

Customer understanding of convenience food packaging in the European Union

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Preface

This report is a final Bachelor's Thesis of Aleksandra Matysiak, a 22 years old student from Poland. It has been written as a part of the final assignment for the International Food Business double Bachelor's degree at AERES University of Applied Sciences in Dronten, the Netherlands and Dalhousie University in Truro, Canada. I would like to thank Umair Qureshi, my thesis coach, for supporting me and providing necessary feedback.

This research was conducted to better understand customer knowledge and perception on packaging used for convenience food products in the European Union. The results can be used by food producers and retailers to improve marketing and communication with consumers in regard to product packaging and sustainability.

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Summary

With globalization and growing population, the food industry is facing sustainability challenges and customers' concerns about environmental issues are increasing. As customers play an important role in the food system, it is important to understand their perception and understanding of sustainability aspects. With the globally changing lifestyles of customers, the convenience food industry is rapidly growing. Therefore, the goal of this research was to gather information about customer understanding of plastic packaging used for convenience food products in the European Union. A survey was created and 197 answers were collected from respondents from 7 European countries and age all age groups.

The research found that there are statistically significant differences between the country in the European Union and interest in packaging sustainability. Moreover, gender differences were noticed in relation to understanding sustainability communicates as well as perception of packaging materials. Male respondents showed a higher level of understanding as well as found aluminium more sustainable than female respondents did. Therefore, sustainability communication should be short, clear and adjusted to target audience.

Moreover, it was analysed that 73,8% of respondents perceive plastic packaging as unsustainable or rather unsustainable. However, this perception does not influence all participants to avoid buying food products packed in plastic due to convenience reasons. The results of this research are useful for food producers and retailers who want to improve communication on packaging sustainability with customers. Based on the results, a recommendation for businesses is to present sustainability information in a clear and non-confusing way for the customers. Moreover, additional research in the direction of customer knowledge about sustainability of packaging materials is recommended.

1. Introduction

1.1 Sustainability in the food industry

Over the past decades, the customers' concerns about global environmental issues have been increasing. Therefore, companies are pressured to put more weight on sustainable production and supply chain management as this is one of the biggest challenges among industries in today's competitive business world (Govindan et al., 2016).

On the other side, consumers play an important role too in shaping the food industry. With the buying behaviour, consumers drive demand for manufactured foods and choose from products that are already available in the market (Johnston et al., 2014). Moreover, consumers are crucial to promote trends by sharing knowledge and experiences (Lazzarini et al., 2018). Grunert et al., 2014 and Van Loo et al., 2017 have proven that motivation is a crucial factor in making sustainable food choices, but consumers must have sufficient knowledge and access to accurate information to be able to choose the most sustainable option (Peschel et al., 2016; Vermeir & Verbeke, 2008).

Due to the growing population, the food production is intensively increasing and leads to high greenhouse emissions, which has a significant effect on the environment (Steinfeld et al., 2006). According to Tukker and Jansen (2006), food production accounts for almost one-third of the environmental impact from total household consumption. Aspects that increase food's environmental impact are heating greenhouses, transportation, packaging and storage (Lazzarini et al., 2018). Moreover, the food industry faces the problems of losses in biodiversity, soil degradation and water stress (Lazzarini et al., 2018).

1.2 Globalization and the food industry

Due to the developments in technology, telecommunication and transportation, since the mid-1980s, the supply chains became more global resulting in both positive and negative effects on the economy, environment and societies (Zhang et al., 2022b). For example, globalization opens growth opportunities for developing countries and helps countries to guarantee food security through global trade (Zhang et al., 2022b, Liu et al., 2021). Moreover, an advantage of globalization of the food industry for customers is increased diversity, access, availability and affordability of food products (Black, 2016). Globalization gives consumers access to tropical products that cannot be produced domestically by most countries, for example in Western Europe (Dalin & Rodríguez-Iturbe, 2016).

However, this requires additional transportation. While the majority of agricultural products (such as raw crops) are often shipped by cargo, which is the least emission intensive transport mode, processed agricultural products (including dairy products, meat products and plant-based products) strongly rely on carbon intensive air transport, which results in higher carbon dioxide emissions (Dalin & Rodríguez-Iturbe, 2016).

1.3 Convenience food products

In general, convenience means „designed for quick and easy preparation or use” (The Merriam-Webster Dictionary, n.d.). When talking about food products, the concept of convenience is multidimensional (Scholderer & Grunert, 2005). Convenience can be defined in terms of saving time, physical energy and mental energy, but is also dependent on the consumption stage, such as planning, purchasing, preparation and eating disposal (Scholderer & Grunert, 2005). Therefore, convenience food products can be defined as products that save time and minimize physical and mental effort related to shopping, preparation, consumption and post-meal activities (Buckley et al., 2007; Candel, 2001; Darian & Cohen, 1995).

Convenience is currently one of the biggest trends in the food industry (Bruner et al., 2010). As a result of globalization, changes in customers lifestyles and household structures (including more single households and more women developing professional careers and pursuing paid work), as well as technological advancements, such as the microwave, the demand for convenience food products is steadily increasing (Buckley et al., 2007; Lagaron et al., 2004; Bruner et al., 2010). Moreover, research by Swoboda and Morschett (2001) finds that consumers looking for convenience products are less price-sensitive than non-convenience-oriented consumers. This means that convenience-oriented consumers are willing to pay more for the ease and comfort.

Convenience food products can be divided into 4 main categories: highly processed foods, moderately processed foods, single components and salads (Bruner et al., 2010). Highly processed foods include ready-to-eat chilled and frozen products, canned products and dried instant products (Bruner et al., 2010). Examples of moderately processed foods are ready-to-eat fresh sandwiches, chilled fresh pasta products and warm pizza (Bruner et al., 2010). Single components are pre-cut, seasoned, frozen and canned foods such as vegetables, fish and meat (Bruner et al., 2010). Salads can come in a form of cut and washed salads in a bag, ready-to-eat salads with sauce, green salads and pre-cut, fresh fruit salads (Bruner et al., 2010).

The convenience market is constantly growing. In 2020, the global packaged food market was worth \$1.9 trillion and is expected to reach \$3.4 trillion by the year 2030 with a 5% annual growth rate (Kan & Miller, 2022). For example, in Italy, the ease of use has increased the consumption of minimally processed vegetables by 380% in the years 2002-2012 (Sillani & Nassivera, 2015).

The revenue in the convenience food sector in Europe in 2021 was \$2.54 billion and is expected to reach \$5.84 billion by the year 2025 with the annual growth rate of 23.48% (Statista, n.d.). Moreover, the number of users in the convenience food segment in Europe is expected to reach 91.1 million by the year 2025 (Statista, n.d.).

1.4 Food packaging and sustainability

The main function of food packaging is to protect the food from external influences such as oxygen, moisture, microorganisms, insects, dirt, heat, light and other (Restuccia et al., 2010). Moreover, food packaging is used for extension of shelf-life, retardation of spoilage, ensuring food safety, maintenance of quality and support of non-solid foods (Restuccia et al., 2010; Robertson, 2006). In addition to these functions, packaging can be used for convenience, marketing and communication link between the producer and the customer (Restuccia et al., 2010).

Generally, there should be a minimum interaction between food and packaging (Restuccia et al., 2010). However, as a result of globalization and changes in customers lifestyles, there is more demand for fresh and tasty convenience food products with prolonged shelf-life and controlled quality, and as a result, new packaging technologies where interaction between food, packaging and environment occurs, have been developed in the past decades (Lagaron et al., 2004; Ahvenainen, 2003; Ahvenainen & Hurme, 1997). Examples of these technologies include removing oxygen from the package and inhibiting the growth of microbes (Risch, 2009).

Despite the benefits of packaging, there are concerns about the environmental impact of packaging, such as extraction of raw materials, greenhouse gasses emissions and use of water and energy, which altogether result in pollution and waste (Kan & Miller, 2022). Moreover, as most of the packaging used for food is designed for single use, there is minimal circularity, which creates visible waste problem (Kan & Miller, 2022). However, the study of Wiefek et al., (2021) found that some customers are concerned about hygiene of unpacked foods as well as long-term hygiene effect on reusable packaging options. In addition to that, since the start of COVID-19 pandemic there has been a 15% growth of non-biodegradable food packaging waste, which was a result of the consumers' fear of SARS-CoV-2 infection (Oliveira et al., 2021). Therefore, to avoid contact with materials and surfaces, customers were choosing single-use packaging options more frequently than before the start of COVID-19 pandemic (Oliveira et al., 2021).

One of the most common materials used for food products is plastic, as it is liquid, easily moldable, easy to print, heat sealable, cheap and can be combined with other production processes (Geyer et al., 2017; Kan & Miller, 2022). According to the ING Economics Department (2019), around 40% of total food in Europe is packed in plastic. Moreover, over the past 60 years, the annual worldwide production of plastic increased by 379 tonnes, starting from 2 million tonnes in 1950 to 381 million tonnes in 2015 (Kan & Miller, 2022). For example, only in the United States, 13 million tonnes of plastic packaging and containers was used in 2018 (United States Environmental Protection Agency, 2020). As estimated by Lebreton and Andrady (2019), if the production of plastics continues at the current growth rate, it will reach the level of 155-265 Mt by the year 2060. On the other hand, Barlow and Morgan (2013) claim that reducing plastic packaging in the food industry can result in bigger problems, such as increased food losses. Overall, modern commerce is highly dependent on plastic food packaging, which performs an important role in creating a sustainable and efficient production system (Sundqvist-Andberg & Åkerman, 2021).

Since the majority of plastic packaging is thrown away in the same year as it was produced (Geyer et al., 2017), the life cycle of this material is short. Combined with large volumes, it creates a visible waste management problem.

Even though there are many sustainability challenges in the food industry, the most visible problem for the consumers is plastic pollution. The study of Kitz et al. (2021) found that people generally support green packaging, however customers often lack knowledge and guidance to choose the most environmentally beneficial option. While customers are a large player in the food industry, this research will look at customer perception, awareness and knowledge about sustainability of packaging used for food products, with the focus on convenience food products.

1.5 Sustainability of plastic packaging compared to other materials

The study of Beitzel-Heineke et al. (2017) found that replacing plastic packaging with different materials could help in reducing plastic waste, however this solution is not certainly more environmentally friendly.

Since plastic is a light material, its transportation produces less carbon emissions compared to other, heavier materials such as glass (Wiefek et al., 2021). In the case of aluminium, it cannot be recycled in a closed loop, which leads to downcycling and addition of virgin material to recycled aluminium (Wiefek et al., 2021). Moreover, manufacturing of glass and aluminium requires high temperatures, which makes these processes very energy intensive (Brough & Jouhara, 2020). As for paper, it degrades in the environment faster than plastic and results in less litter, however in regard to the full life-cycle impact, paper has a higher environmental impact (Wiefek et al., 2021).

Therefore, substituting plastic with different materials, such as paper, glass and aluminium can help in reducing plastic waste issue, but might cause other environmental problems (Wiefek et al., 2021).

1.6 Consumer behaviour in relation to food and food packaging

As a result of globalization, consumers worldwide have access to a variety of food products (Carcea et al., 2009). Therefore, more and more customers, especially Europeans, are concerned about the food origin, regional identity and quality (Carcea et al., 2009, Kelly et al., 2005).

Stranieri et al. (2017) state that food purchasing processes are not only based on rational decision making processes, but also on habits (for example associated with the aim to buy healthy products). Moreover, strong habits, especially when talking about daily food purchases, influence the customers' actions much more than attitudes (Stranieri et al., 2017). In addition to that, when making choices for convenience food products, customers select products mostly automatically because of time restraints (Daniels et al., 2015).

1.7 Knowledge gap: Customer understanding of sustainability aspects of food packaging

While there is scientific research on sustainability and environmental aspects of certain food packaging used in the food industry, there is limited information about the customers' knowledge, awareness and perception in that area. The studies of Kitz et al. (2021) and Wiefek et al. (2021) found that customers often lack knowledge and guidance to choose the most environmentally beneficial and sustainable options. Nordin and Selke (2010) discovered that consumers often lack knowledge and understanding of terminology when talking about sustainability. Moreover, Govindasamy et al. (2001) emphasize that environmental knowledge should be studied further. The study of Martinho et al. (2015) about social factors affecting customers' purchase of products in sustainable packaging, it was recommended to further analyze the relationship between product, packaging and purchasing behaviour.

The goal of this study is to investigate the interaction between the customers' understanding of sustainability aspects of food packaging options available in the market and customer perception on the most common packaging materials, with the focus on plastic packaging in the convenience food market in European countries. Moreover, this research is expected to show if there are differences in customer behaviour regarding packaging between different countries, age groups and genders.

Therefore, the main question of this research is: What is the relationship between the customer knowledge about plastic packaging used for convenience food products and the customer buying behaviour in different countries of the European Union?

To answer the main question, the following sub-questions were formulated

1. To what extent do customers look at packaging when buying convenience food products?
2. What is the customer knowledge about sustainability of packaging used for food products?
3. What is the customer perception on the main packaging materials used in the food industry (plastic, glass, paper and aluminium)?
4. What is the customer knowledge about packaging waste management and recycling of packaging materials used in the food industry?

The aim of this study is to better understand the customer knowledge, perception and motivation for certain buying behaviour in the area of convenience food products. Moreover, the results will be beneficial for food producers and retailers to improve communication with customers on the topic of sustainability. As previously found by Martinho et al. (2015), understanding the customer behavior is beneficial for introducing new features and formulating mechanisms for choosing sustainable packaging.

