because these

samples were clear and attractive. Therefore, based on the previous findings some recommendations will be presented.

4.8 IMPLICATIONS

According to Walter (2011) consumers are not aware of what bio-based stands for. This study confirmed that fact since consumers stated that they were not familiar with the term and although some of the participants mentioned that they have heard of it, they did not understand the meaning. Nevertheless, participants assumed that the benefits of the conventional packages were in the bio-based packages, such as the product protection. This was a good indicator since in the qualitative part of this study it was shown that consumers mostly cared about the quality of the content. In addition, consumers believed that beverage carton packages with bio-based plastic could be more expensive than the conventional packages. In this sense, consumers expected that the price of the bio-based package would be more expensive compared with the conventional carton package.

Throughout the study, most of the consumers showed a receptive behaviour by mentioning that

the impact on the environment was important when purchasing beverage cartons. According to Reinders et al., (2017) personal environmental norms are a relevant moderator when introducing a bio-based concept in the market. This has been evident in the consumers' willingness to purchase beverage cartons with bio-based plastic once they understand the concept. **Therefore, it is recommended that in order to trigger consumers' attention and interest, it is essential to create a clear notion of the concept. For instance, the wording is a key element to consider.** It was evident in the research that consumers tempted to choose general wording such as plant-based package or package made from natural sources. This was a recurring pattern through the questionnaire not only when consumers were able to define the bio-based concept by themselves but also in the samples they chose with the clearest wording such as sample B 'Plantaardige grondstoffen'.

Secondly, Fisher, Bashyal, and Bachman, (2012)

have stated that demographics are important to be considered in sustainable products. The authors have shown that people with high level of education are likely to present environmentally friendly behaviours as well as consumers from 55 years old and above. **This study has confirmed these findings.** Highly educated consumers are more environmentally conscious and more open to pay attention to information explaining the characteristics of beverage cartons with bio-based plastic. Hence, these types of consumers have shown their willingness to purchase products with the bio-based package. Furthermore, the same phenomenon was evidenced in the group age of people from 55 years old and above. **It is, therefore, important for Tetra Pak to obtain further insights of these segments.** Nonetheless, the study has shown in general that there are not too many differences between groups, age, gender and educational level which mean that other segments should not be left aside.

Thirdly, regarding understanding, clarity, and attractiveness of the informational cues presented in this study (logos, infographics and storytelling), we have seen that they were slightly different. In terms of clarity, it has been shown that infographics better communicate the natural resources used to produce the bio-based packages than logos and storytelling. This fact could be related to the visual composition illustrating the resources (trees and sugarcane) in a literal form. However, logos clearly

represented the recyclability of the package for consumers from 55 years old and above. This fact could be associated with the representation of the arrows and the simplicity of the composition which makes it easy to read.

On the other hand, when the clarity of the samples was evaluated per condition, it was evidenced that both logos and narratives coincided in clarity of wording, clarity in communication of the bio-based concept, and ease of recognition represented by sample B. However, consumers in the infographics' group identified sample A as the clearest in all the aspects. It was evidenced that in all the conditions, sample C was the least chosen. Therefore, we could conclude that the wording, communication, and recognition are too general to describe the bio-based concept in sample C.

Consumers have also interpreted that beverage carton packages with bio-based plastic are mainly made from plants as well as fully made of plants. This needs to be more specific in the information since it could lead to create confusions. According to Reinders et al., (2017) packages with higher percentages of bio-based materials are more appreciated by consumers compared to those that have lower percentages of bio-based materials. This means that consumers will evaluate positively the product and have positive expectations resulting in higher purchase intentions. **Therefore, it is recommended to provide accurate information**

about the percentage of bio-based material to avoid green washing associations. This was not clear in the visual compositions. Hence consumers believed that beverage cartons were fully or mainly made of plants. **Another aspect which needs to be clear in the informational cues for consumers is how to dispose of the bio-based package.** The fact that the package uses natural resources to be produced makes consumers associate it with biodegradable. Therefore, consumers assume that the package needs to be disposed of in the organic waste. This was also evidenced in the qualitative part of this study.

this study.