2. Materials and Methods

To understand the consumers' behaviour in relation with plastic packaging used for convenience food products in the European Union, this research was performed as quantitative research. Due to a broad geographical area taken into consideration in this research, it was not possible to obtain a sufficient number of responses by conducting personal, face-to-face interviews. Therefore, a survey was created in Google Forms and shared online on various social media platforms, such as Facebook, Whatsapp, Instagram and LinkedIn. Participants were also asked to share the survey to attract more respondents. Research outcomes were expected to be useful for convenience food manufacturers and convenience food retailers in the European Union. Therefore, the survey aimed at a general public in the European Union.

This research had a between-group design, with all respondents going through the same research process, where all participants either have, or have not bought and consumed convenience food products. Therefore, each single person could have been considered independently, and from these results different groups were highlighted.

The dependent variable in this research was the customer response. This variable was selected to analyze whether the purchase and consumption of convenience food products leads to a difference in the customers' perception, and therefore, response. The control variables in this research were the purchase and consumption of convenience food products and lack of purchase and lack of consumption of convenience food products.

According to Rani (2014), customer habits and buying preferences change in correlation with age. Moreover, as stated by Lenartowicz and Roth (2001), nations and subcultures have different ethnic and religious backgrounds, which can further influence customer behaviour and patterns. As stated by Mitchell and Walsh, 2004, males and females pursue different products and are likely to have different ways of thinking about obtaining these products. Therefore, the independent variables in this research were age, gender and country in the European Union. The results were expected to indicate whether there are differences between different countries in the European Union and different age groups, as well as different genders.

The current population in the European Union is 447 million people (The World Bank Group, 2022). To get a reliable result, the initial goal was to obtain at least 385 responses, with a confidence level of 95% and a margin of error of 5% (XM BLOG, 2022). The collection of data started on the 11th of May 2022 and was performed until the 29th of May 2022. Due to time constraints, the survey had to be closed at the level of 197 responses, which resulted in a change of margin of error to 7%. When all results were collected, the data was transferred to Microsoft Excel and SPSS for further analysis. The collected data was sorted into groups based on the country of living, age and gender.

In questions 1-3 of the survey, respondents were asked about age, gender and country of residence in the European Union, which were the independent variables. Moreover, in questions 4 and 5 of the survey, the customers were asked about regularity of purchase and consumption of convenience food products, which were the control variables. As the results collected in these

questions were descriptive data, it was analyzed in a form of graphs for a better visualization as well as to provide a simple summary of the sample.

After answering the demographic and control questions, respondents were asked in questions 6-10 to indicate on a scale from 1 to 5 whether they check, read and understand the sustainability information presented on the label. In addition to that, the respondents were asked whether they think enough information is presented on the label and if the packaging material influences the buying behaviour. These questions were asked to answer sub-questions 1 and 2. To answer sub-question 3, the customers were asked to indicate on a scale from 1 to 5 their perception on sustainability of different packaging materials. The results were presented in the form of a 5-point Likert scale for a better visualization. To answer sub-question 4, respondents were asked about awareness, knowledge, perception and attitude towards recycled packaging.

When analyzing relationships between customer responses relating to sub-questions 1-3 and gender, the Mann-Whitney U test was used. The answers were ordinal data and there were 2 independent groups (male and female) that were not distributed equally, which justifies the use of the Mann-Whitney U test (Bevans, n.d.). However, for analyzing relationship between gender and responses relating to sub-question 4, the Chi-Square test was used, as the dependent variables were nominal. For comparing age and country of residence with all 4 sub-questions, the Chi-Square tests were conducted as there were more than 2 groups in each independent variable. Moreover, Chi-Square tests were used for these questions as the variables were nominal and ordinal, which confirms the choice of the Chi-Square test (Laerd Statistics, n.d.). The results of these tests were expected to determine the association between variables of this research and answer the sub-questions.

It was expected that by answering the sub-questions and comparing the results to the final survey questions about customers' preferred and avoided materials for convenience food products, the main question of this research would be answered.

The survey is attached below in Appendix 1 and the results are attached in Appendix 2.

3. Results

3.1 General overview

The survey was available online from the 11th of May 2022 to the 29th of May 2022. Due to time constraints, the survey was closed before reaching the target of 385 responses and was closed at 197 responses. As two of the respondents indicated the country outside of the European Union, the number of valid responses declined to 195. The 195 responses resulted in a confidence level of 95% and a margin of error of 7%.

From the valid responses, 48,21% of respondents currently live in Poland, 35,90% of respondents live in the Netherlands, 8,21% in Germany, 5,13% in France, 1,54% in Italy, 0,51% in Hungary and 0,51% in Austria.

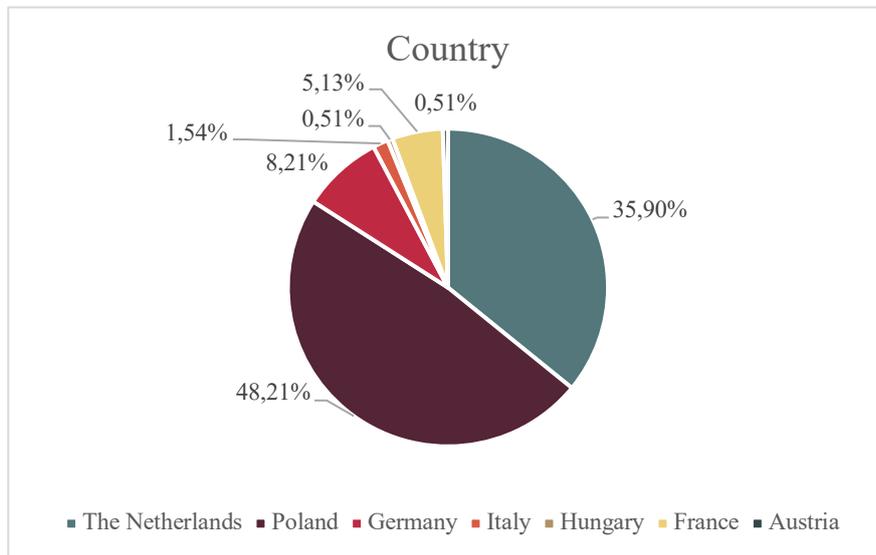


Figure 1. Current country of residence of the respondents.

As presented in figure 2, 63,59% of the 195 respondents were women, 33,85% were men and 2,56% preferred not to say or identified as “other”.

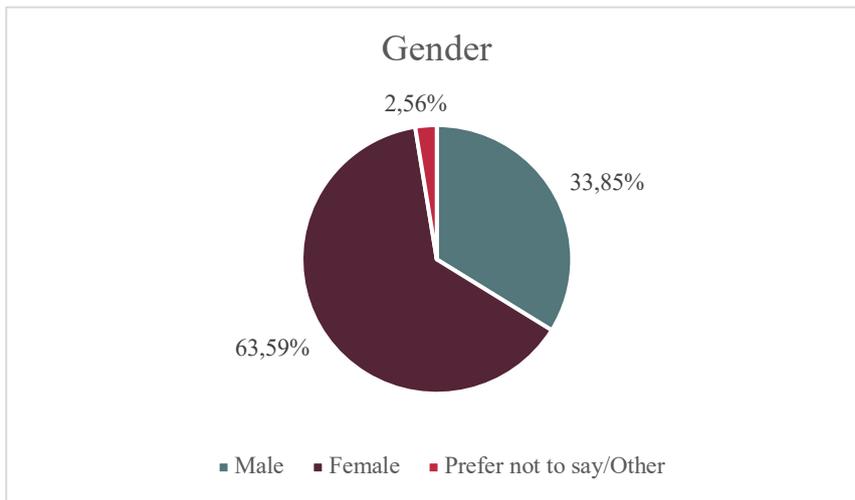


Figure 2. Gender of the respondents.

Furthermore, from all respondents the majority (66,15%) was in the age group between 18 and 30, 12,82% were in the age group between 41 and 50, 8,72% were under the age of 18, 8,72% were between the age of 31 and 40, 2,56% were in the age group 51-60 and 1,03% of respondents were over the age of 60.

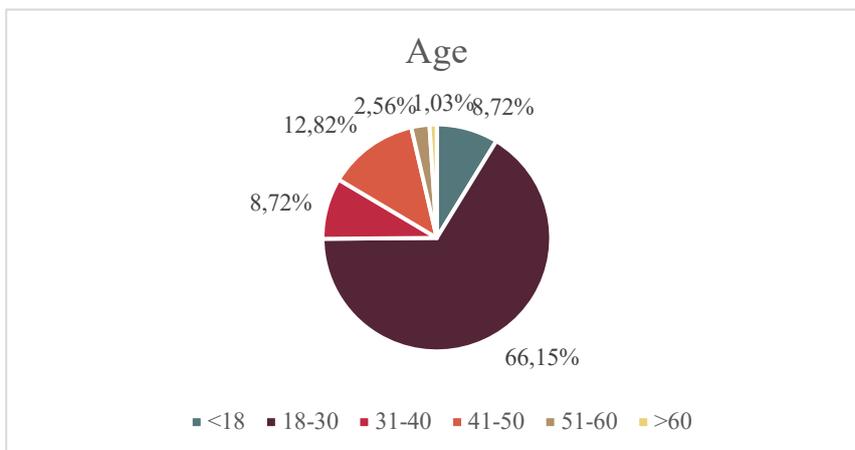


Figure 3. Age of the respondents.

Participants were then asked if they buy or consume convenience food products (such as ready-to-eat meals, sandwiches to grab on the go, pre-packed snacks or juices, pre-cut fruits and vegetables) on a regular basis. As seen in figure 4, 68% of respondents indicated that they buy or consume convenience food products on a regular basis, while 32% do not.

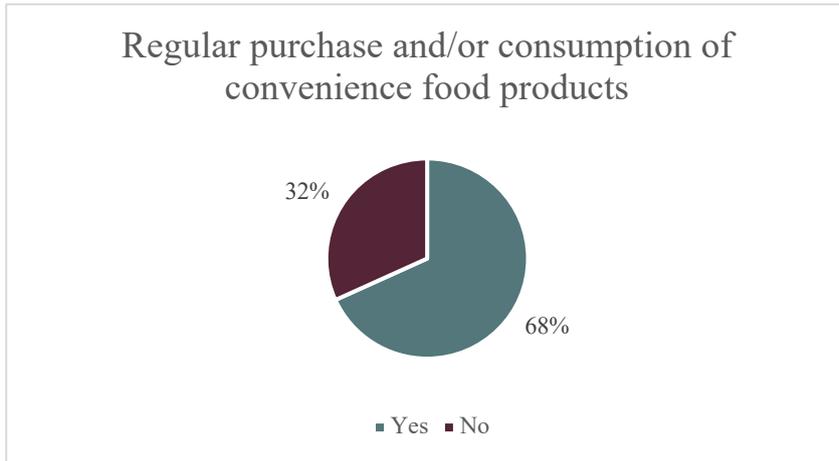


Figure 4. Answers of respondents indicating whether they purchase and/or consume convenience food products on a regular basis.

From all respondents, 40% purchases or consumes convenience food products less than once a week, 29,23% indicated they purchase or consume convenience food products once a week, 26,67% 2-3 times a week, 3,08% 4-5 times a week and 1,02% more often that 5 times a week.

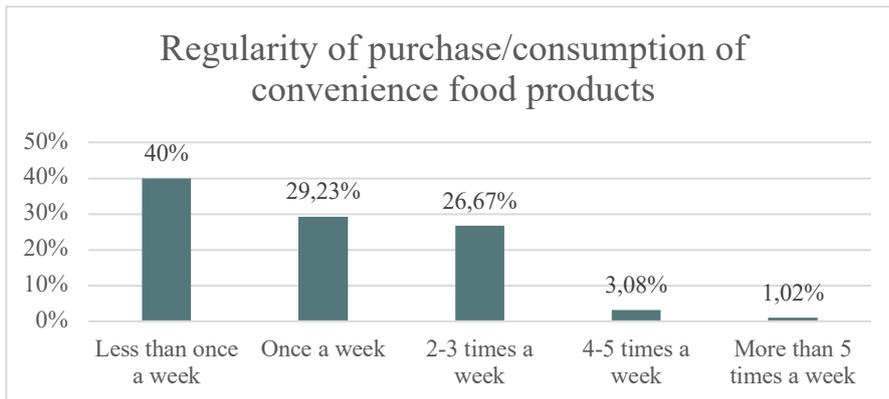


Figure 5. Regularity of purchase and/or consumption of convenience food products of the respondents.

3.2 Customer interest in packaging when buying convenience food products

To measure to what extent customers look at packaging when buying convenience food products, 3 statements were given: “I check information about packaging presented on the label before purchasing the product.”, “I read all information about packaging presented on the product.” and “The packaging material determines whether I buy the product or not.”. In figure 6, respondents’ answers are presented.

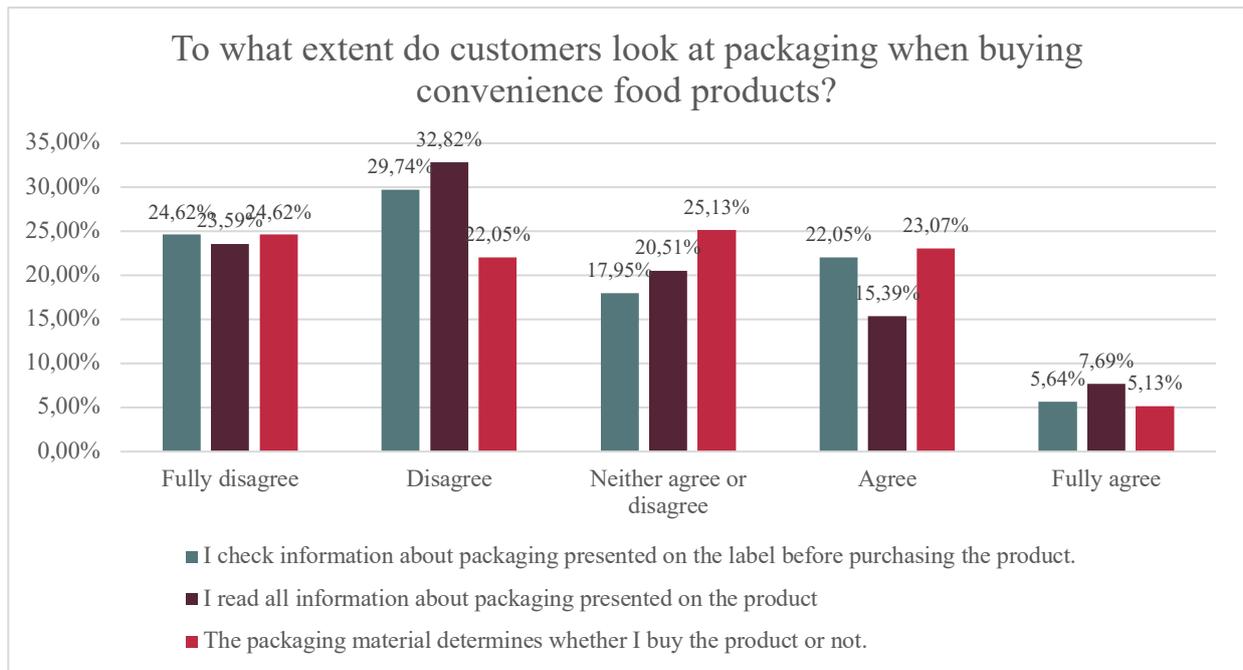


Figure 6. Answers to statements “The packaging material determine whether I buy the product or not.”, “I check information about packaging presented on the label before purchasing the product.”, I read all information about packaging presented on the product.”.

3.2.1 Country vs. interest in packaging when buying convenience food products

In table 1, respondents’ answers are presented by country. The means were calculated from all 195 valid answers indicated on a scale from 1 (fully disagree) to 5 (fully agree). Generally, the highest average score (3) was indicated by Austrian respondents. The lowest score was 2,27 indicated by Dutch respondents. Moreover, from the Chi-Squared test 2 values showed statistical significance – “The packaging material determines whether I buy the product or not.” With the P-value of .009 and “I read all information about packaging presented on the product.” With the P-value of .029. This means there are differences regarding these statements between countries.

Table 1: Country vs. Respondents' answers to the statements "The packaging material determines whether I buy the product or not.", "I check information about packaging presented on the label before purchasing the product.", "I read all information about packaging presented on the product.", showing means from the realised count, Chi-Squared test value and P-value.

Country	The packaging material determines whether I buy the product or not.	I check information about packaging presented on the label before purchasing the product.	I read all information about packaging presented on the product.	Average
Austria	5	2	2	3
France	3,2	2,7	2,8	2,9
Germany	2,63	2,81	2,88	2,66
Hungary	4	2	1	2,33
Italy	3	2,67	2,67	2,78
Poland	2,77	2,63	2,64	2,68
The Netherlands	2,23	2,36	2,23	2,27
Test Value	43.181	24.977	38.979	
P-value	.009	.407	.027	

3.2.2 Age vs. interest in packaging when buying convenience food products

In table 2, respondents' answers are presented by age. The means were calculated from all 195 valid answers indicated on a scale from 1 (fully disagree) to 5 (fully agree). Generally, the highest average score for all three statements was given by respondents in the age group 41-50, while the lowest average was calculated equally for the respondents from age group of 18-30 and >60. From the conducted Chi-Squared test, no statistical significance can be observed, which means there is no relationship between given variables and age groups.

Table 2: Age vs. Respondents' answers to the statements "The packaging material determines whether I buy the product or not.", "I check information about packaging presented on the label before purchasing the product.", "I read all information about packaging presented on the product.", showing means from the realised count, Chi-Squared test value and P-value.

Age	The packaging material determines whether I buy the product or not.	I check information about packaging presented on the label before purchasing the product.	I read all information about packaging presented on the product.	Average
<18	3	2,35	2,35	2,57
18-30	2,56	2,55	2,40	2,50
31-40	2,35	2,77	2,77	2,63

41-50	2,8	2,44	2,96	2,73
51-60	2,4	2,6	2,80	2,60
>60	2	3	2,50	2,50
Test value	27.185	22.974	22.316	
P-value	0.130	.290	.324	

3.2.3 Gender vs. interest in packaging when buying convenience food products

Table 3 compares to what extent do male and female respondents look at packaging when purchasing convenience food products. The means presented in the table were calculated from 190 responses of men and women who were asked to indicate on a scale from 1 to 5 how much they agree with the given statements (1 meaning “fully disagree” and 5 meaning “fully agree”). There were 5 respondents who indicated the answer “Prefer not to say/Other” in the question about gender. Because of this small number, these answers were not taken into consideration for this test.

Generally, female respondents have a higher average for all presented statements, with the average of 2,58 and highest mean of 2,65 for the variable: *The packaging material determines whether I purchase the product or not*. However, for all statements the p-value was higher than the significance level of 0.050, which means there is no relationship found between gender and the extent to which customers look at packaging when purchasing convenience food products.

Table 3: Gender vs. Respondents' answers to the statements “The packaging material determines whether I buy the product or not.”, “I check information about packaging presented on the label before purchasing the product.”, “I read all information about packaging presented on the product.”, showing means from the realised count, Mann-Whitney U test value and P-value.

Count		I check information about packaging presented on the label before purchasing the product.	I read all information about packaging presented on the product	The packaging material determines whether I purchase the product or not.	Average
66	Male	2,53	2,42	2,46	2,47
124	Female	2,57	2,53	2,65	2,58
	Test value	3873.000	3957.000	3642.000	
	P-value	.770	.651	.232	

3.3 Customer knowledge about sustainability of packaging used for food products

When asked whether convenience food retailers present enough information about sustainability of packaging used for the products, 38,45% indicated they disagree and 10,78%

fully disagree, summing up to 49,23%. On the other side, 18,46% of respondents agrees that producers and retailers present enough information about sustainability of packaging and 5,13% claims to fully agree with this statement, summing up to 23,6%. At the same time 27,17% neither agrees or disagrees.

For the statement “I understand all information about packaging presented on the product.” 5,13% of respondents fully disagree and 21,03% disagree, summing up to 26,16%. 31,28% of respondents agree and 16,41% fully agrees with the statement, summing up to 47,69%. Moreover, 26,15% of respondents indicated that they neither agree or disagree with the statement.

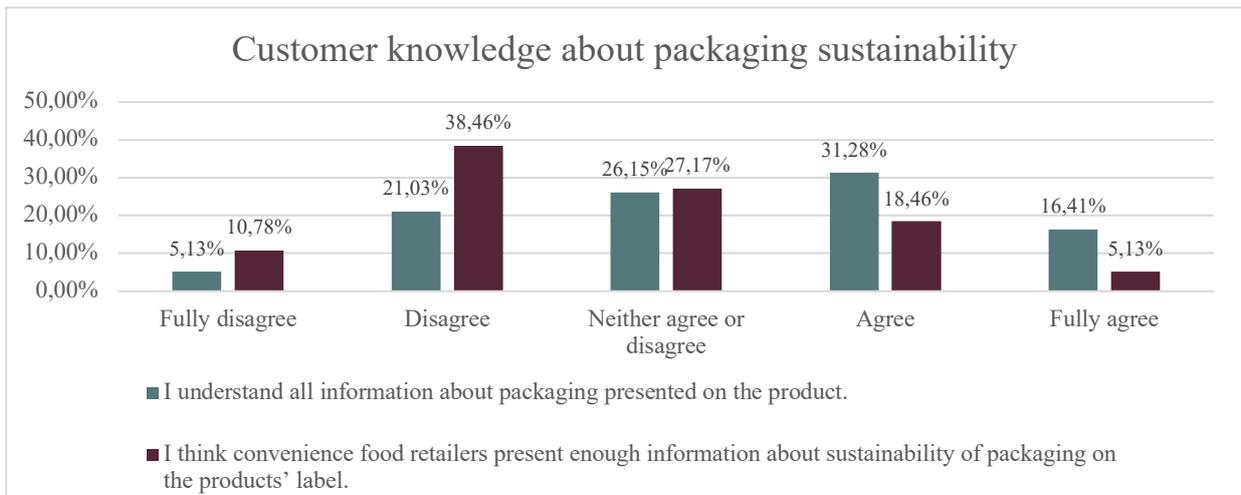


Figure 7. Customer knowledge about packaging sustainability

3.3.1 Country vs. customer knowledge about packaging sustainability

In table 4, respondents’ answers are presented by country. The means were calculated from all 195 valid answers indicated on a scale from 1 (fully disagree) to 5 (fully agree). Generally, the highest average score (3,5) was indicated by Austrian respondents. The lowest score was 2,27 as indicated by Dutch respondents. From the performed Chi-Squared test, P-values were higher than 0.05, which indicated there is not statistical significance.

Table 4: Country vs. Respondents’ answers to the statements “I think convenience food retailers present enough information about sustainability of packaging on the products’ label.” “I understand all information about packaging presented on the product.”, showing means from the realised count, Chi-Squared test value and P-value.

Country	I think convenience food retailers present enough information about sustainability of packaging on the products' label.	I understand all information about packaging presented on the product.	Average
Austria	3	4	3,50
France	2,1	3,7	2,90

Germany	2,38	3,38	2,88
Hungary	3	2	2,50
Italy	2,33	3,67	3,00
Poland	2,76	3,12	2,94
The Netherlands	2,76	3,54	3,15
Test value	18.977	28.257	
P-value	.753	.249	

3.3.2 Age vs. customer knowledge about packaging sustainability

In table 5, respondents' answers are presented by age group. The means were calculated from all 195 valid answers indicated on a scale from 1 (fully disagree) to 5 (fully agree). The highest average score for both statements (3,06) was indicated by the age group 18-30, while the lowest score (2,2) was indicated by the age group 51-60. From the Chi-Squared test, both statements do not show statistical significance as indicated by the P-values.

Table 5: Age vs. Respondents' answers to the statements "I think convenience food retailers present enough information about sustainability of packaging on the products' label. "I understand all information about packaging presented on the product.", showing means from the realised count, Chi-Squared test value and P-value.

Age	I think convenience food retailers present enough information about sustainability of packaging on the products' label.	I understand all information about packaging presented on the product.	Average
<18	3	2,82	2,91
18-30	2,71	3,40	3,06
31-40	2,38	3,47	2,93
41-50	2,32	3,24	2,78
51-60	1,2	3,2	2,2
>60	3,5	3,5	3,5
Test value	12.765	23.067	
P-value	.887	.286	

3.3.3 Gender vs. customer knowledge about packaging sustainability

As presented in table 6, the survey received 66 responses from men and 124 responses from women. The means presented in the table were calculated from 190 responses of men and women who were asked to indicate on a scale from 1 to 5 how much they agree with the given statements (1 meaning “fully disagree” and 5 meaning “fully agree”). There were 5 respondents who indicated the answer “Prefer not to say/Other” in the question about gender. Because of this small number, these answers were not taken into consideration for this test.

Both men and women had a lower average for the statement: *I think convenience food retailers present enough information about sustainability of packaging on the products’ label.* than for the statement: *I understand all information about packaging presented on the product.* For both statements male respondents had a higher average score (3,16) than female respondents (2,93).

For comparing differences between male and female responses regarding customers’ knowledge about sustainability of packaging used for food products, the Mann-Whitney U test was performed. In the results of this test, the only dependent that was statistically significant was: *I understand all information about packaging presented on the product.* For this statement, men indicated an average of 3,58, while women’s average was 3,20, which resulted in a test value 4865.000 and p-value .027. That means that men feel like they understand information about packaging more than women.

Table 6: Gender vs. Respondents’ answers to the statements “I think convenience food retailers present enough information about sustainability of packaging on the products’ label. “I understand all information about packaging presented on the product.”, showing means from the realised count, Mann-Whitney U test value and P-value.

Count		I think convenience food retailers present enough information about sustainability of packaging on the products’ label.	I understand all information about packaging presented on the product.	Average
66	Male	2,73	3,58	3,16
124	Female	2,66	3,20	2,93
	Test value	4159.500	4865.000	
	P-value	.845	.027	

3.4 Customer perception of the main packaging materials used in the food industry

To understand the customer perception of the main materials used in the food industry, respondents were asked to indicate their view on sustainability of plastic, glass, paper and aluminium on a scale from 1 (least sustainable) to 5 (most sustainable). The results are presented below in figure 8 and table 7.