Finally, the study has shown that consumers consider the images attractive in general. However, sample B was chosen as the most attractive in logos and storytelling followed by sample A. For the infographics, sample A was the most attractive followed by sample B. Hence, it could be concluded that the illustrations of sugarcane and wood play an important role for consumers in the clarity of the concept. According to Walter (2011), brands are advised to develop clear communication for consumers of what bio-based stands for. In this research, it was evidenced that the wording was another important element to reinforce the illustrations with words such as 'package made of natural sources' or 'package made of sugar cane and wood'. This makes the explanation easier and clearer to understand. The following tables (3,4, and 5) illustrate a summary of the findings gathered in




		CLARITY			UNDERSTANDING		ATTRACTIVENESS
DIFFERENCES		Communtion of the concept	Recyclability of the package	Made of renewable sources	Bio-based percentage	Disposal of the package	General attractiveness
Between groups		-	-	 ($\chi^2(2) = 8.15$ $p = .017$)	-	-	-
Age		-	 ($\chi^2(2) = 8.15$ $p = .017$)	 ($\chi^2(2) = 7.67$ $p = .022$)	-	-	-
Gender		-	-	-	-	-	-
Education		-	-	-	-	-	-
COMPARISONS							
CONDITIONS	Logos - Infographic	-	-	(MD= -30.61 SD= 14.55 $p = .106$)	-	-	-
	Infographics - Storytelling	-	-	(MD= -37.91 SD= 15.55 $p = .028$)	-	-	-
	Storytelling - Logos	-	-	(MD= 7.31 SD= 14.73 $p = .106$)	-	-	-
AGE	18-34 / 35-54	-	(MD= -57.28 SD= 14.22 $p = 1.00$)	(MD= -13.18 SD= 14.15 $p = 1.00$)	-	-	-
	35-54 / 55 and above	-	(MD= 42.510 SD= 16.32 $p = .028$)	(MD= 40.94 SD= 14.79 $p = .017$)	-	-	-
	55 and above / 18-34	-	(MD= 36.782 SD= 14.86 $p = .040$)	(MD= 27.75 SD= 16.25 $p = .263$)	-	-	-
TOTAL PARTICIPANTS		528					

Table 3. Significant differences in clarity, understanding and attractiveness.

		PRODUCT PERCEPTION			PURCHASE INTENTIONS	
DIFFERENCES		Product protection	Product price	Info. cue attention	Environmental impact	Bio-based package
Between groups		-	-	-	-	-
Age		-	-	($\chi^2(2) = 9.78, p = .008$)	($\chi^2(2) = 10.03, p = .007$)	($\chi^2(2) = 12.82, p = .002$)
Gender		-	-	-	-	-
Education		-	-	($\chi^2(2) = 11.14, p = .004$)	($\chi^2(2) = 46.41, p = .003$)	($\chi^2(2) = 10.26, p = .006$)
COMPARISONS						
AGE	18-34 / 35-54	-	-	(MD= -14.12 SD= 14.36 p= .997)	(MD= -13.69 SD= 14.87 p= 1.00)	(MD= -13.77 SD= 14.64 p= 1.00)
	35-54 / 55 and above	-	-	(MD= -46.86 SD= 15.01 p= .005)	(MD= -38.44 SD= 15.54 p= .040)	(MD= -43.75 SD= 15.30 p= .013)
	55 and above / 18-34	-	-	(MD= 32.74 SD= 16.48 p= .141)	(MD= 52.13 SD= 17.08 p= .007)	(MD= 57.52 SD= 16.80 p= .002)
EDUCATION	Low - Middle	-	-	(MD= -18.63 SD= 16.43 p= .771)	(MD= -34.57 SD= 17.01 p= .126)	(MD= -10.13 SD= 16.74 p= 1.00)
	Middle - High	-	-	(M= -45.20 SD= 13.55 p= .003)	(MD= -46.41 SD= 14.03 p= .003)	(MD= -43.40 SD= 13.82 p= .005)
	High - Low	-	-	(MD= 26.57 SD= 16.90 p= .348)	(MD= 11.84 SD= 17.50 p= 1.00)	(MD= 33.27 SD= 17.22 p= .160)
TOTAL PARTICIPANTS		528				