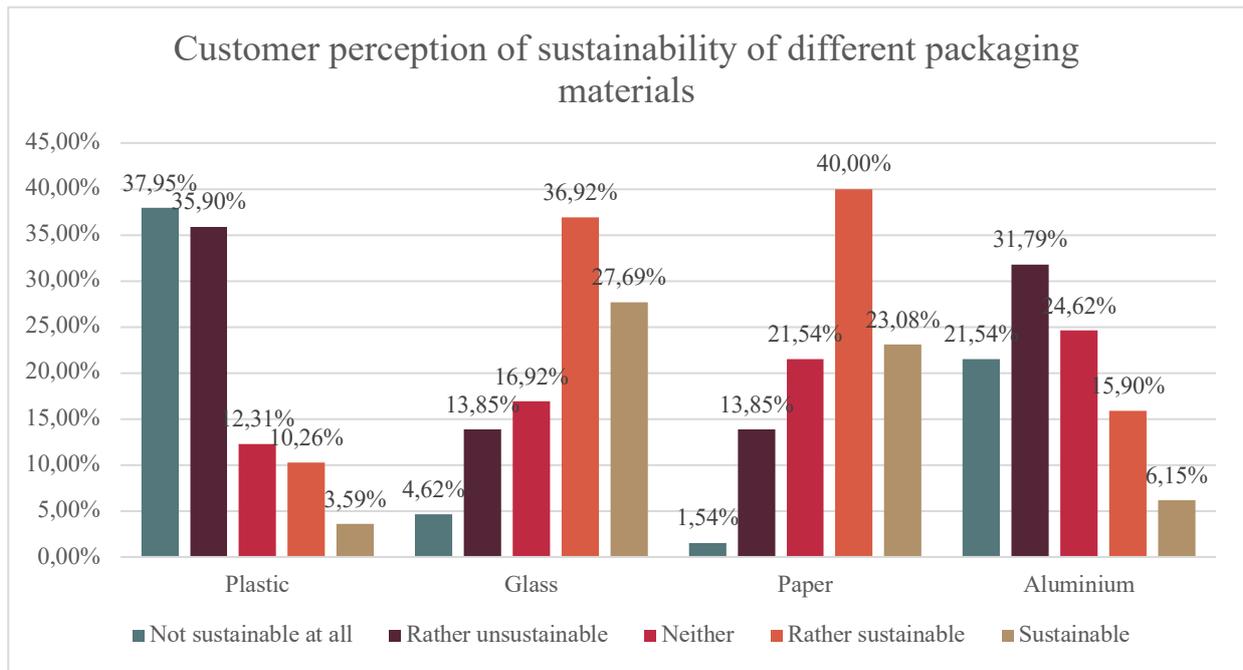


Figure 8. Customer perception of sustainability of packaging materials used in the food industry – plastic, glass, paper, aluminum.

As presented in table 7, plastic was indicated by 73,8% of respondents as the least sustainable material. At the same time, 13,9% of all respondents indicated plastic as sustainable or rather sustainable. Material indicated as the most sustainable was glass, with a total of 64,6% of responses. Respondents who indicated glass as unsustainable accounted for 18,4% of all 195 respondents.

Table 7: Customer perception of sustainability of different packaging materials – plastic, glass, paper, aluminium, showed as a summed percentage.

Packaging material	Unsustainable and rather unsustainable	Neither	Rather sustainable and sustainable
Plastic	73,8%	12,3%	13,9%
Glass	18,4%	16,9%	64,6%
Paper	15,3%	21,5%	63,1%
Aluminium	53,3%	24,6%	22,1%

3.4.1 Country vs. customer perception of the main packaging materials used in the food industry

In table 8, the respondents answers about sustainability perception of packaging materials are grouped into countries. The lowest score was given by Austrian and Hungarian respondents (1) for plastic packaging. At the same time, respondents from Austria and Hungary indicated Paper

as the most sustainable material with the mean of 5. What can be observed is that besides Hungary, all other countries mentioned in the survey have a higher average score for glass and paper, while plastic and aluminium are given lower scores. Besides Germany, all countries have the lowest score assigned to plastic.

From the Chi-Squared test results, P-values for all material are higher than the maximum significance level of 0.05, which means there is no statistically proven relationship between countries and customer perception about different packaging materials.

Table 8: Country vs. Respondents' perception about sustainability of plastic, glass, paper and aluminium, showing means from the realised count, Chi-Squared test value and P-value.

Country	Material			
	Plastic	Glass	Paper	Aluminium
Austria	1	5	5	3
France	1,5	4	3,8	2,1
Germany	2	1,25	3,88	1,94
Hungary	1	2	5	2
Italy	1,67	4	4,67	3,33
Poland	2,14	3,67	3,65	2,60
The Netherlands	1,99	3,69	3,63	1,91
Test value	18.630	33.052	15.164	35.710
P-value	.546	.103	.916	.218

3.4.2 Age vs. customer perception of the main packaging materials used in the food industry

In table 9, respondents' answers are presented by age. The means were calculated from all 195 valid answers indicated on a scale from 1 (fully disagree) to 5 (fully agree). Besides respondents from the age group <18, who on average indicated Aluminium as the least sustainable, all other age groups had the lowest average score for plastic. Similar to country analysis, glass and paper were indicated as more sustainable than Aluminium and Plastic by all age groups.

From the Chi-Squared test results, P-values for all material are higher than the maximum significance level of 0.05, which means there is no statistically proven relationship between countries and customer perception about different packaging materials.

Table 9: Age vs. Respondents' perception about sustainability of plastic, glass, paper and aluminium, showing means from the realised count, Chi-Squared test value and P-value.

Country	Material			
	Plastic	Glass	Paper	Aluminium
<18	2,53	3,47	3,65	2,47
18-30	2,02	3,72	3,68	2,61
31-40	2,24	3,88	3,77	2,77
41-50	1,92	3,56	3,88	2,2
51-60	1,8	4	4,2	3,2
>60	2	4	4	2
Test value	18.630	20.413	18.644	34.416
P-value	.546	.432	.545	.099

3.4.3 Gender vs. customer perception of the main packaging materials used in the food industry

As presented in table 10, the survey received 66 responses from men and 124 responses from women. For all presented materials, men had a higher average than females. The highest mean was 3,75 for Paper (indicated by men) and the lowest mean was 2,05 for Plastic (indicated by women). For comparing differences between male and female responses regarding customer perception of sustainability of different packaging materials used in the food industry (plastic, glass, paper and aluminium), the Mann-Whitney U test was performed. In the results of this test, the only dependent variable that was statistically significant was Aluminium, with a test value 4999.500 and p-value .009. That means that women find Aluminium as a less sustainable material than men.

Table 10: Gender vs. Respondents' perception about sustainability of plastic, glass, paper and aluminium, showing means from the realised count, Mann-Whitney U test value and P-value.

Count		Material			
		Plastic	Glass	Paper	Aluminium
66	Male	2,12	3,74	3,75	2,89
124	Female	2,05	3,71	3,74	2,39
	Total Average	2,09	3,73	3,75	2,64

	Test value	4319.000	4301.500	4134.500	4999.500
	P-value	.507	.545	.902	.009

3.4.4 Respondents' preferred and avoided materials

As presented in figure 9, the preferred material for convenience food products is paper with 37,44% of all responses. The most avoided material, with 41,54% of all responses is plastic. In addition to that, 25,13% of respondents indicated "I don't care" when asked about preferred material and 22,56% indicated the same answer when asked about avoided materials.

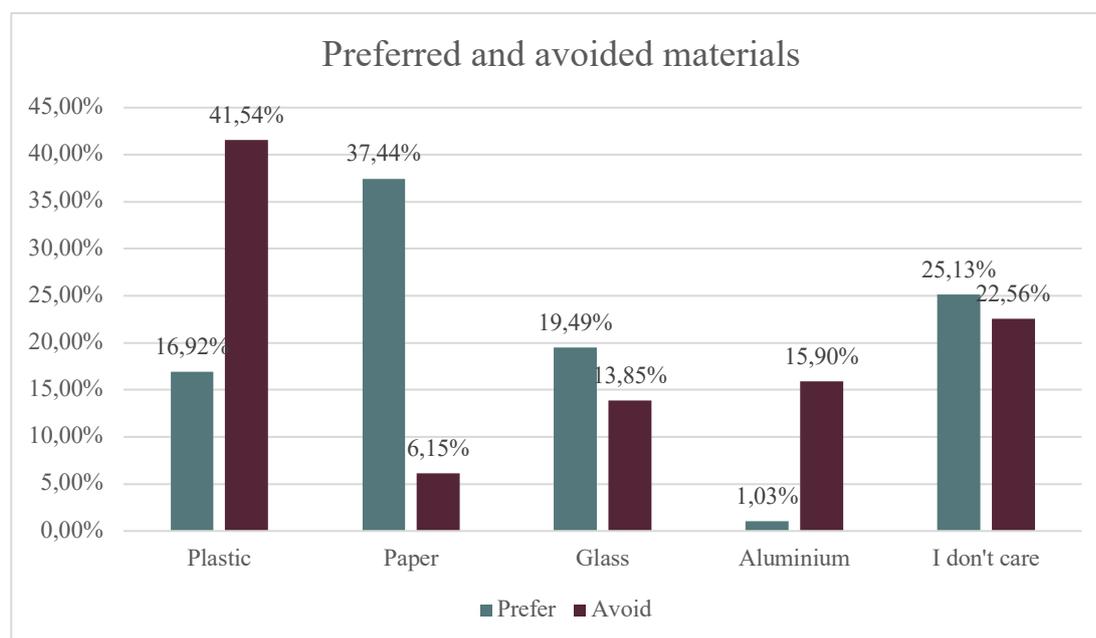


Figure 9. Materials respondents prefer and try to avoid when buying convenience food products.

Moreover, when asked about preferred and avoided materials, customers were asked to explain their decision. All answers given for each material are attached in Appendix 2.

3.5 Customer knowledge about packaging waste management and recycling of packaging materials used in the food industry

To understand what the customer knowledge about recycling processes is, respondents were given a statement: “I am aware of the recycling processes.” As presented below in figure 10, 88% of respondents indicated the “Yes” answer, while 12% said “No”.

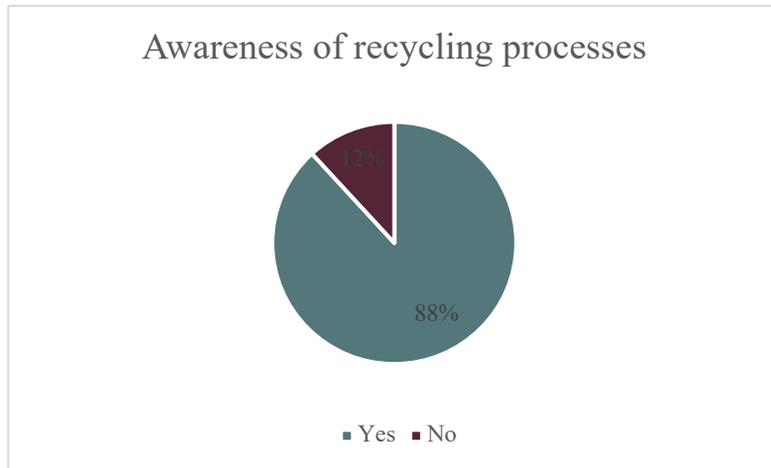


Figure 10. Respondents’ awareness of recycling processes.

3.5.1 Country vs. customer awareness of recycling processes

In table 11, respondents’ answers are presented by country. From the Chi-Squared test, the P-value was .975, which is too high for the test results to be statistically significant.

Table 11: Country vs. Respondents’ awareness of recycling processes, showing means from the realised count, Chi-Squared test value and P-value.

Country	I am aware of the recycling processes.		Total	Test value	P-value
	No	Yes			
Austria	0	1	1		
France	1	9	10		
Germany	2	14	16		
Hungary	0	1	1		
Italy	0	3	3		
Poland	10	84	94		
The Netherlands	10	60	70		
Total	23	172	195	1.246	.975

3.5.2 Age vs. customer awareness of recycling processes

In table 12, respondents’ answers are presented by age group. From the Chi-Squared test, the P-value was .753, which is too high for the test results to be statistically significant.

Table 12: Age vs. Respondents’ awareness of recycling processes, showing means from the realised count, Chi-Squared test value and P-value.

Age	I am aware of the recycling processes.		Total	Test value	P-value
	No	Yes			
<18	2	15	17		
18-30	16	113	129		
31-40	3	14	17		
41-50	1	24	25		
51-60	1	4	5		
>60	0	2	2		
Total	23	172	195	2.657	.753

3.5.3 Gender vs. customer awareness of recycling processes

In table 13, the answers for the statement “I am aware of the recycling processes.” Are presented by gender. The survey received 66 responses from men and 124 responses from women. There were 5 respondents who indicated the answer “Prefer not to say/Other” in the question about gender. Because of this small number, these answers were not taken into consideration for this test. Therefore, the total count of answers for this test was 190.

For both males and females, equally 88% indicated the “Yes” answer meaning the respondents from both genders are equally aware of the recycling processes. The P-value from the Mann-Whitney U test comparing genders was .996, which means there is no statistical significance of this test.

Table 13: Gender vs. Respondents’ awareness of recycling processes, showing answers in percentage, Mann-Whitney U test value and P-value.

Count		I am aware of the recycling processes.	
		Yes	No
66	Male	88%	12%
124	Female	88%	12%
	Total average	88%	12%

	Test value	4091.000	
	P-value	.996	

In figure 11, respondents answers for the question “Are you willing to buy products packed in recycled materials?” are presented. 77% of respondents indicated that they are willing to buy such products, 19% said maybe and 4% said no.

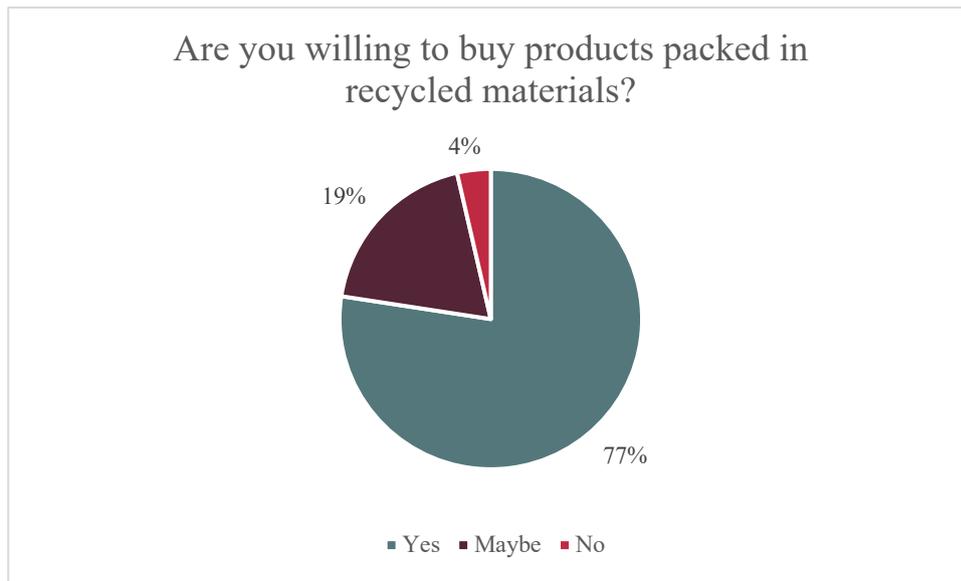


Figure 11. Respondents' willingness to buy products in recycled packaging.

4. Discussion of results

4.1 General overview

While the survey provided sufficient data to get a general overview of the customer understanding of packaging used for convenience food products in the European Union, the research was not as successful as initially planned. The survey was available online for 2,5 weeks from the 11th of May 2022 until the 29th of May 2022. It was expected to be enough time to collect 385 responses, however, on the 29th of May 2022 there were 197 responses collected. Due to time constraints, the survey had to be closed before reaching the target amount, which did not affect the previously stated confidence level of 95% but changed the margin of error from 5% to 7%. From the collected answers, 2 answers were not valid as respondents indicated countries from outside of the European Union, resulting in 195 valid answers.

The initial plan was to check whether the customer response about purchasing or consumption of convenience food products as well as regularity of purchases and consumption influence the customer response. However, it has been later decided that to get a better overview of the topic, all answers should be considered in this research regardless of regularity of consumption.

The research hoped to compare customers understanding of packaging used for convenience food products between countries of the European Union. However, the scope was too broad and the respondents were not equally distributed between countries in the European Union as well as not all EU member countries were reached. Poland, the Netherlands, Germany and France were the most indicated countries, while Italy, Hungary and Austria were low response countries that together accounted for 2,83% of all responses. Therefore, this research gives a good overview about customer understanding of packaging used for convenience food products in the European Union as a whole.

From 195 responses, 63,59% were women, 33,85% were men and 2,56% preferred not to say or identified as “other”.

The majority (66,15%) of the respondents were in the age group between 18 and 30. The survey was shared online on social media platforms such as Facebook, Instagram, WhatsApp and LinkedIn, which might be a possible reason for such a result.

There were 2 control questions in the survey about regularity of purchase and/or consumption of convenience food products. 68% of respondents indicated that they buy convenience food products on a regular basis and 55.90% of respondents indicated that they purchase these products between 1 and 3 times a week. These questions were given to get a general understanding whether respondents are active buyers of such products, but the answers were not taken into consideration for further analysis.

4.2 Customer interest in packaging when buying convenience food products

From the survey answers, it can be concluded that 54,36% of respondents do not check information about packaging presented on the label before purchasing the product. Similarly, 56,41% indicated “disagree” or “fully disagree” when asked about reading all information about packaging presented on the product. Moreover, 28,2% said that the packaging material determines whether they buy the product or not, while 46,67% of respondents disagreed with that statement.

As a majority of respondents indicated that they do not check and do not read all information about packaging presented on the label, it can be observed that when customers look at convenience food products, they might think about other aspects of the product, such as time savings, energy savings, preparation of the food, disposal or other. In addition to that, if the food producers and retailers want to communicate sustainability information about packaging, it should be presented in a clear and visible way, so customers can see it even when not specifically looking for it. Moreover, as almost half of the respondents said that the packaging material does not determine whether they purchase the product or not, there is a possibility that people buy certain products because of their personal habits and simply do not look at packaging as their buying behaviour is automatic. Moreover, Daniels et al. (2015) confirms that customers’ buying behaviour in relation to convenience food products can be automatic because of time restrains.

To see if there are differences between countries, means of total answers per country were calculated and Chi-Squared tests were performed. The highest average for all statements was calculated for Austria (3) and the lowest for the Netherlands (2,27). However, as Austria was a low response country with only one participant, it does not give an accurate answer when compared to a high response country like the Netherlands (70 answers) or Poland (94 answers). Nevertheless, from the Chi-Squared tests for the statements: “The packaging material determines whether I buy the product or not.” (P-value .009) and “I read all information about packaging presented on the product.” (P-value .027) there can be observed statistically significant difference between countries, which proves what was found in the research of Lenartowicz and Roth (2001) about differences in behaviours and patterns between nations and subcultures. It means that priorities of customers from different countries might differ and therefore, they probably look at different aspects of the food product when buying.

For all 3 statements, the highest mean was calculated for the age group 41-50 (2,73), while the lowest was calculated for the age group 18-30 and >60 (2,50). When comparing means from different age groups, there is no clear pattern regarding interest in packaging as well as no statistical significance was observed from the Chi-Squared tests. Therefore, based on this research sample it can be assumed that customer interest in packaging and information presented on the product’s label depends on each individual rather than age group.

When comparing results between genders, female respondents had a higher average for all given statements, with the mean of 2,58. At the same time, male respondents had a mean of 2,47. This means that women generally pay more attention to packaging materials and information when buying convenience food products. This information is useful for producers and retailers selling

products dedicated especially for women or products that generally attract more female customers rather than male. However, from the Mann-Whitney U test no statistical significance was observed.

4.3 Customer knowledge about sustainability of packaging used for food products

While the studies of Nordin and Selke (2010) and Kitz et al. (2021) found that customers often lack knowledge, understanding of terminology and guidance when it comes to sustainability, only 26% of respondents indicated that they do not understand sustainability communicates presented on the label. However, 49% of respondents indicated that retailers do not present enough information about sustainability of the packaging, which means that even when these customers pay attention to sustainability, they might not know which option is the best.

From the Chi-Squared tests performed to compare responses by country, no statistical significance was observed. From the responses, the highest mean was calculated for Austria (3,50) and the lowest for Hungary (2,50). However, both countries were low response countries with only one respondent per country and therefore do not give a fair reflection on the topic. The second highest mean was calculated for the Netherlands (3,15) and the second lowest (2,88) for Germany.

When looking at differences between age, the highest average (3,06) was calculated for the age group 18-30, while the lowest (2,2) was calculated for the age group 51-60. In the case of comparing age groups and variables about understanding of sustainability information, no statistical significance has been observed and similarly to the previous questions about interest in packaging information – the answers might be dependent on everyone's independent opinion. Moreover, to get more reliable results when comparing variables with age, respondents should be equally distributed between age groups.

When looking at gender differences, the higher mean was calculated for male respondents (3,16), while female respondents had a lower mean of 2,93. This difference resulted in a statistical difference based on the Mann-Whitney U test with the P-value =.027. This answer suggests that women have a generally lower understanding of packaging sustainability information than men. Moreover, it can be concluded that women think that convenience food retailers could provide more information about sustainability of packaging on the product's label. It proves the previous information found in the research of Mitchell and Walsh (2004) about differences between genders. Considering the difference, results of this test might be considered for products that are especially designated for women or might generally attract more female customers than male.

4.4 Customer perception of the main packaging materials used in the food industry

Overall, plastic was indicated by 73,8% of respondents as the most unsustainable material. According to respondents, the most sustainable materials were glass (64,6% of respondents) and paper (63,1% of respondents). Aluminium was indicated as a rather unsustainable material with 53,3% of respondents choosing “Not sustainable at all” or “Rather unsustainable” answers. These results can be linked with the fact that around 40% of total food in Europe is packed in plastic (ING Economics Department, 2019), which influences the plastic waste visible to the customers. Moreover, these results might suggest that customers look at sustainability from the perspective of creating waste or time necessary for a certain material to degrade in the environment instead of life cycle, energy and carbon emissions relating to production and transportation as well as recycling possibilities. Therefore, especially for products packed in plastic, it is important to state sustainability efforts that could improve the image of plastic packaging.

When looking at differences between countries, Austria and Hungary have the lowest average (1) for plastic and the highest average (5) for paper. However, as mentioned earlier, these countries are low response countries with only one participant per country and therefore, these results do not give a fair result. From this research sample, respondents from Germany are the only ones who have a lower mean for glass (1,25) and aluminium (1,94) than plastic (2), which was indicated as the least sustainable by respondents from other countries. When looking at country analysis, glass and paper were indicated as more sustainable by all countries. Similarly, when comparing age groups, all groups besides <18, which indicated aluminium as the least sustainable, said that they perceive plastic as the least sustainable and glass and paper as more sustainable. However, the results of the Chi-Squared tests illustrate no statistically proven relationship between countries, age and customer perception of different packaging materials.

When analyzing differences in perception of materials between genders, a Mann-Whitney U test confirms there is a statistically proven relationship between genders regarding aluminium. This material has a mean of 2,89 indicated by men and 2,39 by women, which resulted in P-value =.009, showing strong relationship. This means that men perceive aluminium as more sustainable material than women, which confirms that men and women pursue different products and might have different ways of thinking when it comes to obtaining these products (Mitchell & Walsh, 2004). For other materials, no statistical significance was noticed.

These answers can be compared with answers on what materials customers prefer and try to avoid when buying convenience food products. What can be observed is that in this question, plastic was indicated as the most avoided material, which relates to the low scores given by respondents to the questions above about perception. However, for this question 41,54% of respondents indicated that they try to avoid plastic packaging, while 73,8% indicated plastic as least sustainable. This suggests that even though customer perception about plastic is bad, some customers do not try to avoid it when buying convenience food products or do not care about the material when buying the product (as indicated by 22,56%). Moreover, the most preferred material by customers when buying convenience food products was paper (37,44%), while earlier glass was indicated as the most sustainable. This leads to a conclusion that when buying

convenience food products, customers might prioritize different properties of the product than sustainability of packaging, which some of the customers indicated in question 16 and 17 of the survey. In addition to that, a potential reason for such a difference between customer buying behaviour and perception about various materials is the automatic decision-making based on customers' personal habits (Daniels et al., 2015).

As the question "Why?" was not a mandatory field, only some participants explained their motivation to choose or avoid a certain packaging material over other. When customers chose plastic, the most indicated motivation was light weight of the material, convenience (easy to grab on the go, easy to dispose after use as well as easy to use), hygiene, visibility of what is inside the package as well as freshness of food inside. Some respondents indicated plastic as the most sustainable material. However, the most common responses as for avoiding plastic were environmental concerns of the participants. For glass, the mostly indicated answer as for preference was reusability, while heavy weight, prize and breakability of glass were main reasons customers decide to avoid this material. For paper, the most common answer as for preferred material was environmental concern and sustainability perception, while some people said they avoid plastic because it's bad for recycling and simply annoying. With aluminium, main reason for avoiding this material were sustainability and effect on the environment, as well as taste and lack of convenience. When respondents chose the answer "I don't care", explanation answers included food itself as more important than packaging when buying convenience food products as well as lack of packaging varieties.

4.5 Customer knowledge about packaging waste management and recycling of packaging materials used in the food industry

The last section of this research focused on customer awareness of packaging waste management and recycling processes of packaging materials used in the food industry. 88% of respondents said they are aware of the recycling processes. From Chi-Squared tests comparing countries and age groups there was no statistical significance observed. Moreover, the answers were equally distributed between genders – both 88% of men and 88% of women indicated that they are aware of the recycling processes. Therefore, no statistical significance was observed for gender either.

Moreover, the question measures the customer perception about their knowledge instead of measuring the actual knowledge. Therefore, it is possible that some respondents chose the answer "Yes" when asked if they are aware of the recycling processes, while their concept might be wrong when compared to scientific information.

The answers from these questions can be compared to the answers about willingness to buy products packed in recycled materials. 77% of respondents indicated that they are willing to buy such products and 19% chose "Maybe". These numbers show customers' great attitude towards recycled packaging and might be related with the previously stated customers' concerns about the environment and plastic pollution.

In this section, respondents were asked additionally 2 other questions about their perception of recycled packaging and willingness to pay extra for such packaging. However, these answers

appeared to be not relevant for this research. Nevertheless, the answers are attached in Appendix 2 with all answers of the survey.