Table 4. Significant differences in product perception and purchase intentions

	CLARITY		ATTRACTIVENESS		
	Representation of the concept	Wording	Recognition	Favourite	Total
LOGOS					173
First	B	B	B	B	
Second	A	A	A	A	
Third	C	C	C	C	
INFOGRAPHICS					182
First	A	A	A	A	
Second	B	B	B	B	
Third	C	C	C	C	
NARRATIVES					173
First	B	B	B	B	
Second	A	A	C	A	
Third	C	C	A	C	
TOTAL PARTICIPANTS					528

Table 5. Consumers' preferences for the samples presented regarding clarity and attractiveness

4.9 LIMITATIONS AND FURTHER RESEARCH

There are some limitations in which the findings of this study can be extended in further research. This study was a between-subject experiment evaluating three samples per condition (3x1). However, further research could explore how consumers evaluate the different informational cues at the same time (logos vs infographics vs storytelling) (3x3). By doing so, more specific differences between the compositions could be uncovered. Furthermore, it could be explored whether clarity, understanding and attractiveness have an influence on the purchase intentions and the purchase frequency of the product. From a managerial perspective, brands could assess whether the position of the visual cues on different parts of the package such as the front panel could assist consumers in their decision-making (Silayoi & Speece, 2007). This could determine whether consumer will purchase bio-based products when they are persuaded by the visual cues in a real-purchase setting (Reinders et al., 2017).

Moreover, the informational cues designed for this study could be adapted to assess different brands' category (e.g., premium brand, mid-range brand, or budget brand). This could provide marketers a clear notion on how to display the visuals according to the type of brand and segments. In addition, consumers could evaluate which type of product category better suits the bio-based package (e.g., juice, dairy products, water, wine etc.). Further research could also explore and compare the findings of this study in other countries. For instance, not every country has the same ways to sort and recycle beverage carton packages. Therefore, the illustration should be adapted for each situation.

Based on the theoretical background of this study, it was expected that logos were going to communicate the concept clearer than infographic and storytelling (Wu et al., 2009). Nevertheless, infographics were more concise communicating the concept of beverage cartons with bio-based

plastic. Moreover, it was expected that consumers would understand better the bio-based concept through infographics compared to logos and storytelling (Harrison et al., 2015). However, this was not evidenced. Finally, storytelling was expected to be more attractive for consumers compared to logos and infographics (Lundqvist et al., 2013). Nonetheless, this expectation was not met in the study. Further research could elaborate on different configurations of one concept. For instance, brands could try different types of storytelling by using multiple sizes and amount of information in the visual. These configurations will enable brands to identify if the size, amount of information, and graphic composition make the differences in clarity, understanding and attractiveness.

Finally, this study was a specific study for the company Tetra Pak on how they could advise their clients to introduce the bio-based concept to their consumers. Therefore, the study has focused on beverage carton packages. Further studies could explore if the findings obtained in this research are applicable for different types of bio-based packages. (e.g., packages which are plant-based and biodegradable). This is important to consider because the information presented to the consumers, needs to be carefully designed to avoid confusions in the terminology used to define sustainable concepts (Walter, 2011).

An aerial photograph of a forest with a lake. The top half of the image shows a calm lake reflecting the surrounding forest. The bottom half shows the forest from an aerial perspective, with trees in shades of green and yellow. A central white box with a black border contains the word "RECOMMENDATIONS" in black, uppercase letters.