4.6 Customer understanding of packaging used for convenience food products in the European Union

By answering the 4 sub-questions, it is now clear what the customer interest in packaging used for convenience food products is and what is the customer understanding of information provided by retailers. Moreover, there is a good overview of customer perception of 4 main packaging materials used for convenience food products: plastic, paper, glass and aluminium. In addition to that, there is an overview of customer perception about their knowledge in regard to recycling and waste management.

As found out in the previous research of Kitz et al. (2021), customers often lack knowledge and guidance to choose the most environmentally friendly options. While in this research respondents had a generally high mean for understanding sustainability communicates and awareness of recycling processes, it must be mentioned again that customer perception about their knowledge and understanding might differ from what the respondents know or perceive as sustainable.

In this research it has been observed that the general perception of plastic is bad, as 73,8% respondents indicated this material as not sustainable at all or rather unsustainable. In the explanation why, the main reason for such a result was customer concern about environment, which was highly based on visible plastic pollution. Moreover, customers in this research indicated that in the case of buying convenience food products, convenience is generally of higher importance than packaging.

Finally, it can be concluded that customers identify packaging sustainability mostly with visible environmental aspects instead of other aspects such as material's life cycle, CO2 emissions emitted during production and transportation as well as food safety.

While 47,69% of respondents claim to understand sustainability information communicated on packaging, 23,6% of respondents agree that there is enough sustainability information presented on the product. That means that presenting more information on the product's label can provide customers with more guidance towards choosing the most sustainable option, as well as create more awareness on the topic of sustainability. Moreover, such a message towards customers might potentially influence customer perception of different materials, and hence influence customer buying behaviour.

5. Conclusion and recommendations

5.1 Conclusion

As the population is growing, the food industry is facing sustainability challenges. Looking at changes in customers' lifestyles, food manufacturers must respond to these shifts and adjust the products to the demand. As a result, a high increase in demand for convenience food products can be noticed. Since customers are of great importance when shaping the food system as their buying behaviour influences demand, it is important to understand how customers think. Therefore, the objective of this research was to analyze customer understanding and perception of plastic packaging used for convenience food products.

As stated previously, one of the most visible problems is plastic pollution in the environment, which has a significant influence on the customer perception of this material. While the majority of respondents indicated that they have no interest in sustainability of packaging, it can be concluded that they have different priorities when buying convenience food products. However, there were differences in the customer interest in packaging sustainability between countries in the European Union, meaning that producers and retailers must adjust the sustainability communication accordingly to each country.

Similarly, a difference between genders was noticed regarding knowledge about sustainability, where women had a generally lower understanding compared to men. With this knowledge, retailers can advertise gender-related products more accurately. The same process can be used for products packed in aluminium, which is perceived as more sustainable by the male audience.

In addition to that, customers indicated high awareness of recycling processes and showed positive attitude towards recycled packaging materials, which creates a good foundation for food producers and retailers to use more recycled materials. Moreover, communicating this practice can have a positive impact in terms of marketing, especially for sustainability-aware audience.

It was expected that plastic would be indicated as the most unsustainable material due to the visible plastic pollution problem, and this prediction was confirmed by the respondents. However, when comparing to buying behaviour, customers still choose this material for convenience reasons. This information can be used by convenience food retailers to communicate other sustainability information, such as percentage of recycling materials used for the packaging, total CO₂ emissions or other sustainability efforts. Clear and effective communication might attract customers that, for example, are reluctant to buy certain products because of what they perceive as unsustainable packaging. By presenting detailed and clearly formulated information, reluctant customers might better understand the environmental impact and therefore be more willing to purchase such product.

To answer the question: "What is the relationship between the customer knowledge about plastic packaging used for convenience food products and the customer buying behaviour in different countries of the European Union?"

While the majority of customers claim to have good knowledge about sustainability of packaging used for food products, it does not always correspond to scientific information about sustainability of packaging materials. However, the customer knowledge about sustainability connects with the customer perception about these materials and a difference between perception and purchasing behaviour in relation to plastic can be observed. To conclude, while customers find plastic as the most unsustainable material, many customers still buy products packed in plastic for convenience reasons.

5.2 Short-term recommendations

Since people find convenience of higher importance than packaging sustainability when buying convenience food products, food retailers should ensure that communicates are presented in a clear and non-confusing way. Otherwise, customers might not pay attention to such information. These communicates are of the highest importance for plastic packaging, which is generally perceived as the most unsustainable. Moreover, retailers should look at gender statistics as there are differences in perception. For example, it might be beneficial to present more information about sustainability products that usually attract more women than men.

5.3 Long-term recommendations

Looking at longer term, it is advised that retailers analyze differences between various food groups regarding packaging sustainability and adjust communication accordingly to these differences. In this research, the sample size was not sufficient detailed analysis of differences in customer understanding and behaviour related with convenience food products. Therefore, it is advised to narrow down the scope of the research to measure differences between certain countries or conduct research with a bigger sample size to see patterns across member countries of the European Union. Moreover, further research in the direction of customer knowledge about sustainability of packaging materials is recommended.

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7. Appendix 1 – Survey

The convenience food industry is rapidly growing. In this survey, I would like to find out about your knowledge and opinion on sustainability of packaging used for convenience food products. Convenience foods are products designed to save your time and effort related with shopping, preparation, consumption and cleaning (for example ready-to-eat product and pre-cut fruits and vegetables). This survey takes approximately 5 minutes to complete. Thank you very much for your time and effort!

GENERAL INFORMATION

1. Which country in the European Union do you currently live in? (open question)
2. What is your gender?
 - a. Female
 - b. Male
 - c. Prefer not to say/Other
3. How old are you?
 - a. <18
 - b. 18-30
 - c. 31-40
 - d. 41-50
 - e. 51-60
 - f. >60
4. Do you buy convenience food products on a regular basis?
 - a. Yes
 - b. No
5. How often do you purchase/consume convenience food products?
 - a. Less than once a week
 - b. Once a week
 - c. 2-3 times a week
 - d. 4-5 times a week
 - e. More than 5 times a week

ENVIRONMENTAL ASPECTS OF CONVENIENCE FOOD PACKAGING

For the following questions, please indicate to what extent do you agree with the presented statement (with 1 meaning you fully disagree and 5 meaning you fully agree with the statement). When answering these questions, think of packaged convenience food products, such as ready-to-eat products.

6. I think convenience food retailers present enough information about sustainability of packaging on the products' label.
7. I read all information about packaging presented on the product.
8. I understand all information about packaging presented on the product.

9. I check information about packaging presented on the label before purchasing the product.
10. The packaging material determines whether I purchase the product or not.
11. Please indicate on a scale of 1 to 5 what is your perception on sustainability of the materials used for packaged convenience food products (1 being the least sustainable and 5 being the most sustainable). Materials: Plastic, glass, paper, aluminium.

PACKAGING WASTE MANAGEMENT AND RECYCLING

12. I am aware of the recycling processes.
13. I am willing to buy products packed in materials from recycling.
14. I believe recycled materials is just as good as new materials.
15. I am willing to pay extra for a product in recycled packaging.

BUYING PREFERENCES IN RELATION TO PACKAGING

16. When buying convenience food products, I prefer products packed in:
 - a. Plastic
 - b. Aluminium
 - c. Paper
 - d. Glass

Please explain your preference _____

17. When buying convenience food products, I try to avoid products packed in:
 - a. Plastic
 - b. Aluminium
 - c. Paper
 - d. Glass

Please explain why _____

8. Survey answers

In this part of the report, the answers from the survey are presented.

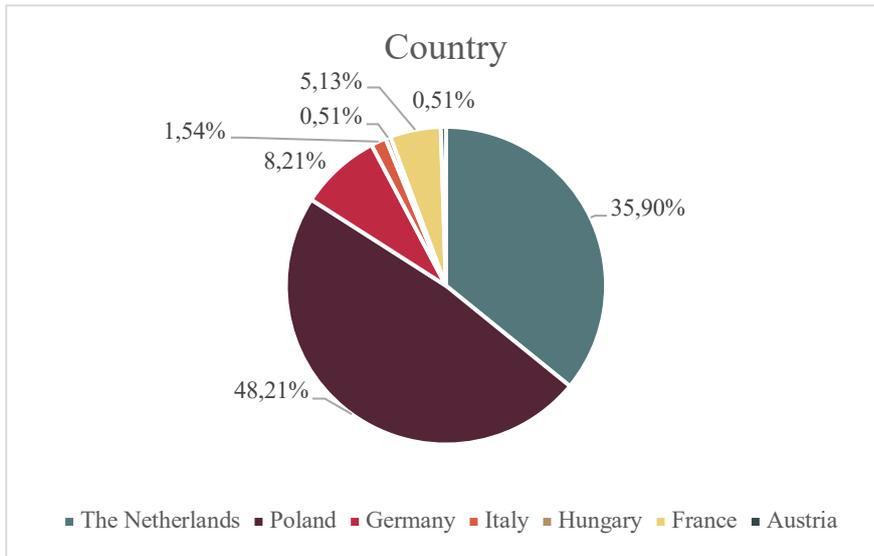


Figure 1. Current country of residence of the respondents.

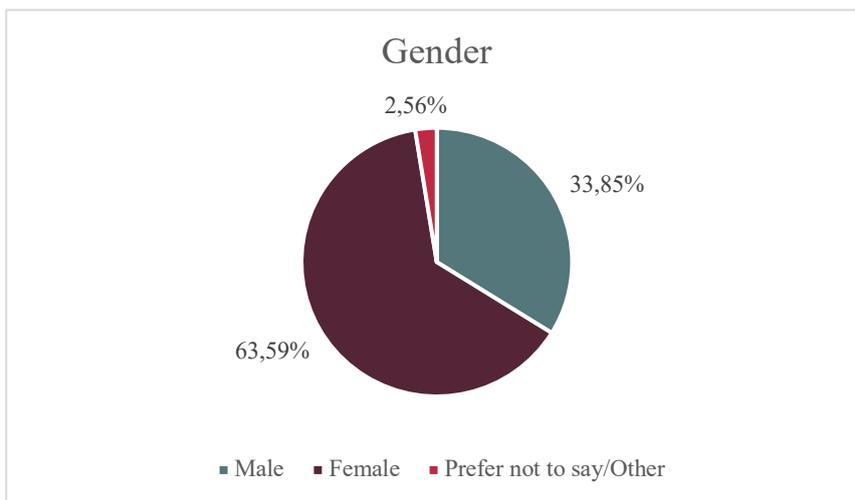


Figure 2. Gender of the respondents.

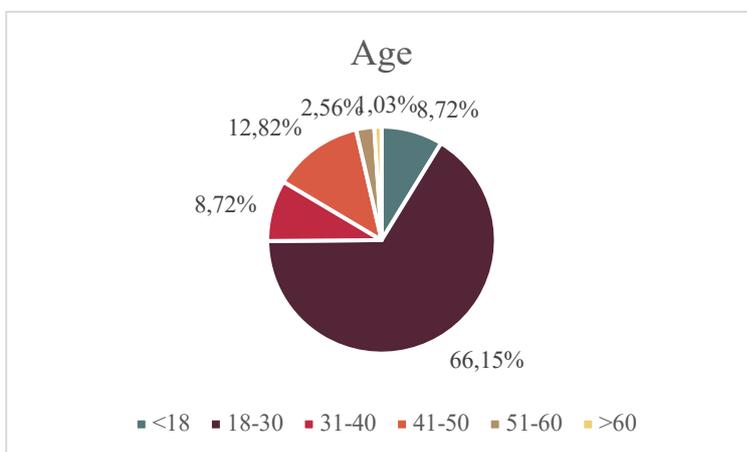


Figure 3. Age of the respondents.

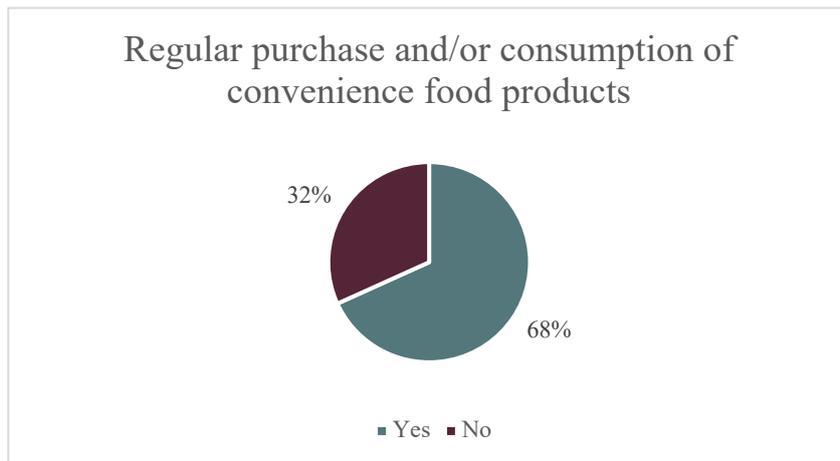


Figure 4. Answers of respondents indicating whether they purchase and/or consume convenience food products on a regular basis.

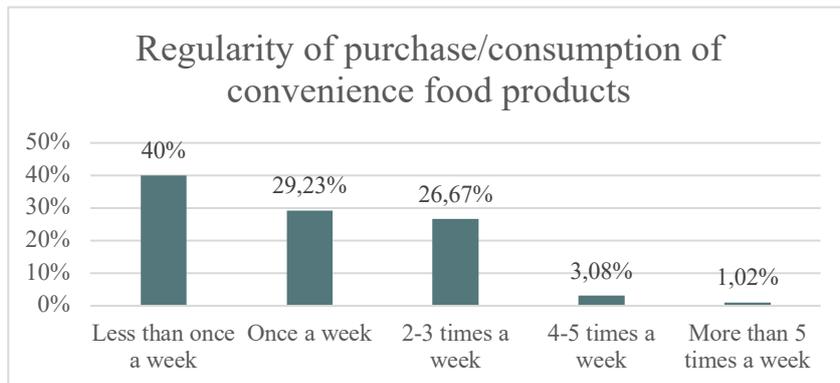


Figure 5. Regularity of purchase and/or consumption of convenience food products of the respondents.