RECOMMENDATIONS

*“Recycling, packaging, businesses are changing all of those things
because that’s what consumers want.”*

Jerry Greenfield

5.1 RECOMMENDATIONS FOR TETRA PAK

Shoppers are everywhere around the world making decisions on what to buy and where to buy it. Nowadays, people are constantly seeking for innovation, reliability and quality especially for fast moving goods. Marketers can assist consumers to make the right choice by presenting an attractive product on the shelf which provides consumers an added value. Tetra Pak, as a packaging manufacturer, can contribute to enhance this attractiveness by offering their clients high quality packages focused on sustainable innovation. The bio-based packaging alternative is a good approach to convince consumers around the world that the environmental impact is a collective responsibility. In this study, it was evidenced that consumers were aware of the importance to contribute reducing the environmental footprint. Therefore, it is essential that consumers understand what they are purchasing when they chose a product with a bio-based package. According to the findings of this research project, four guidelines were developed

for Tetra Pak in order to advise its customers on how to introduce the bio-based concept to their consumers.

to create a clear and concise explanation.

5.1.1 THE RIGHT WORDS

For consumers, it is important to know what they are purchasing and some consumers are more curious than others. For some people, it is important to know what benefits or consequences a product brings along. In the visuals designed for the purpose of this study key words were chosen in order to persuade consumers in a positive way. These words were chosen based on the main attributes of the bio-based package such as the natural resources, the recyclability and the benefit for the consumer and the environment. **It was evidenced that for consumers the words plant-based package or package made of natural resources were the most appropriate way to describe the bio-based concept.** This is related to the fact that consumers understood that the package has a vegetal origin. Therefore, regardless the type of natural resources used to produce the package (e.g., sugarcane and wood), for consumers is enough to know that the materials are from a natural origin.

Furthermore, the amount of words also matters. It was mentioned previously in this study that few words or too many words could lead to consumers' confusion. For instance, if the words renewable resources are chosen, it should be explained what comes from renewable resources. In this case, the materials used to produce the package. **For consumers, the words are the main element to take into consideration followed by the visual aids reinforcing these words**



Figure 50. Example of the bio-based package with the new wording

5.1.2 BIO-BASED PERCENTAGE

Companies need to be very careful when choosing their affirmations. Consumers, trust what the brands communicates and finding out that an affirmation is not true could bring serious repercussions for a brand. With trends such as 'honestly speaking' consumers expect that brands provide them with transparent and reliable information of their value chain. Therefore, general and suggestive statements are not accepted by consumers any longer. For instance, telling a consumer that a product is environmentally friendly when only a 10% of the product is environmentally friendly is not appreciated because it will generate consumers' distrust in the brand.

In order to avoid that type of confusions, Tetra Pak needs to clarify in their explanations about the bio-based package the amount of bio-based material used in the process. Up to now the company counts with the four-star Vincotte certification (figure 51) which means that more than 80% of the package uses renewable raw materials. Therefore, it could be included in the visual cues to explain consumers in an easier way the amount of renewable raw materials that the package uses.



Figure 51. Vincotte certification

5.1.3 DISPOSAL OF THE PACKAGE

Using natural resources to manufacture the materials of the bio-based package could result tricky for Tetra Pak. On the one hand, the company is aiming for a more sustainable value chain. However, the polymers of the bio-based packages have the same properties as the regular carton packages. This is why bio-based packages are fully recyclable just as the conventional packages. For consumers, this could be confusing since they believe that because the package uses plant-based materials its disposal is different. For instance, in this study consumers told that they would dispose of the bio-based package in the organic waste collection rather than the plastic (PMD) waste collection. Nevertheless, every country has different rules to sort and dispose of beverage carton packages. In the Netherlands, there is a set of icons (figure 52) to guide consumers on how to dispose of the packages. However, they are not always easily seen by consumers. In addition, some products sold in the Netherlands are manufactured and packaged in other countries thus this icon is not always present. Therefore, the visual cues could reinforce the correct way to dispose of the bio-based package by telling consumers which collection waste they need to use.