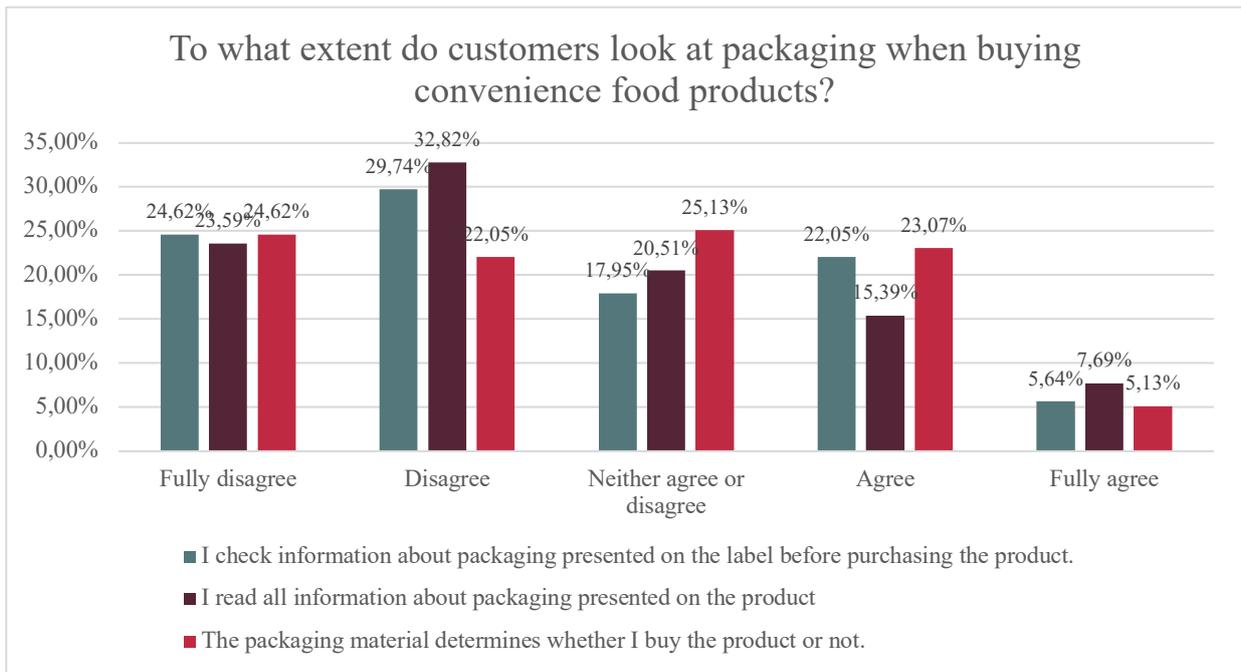


Figure 6. Answers to statements “The packaging material determine whether I buy the product or not.”, “I check information about packaging presented on the label before purchasing the product.”, “I read all information about packaging presented on the product.”.

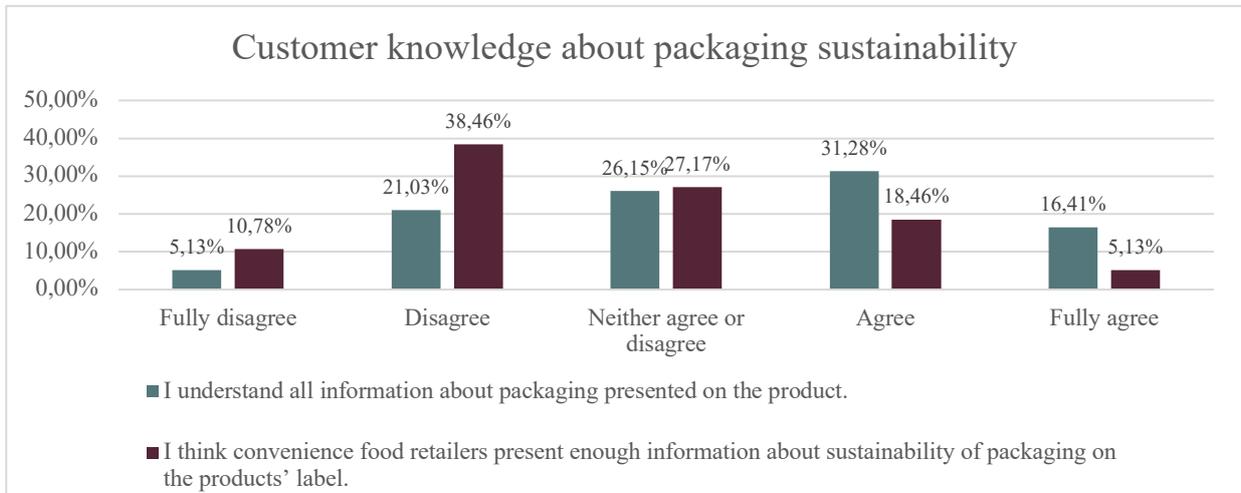


Figure 7. Customer knowledge about packaging sustainability

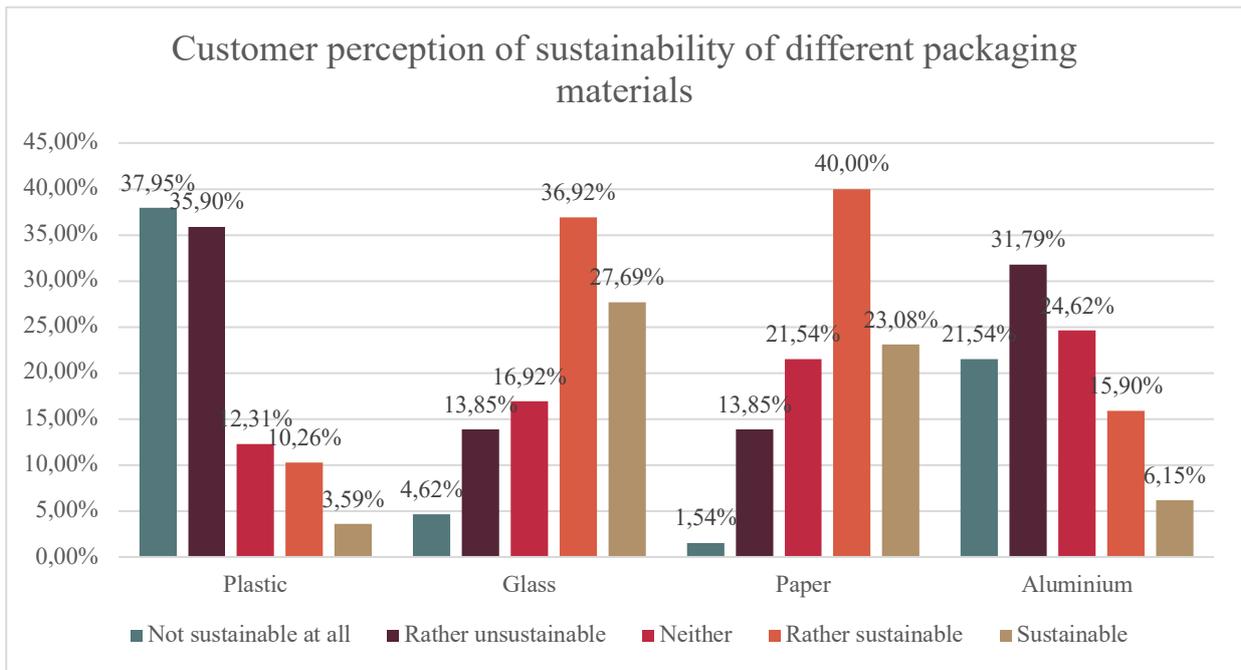


Figure 8. Customer perception of sustainability of packaging materials used in the food industry – plastic, glass, paper, aluminium.

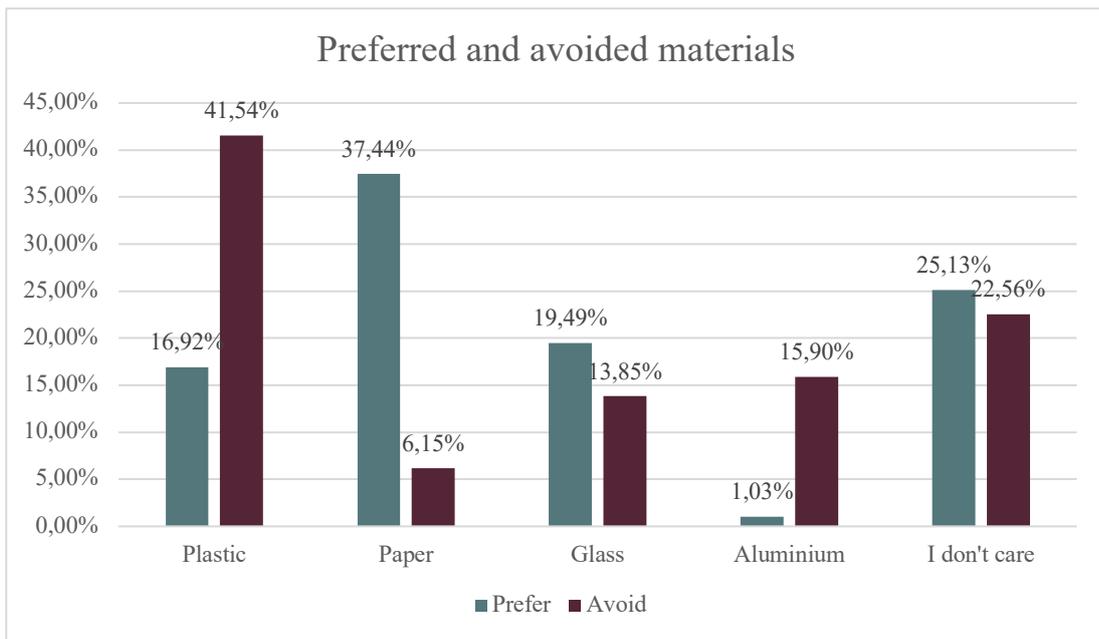


Figure 9. Materials respondents prefer and try to avoid when buying convenience food products.

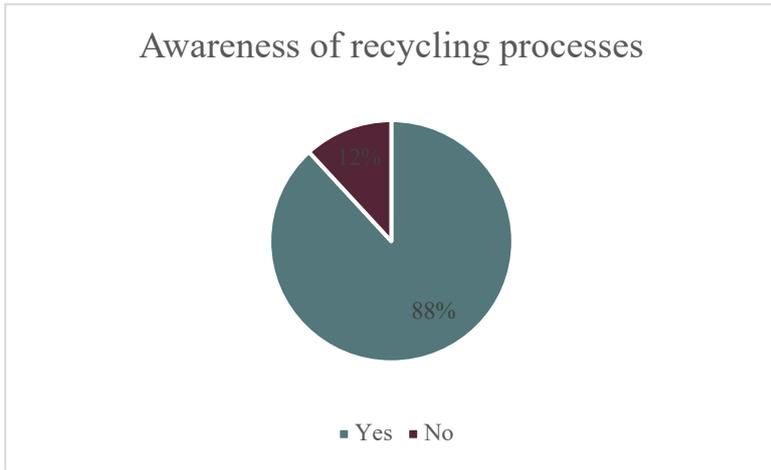


Figure 10. Respondents' awareness of recycling processes.

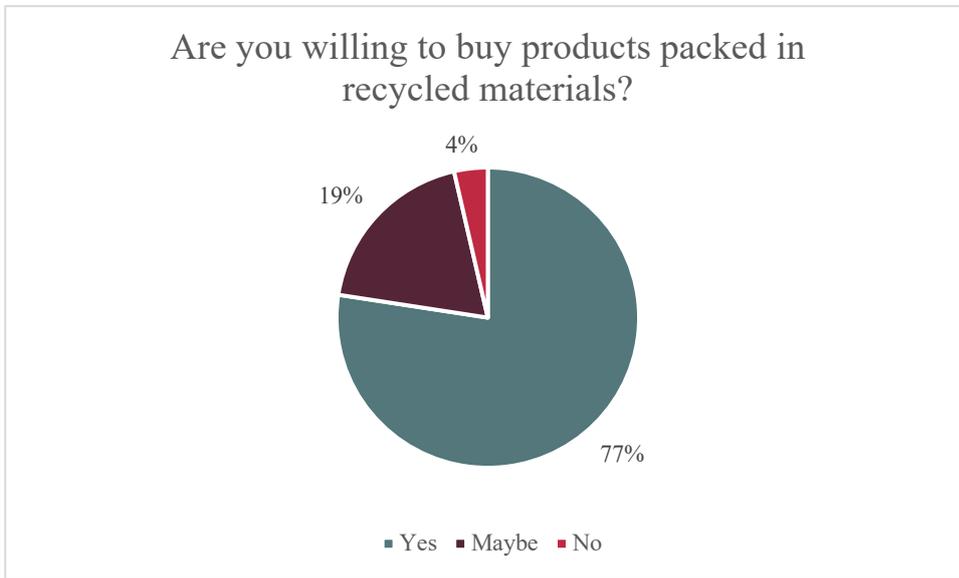


Figure 11. Respondents' willingness to buy products in recycled packaging.

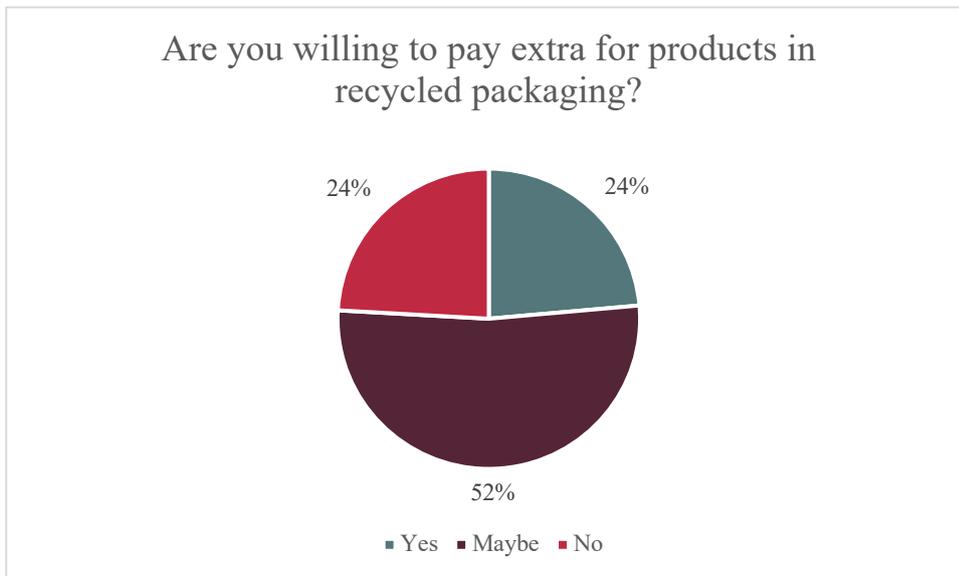


Figure 12. Respondents' willingness to pay extra for products packed in recycled packaging.

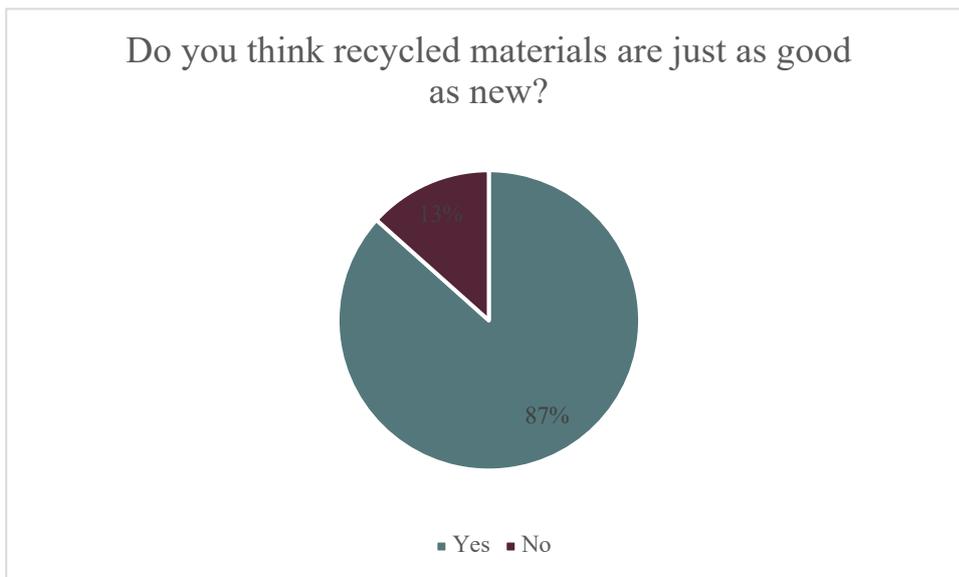


Figure 13. Respondents' perception of recycled materials

Table: Answers to survey questions 16 and 17

When buying convenience food products, I prefer ... because ...

Plastic	Lighter, easier to Carry, won't break
	Easy to store, lightweight
	It protects the product and does not add to much weight so I can easily carry it in my bag.
	because it is hard to destroy and easy to use
	It's much more comfortable to keep food in plastic
	easy to divide in trash

	You can see what you buy and check the product
	Easy to take with me, and to throw away
	If the food is good, I don't care.
	it can easily be recycled
	As long as it is not glass because that is too heavy for a convenience product.
	I perceive it to be more sustainable
	Plastic is the most sustainable material taking into consideration full life cycle
	Light, easy to dispose, easy to carry around
	Easy to grab on the go and easy to throw away
	Easy to use and throw away
	i think it's the most sustainable option
	least harmful for the environment
	easy to use and throw away afterwards, keeps the food fresher
	the most convenient
	easy, convenient, hygienic
	Easy to take and go, simply convenient (but still don't like the plastic problem in the environment)

Paper	Easier to throw away - and mostly the products I like are packed in paper
	More sustainable than the other materials
	Less plastic
	It feels like a better product for the environment
	If I have the choice and the products are identically appealing to me, I opt for the packaging that I believe is more sustainable, thus if possible, paper.
	I usually buy my fruits and vegetables without packaging and everything else i but in the packaging it comes so for example pasta in plastic because its the only option.
	Ponieważ jest biodegradowalne
	Light nad sustainable
	It can be recycled
	Most sustainable
	It seems to be the best material to pack the food products.
	because is more ecological
	it's more eco, it saves freshness of for example bread
	it's not as precarious as others
	I Think its more Eco
	It's more sustainable than plastic, but lighter than glass
	Because it's easy to rip off
	Food is better
	It's sustainable
Paper	More environment friendly
	to my knowledge it's the easiest one to recycle
	Because I know that they are ecological and I don't feel guilty about buying them.
	its light, easy to recycle, easy to open, not plastic
	Seems the least harmful for the environment
	It's natural and cellulose can be reused easily
	Food Feels more fresh than in plastic
	Better for the environment than other materials

	Easy to open/carry, and it is more sustainable than the other options in my perception
	it's usually biodegradable and does not have a lot of unnecessary product used. also it is lightweight
	To protect the environment
	Seems to be more healthy
	I think recycled paper is probably most sustainable
	Looks more natural and easy to recycle
	for the short term (same day) as it is more sustainable (I think). When I keep it for more days it would be plastic
	Easy to recycle, light packaging; Glass is also ok by recycling of glass isn't profitable
	Its eco friendly and better way for sustainability compared to plastics and other products (raw materials)
	Paper is the least damaging to the environment, but we need to cut out trees to source it...
	I don't care
	All packaging types have their pro's and cons so i don't really mind (e.g. glass is more reusable but also breakable, paper and plastic is less reusable but easily disposable etc.)
	It is convenient to throw away and I feel less bad about it
	Sustainable
	I wanna be sustainable
	Easiest to recycle
	Easy to carry around
	Light, easy to use and fast to dispose, hygienic
	The easiest to carry and ready to eat products are of the highest quality when i compare to other materials
	the easiest option

Glass	I can easily repurpose glass for many other things. And I think it's very recyclable
	Plastic packaging causes us to consume plastic which is bad, for paper you're likely to also have plastic and aluminium is also bad for us. Glass the only one that isn't harmful as to my knowledge
	Because you can reuse glass for everything for example vase, decoration..
	Because they are more sustainable and I can reuse them
	Glass can be recycled many times or used again even by myself (easy to clean at home). It is also more enduring than paper.
	Hygienics
	Because I care
Glass	It looks more tidy
	it is durable, food safe and recyclable
	I can use in the future
	Is more suitable for food
	Most sustainable
	for the environment
	Ecology
	can be used multiple times
Clean & safe	

	fully recyclable
	recyclable
	I can give it a second life
	More sustainable and reusable
	Lowest migration of particles from the packaging to the product
	more sustainable I think
	Clean and reusable
	Easiest way of cleaning and recycling
	Clean product without any bad smell like from plastic
	Because I don't give a fuck about the packaging
	It seems more sustainable to me
	Less impact on the environment

I don't care	I buy it for the product inside
	I don't mind what kind of packaging it is, depends in situation if I have to carry the whole day a juice bottle I prefer it in plastic so I can throw it away, with glass it's harder to throw away and to find a glass container. Also I would choose the cheapest option for packaging when it contains both the same product
	If the food is good I don't care what it's packaged in
	I only buy them when I need something fast So it's not matter of preference but availability
	They all have pros and cons
	Just convenience
	I only buy onigiri and it always comes in plastic. There is no other choice
	I buy convenience food rarely, and don't care with packaging.
	As long as I get the food I don't care what it is in
	Honestly speaking, I don't pay much attention to it.
	As long as it looks good I don't care how the product is packed in. But I prefer plastic or glass, because I have the feeling that the product has a longer shelf life.
	Convenient, light, no risk of breaking, recycle options
	it has always been and I think that it is good packed
	Plastic is easier to take away because you can throw it in a trash can and it can be recycled. Glass is nicer but not necessarily more sustainable to produce.
Depends on which product it is. Not every product for example can be packed into glass.	
I don't care	
	depends on the product. you can't get a sandwich in a glass jar, for example. if I'm getting a drink and I have a choice between glass and a plastic, I am more willing to buy glass because I can recycle it on campus. however, if the plastic bottle is also recyclable (stategiefiles) I prefer to buy that.
	Package is package
	I care if it is wrapped well and will stay good till the expiration date
The package just needs to hold the product from shop to home and during transport to the shop.	
Easy to grab, also keep food fresh	

When buying convenience food products, I try to avoid ... because ...

Plastic	Most dangerous for the environment
	It harms the environment
	Because its harming for the earth
	There is so much of it

Because I think it's the most unsustainable packaging, especially in the Netherlands where waste sorting is not that common. In Germany, where I grew up, we had a special trash bag for plastics and aluminium.
Plastic is bad for us
Because this material is hard to recycle
Because it is not sustainable
It is more healthy to consume products from glass containers or bottles or paper packaging (plastic Can be toxic in contact with some foods and drinks - usually in small amounts but still).
Because I care fir envir.
I believe it has the greatest share in environmental pollution
least sustainable
Too many plastic around
Least sustainable
for the environment
because is not ecological and plastic takes longer to decompose
it needs a lot of time to recycle
becuse our planet is enough pollute by plastic
Plastic is rubbish
For the environment
I don't like food packed in this way
the most difficult to recycle and polute our planet
Not sustainable
it's not easily recyclable
Because I care about earth
plastic takes so much time to decompose, i try not to contribute to plastic waste whenever its possible
Because I know it's not eco-friendly
not good for environment
too much plastic in oceans
Ecological reason and practical reasons (it take to much space in the garbage)
Not sustainable, lots of packaging waste
Unsustainable
Plastic is the worst option i think (most unsustainable)
Because it's bad for the environment, so if another option that is not too much more expensive is available i will take that one
also not good for our health
Plastic is to me the most damaging to the environment
Too much issues about plastic and petrol, unsustainable
Usually that packaging cannot be reused due to its special use thus it creates a lot of waste
I don't want to produce more plastic waste
I feel that plastics are harmful to our body and to the environment
Because it is not convenient
Glass has the higher risk of breaking and making a mess, else it would be a very good alternative
Not so easy. Risk of breaking.
Because I don't want to contribute to more plastic in the environment. I can't always avoid it though, since so much products are packed in plastic.
It is in my opinion the worst packaging
It's all about the inside of the package

	because i buy it because of the convience. and i always throw my rubbish in the garbage bin
	Because its not healthy
	I don't like to create more plastic waste

Paper	Break down easily
	It's annoying
	Bad for recycling
	also depends on the product. I don't think there are actually many packaging options for the same product. so, it becomes more of a question whether to buy the product or not, considering it's packaging. Personally, if I see, for example, that a bite-sized snack is packaged individually within another packaging, I feel it's excessive. The amount of packaging will turn me away from purchasing. Instead, if I want to buy a pastry at the grocery store, and there is the option to either put it in a plastic bag or a paper bag, I will probably go for the paper

Glass	Easily breakable, also not in the offer actually
	It is to heavy, and breaks easily
	Because it is heavier
	Heavy
	Because glass is heavy. When I'm out dedicated dustbins for glass aren't always available.
	I would only make use of convenience food products on the go and glass is heavy and inconvenient for that in my opinion.
	Too heavy
	Too heavy
	Cost the most
	I perceive it to be not so sustainable
	It's heavy and can break easily when travelling etc.
	Heavy and can break easily
	Heavy to carry

Aluminium	Scared that it tastes like metal/ that the packaging transcends the taste of the Aluminium to the food
	not sustainable
	Unhealthy
	I think it is not handy and not good for food
	It's unhealthy
	Unhealthy
	I think it's the most harmful material for the environment
	I don't find it healthy
	Unsustainable
	It's the think the less sustainable
	not convenient at all, not sustainable as of my knowledge

I don't care	Same answer as before, depends on situation and price
	Because I need to get something so and so
	There is no choice in packaging. Products are packed in plastic. No choice.
	if i buy convenience products i am most likely in a rush meaning i dont have time to make a sustainable choice by closely inspecting the products
	Honestly speaking, I don't pay much attention to it.
	I'd avoid multi layer packaging
	Package is package
The package just needs to hold the product from shop to home and during transport to the shop.	