Figure 52. Packaging icons for waste collection



Figure 52. Packaging icons for waste collection

5.1.4 INFORMATIONAL CUES

In this study, it was evidenced that there were not big differences between the informational cues communicating the bio-based concept (logos, infographics and storytelling). This means that Tetra Pak could use any of the informational cues presented in this study to communicate the bio-based concept on the package. However, infographics were slightly different representing the natural resources to produce the materials of the package. Therefore, Tetra Pak could initially experiment presenting the concept through infographics while consumers become familiar with the term. However, once consumers identify the concept the use of a logo could be most appropriate due to its concrete composition. It is important to keep in mind that these informational cues change from country to country in terms of language, laws and brand fit.

Based on the recommendations mentioned before, the wording, the amount of bio-based materials used to produce the package, the recyclability emphasis and the correct way to dispose of the package, a new design for infographics has been developed (figure 53). The infographic presents a summary of the main elements that consumers need to know when purchasing a beverage carton with bio-based materials. First of all, the visual tells consumers that the package is made from more than 80% of renewable resources. In addition, it illustrates both, the sugarcane and the wood since consumers

identified in this study that these visual compositions (infographics) better communicates the renewable resources. Secondly, the visual tells the consumer that the package is 100% recyclable and should be disposed of in the container where they usually dispose of beverage carton packages. Lastly, the visual motivates consumers by telling them that the package is not only good for the environmental impact but also for them. An example of how this visual composition could be integrated on the package has been developed. Figure 54, illustrates an Alpro package with the infographic.

Verpakking gemaakt van meer dan 80%
Plantaardige Grondstoffen

100%
 Recyclebaar
 bij drankenkartons

Beter voor het milieu beter voor jou

Figure 53. Infographics' re-design.



Figure 54. Example of the bio-based information on Alpro's package

REFLECTION

I feel so lucky to had this opportunity. When I was looking for a graduation project I knew I needed to find something that suited my capabilities to be able to enjoy it. For me packaging was always interesting, I worked designing packaging a couple of times before the master. However, I never approached it from a sustainable perspective and I never really understood the dynamics behind the packaging. The possibility to work for Tetra Pak in packaging sustainability and had an expert team of supervisors motivated me to explore a new field in my career. Although it seemed easier at the beginning, I must admit that a research project is very challenging but at the end, the knowledge you gain is very enriching.

At the beginning, it took me a while to fully understand the topic and find relevant literature for my project. The fact that the topic is still premature was a barrier for me because the advantages and benefits of the bio-based package are still under discussion. In addition, the concept currently is quite abstract and approached from a scientific perspective.

Therefore, explaining to consumers the concept was difficult. Although I tried to emphasize in both, the qualitative and quantitative phases about the origin of the package, consumers still believed that the concept tackles the end-life of the package (e.g., biodegradable). However, from my perspective, this is a matter of time and companies need to be clearer when approaching consumers about the bio-based packaging.

This project allowed me to improve my skills as a researcher and bring along my capabilities as an industrial designer. I learned from my supervisors, their expertise, and Tetra Pak's team. I enjoyed working in a real-life setting applying my knowledge and the knowledge of the people who guide me through the whole process. I appreciate all the collaboration and support that Tetra Pak gave me during these five months. The company gave me the guidelines to set my research and shape it based on their philosophy. I am sure this project could have been performed from different perspectives but I

learned to make choices and bet for them.

Finally, it was a pleasure for me to work with my chair Marielle Creusen, who guide me through the whole process collaborating me day by day to improve my work from her expertise. My company mentor, Frank Vandewal, who believed in me from the beginning and provide me all the tools to perform my project. To Lise Magnier, my mentor, who gave me the opportunity to join this project and supported me with her broad knowledge in the field. I also appreciate the contribution of Jan Schoormans, who took over the project from Lise and taught me to be more confident about my work. I have learned so much about these team and from each person I take a valuable knowledge to apply it my career.

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