

TALLINN UNIVERSITY OF TECHNOLOGY

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**THE ROLE OF USING TRAFFIC-LIGHT COLOR LABELING
ON CONSUMER PURCHASE DECISION ON THE EXAMPLE
OF FOOD MENU**

Bachelor's thesis

Programme International Business Administration, specialisation Marketing

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I hereby declare that I have compiled the thesis independently and all works, important standpoints and data by other authors have been properly referenced and the same paper has not been previously presented for grading.

The document length is 7516 words from the introduction to the end of the conclusion.

Pariya Talebi

(date)

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ABSTRACT

As the awareness of reducing carbon footprint and mitigating climate change grows, it has become evident that the food system plays a significant role in contributing to these issues. Traffic-light color labeling is a tool that enables consumers to monitor nutritional value and carbon footprint of products and food menus which can help consumers to increase their awareness regarding the impact of their choices.

The purpose of this study is to investigate consumers purchase decisions towards traffic-light color labeling implemented on food menu and to find out if consumers awareness is aligned with positive behavioral change. Quantitative approach was chosen and used descriptive statistical analysis method to analyze the data. To collect data, an online survey was sent out on different social media channels.

The result of the study reveals that the implementation of traffic light labels on food menu resulted in favorable changes towards meals with lower carbon emissions and fewer calories. Moreover, consumers awareness was aligned with positive behavioral change due to implementing carbon footprint on food menu.

Keywords: Decision-making, Consumer behavior, Traffic-color light labeling, Foods environmental impact, Carbon footprint labeling

INTRODUCTION

Having unsustainable habits for decades have directly contributed to climate change and lead us to the current situation that a global shift in human's habit is required. Since the concept of reducing carbon footprint and climate change have been getting more and more attention, the food system has been recognized as a significant contributor to climate change (Vermeulen et al., 2012, p. 202). Approximately, 40% of the earth's land area is used for agriculture (Foley et al., 2005). Moreover, Agricultural activities are responsible alone for about 14% of the global greenhouse gas (GHG) emissions (FAO, 2016, p.38). Greenhouse gas (GHG) emissions associated with food are generated throughout the entire food supply chain, spanning from food production, storage, distribution, processing, packaging, retailing, marketing, preparation, consumption, and waste management. (Plamondon et al., 2022).

While consumers cannot be solely responsible for the environmental impact of their food choices, they can still play a significant role in promoting both environmental sustainability and personal health through informed food choices. (Macdiarmid, 2012; Poore et al., 2018). In order to help consumers to follow more sustainable and healthier trends, providing relevant and decision tools are required (Camilleri et al., 2018). One of the tools which provide consumers visibility of the impact of their choices is traffic-light color labeling which can be implemented on products and foods menus for tracking both the nutritional value and carbon footprint.

In recent years, carbon footprint labeling has gained significant attention for its capacity to decrease emissions associated with food consumption (Meyerding et al., 2019). In addition, the method can be implemented for measuring both environmental and health impact while it can also enhance consumers' ability to evaluate the carbon footprint of food which is a key to persuade consumers to purchase more environmentally friendly food. (Panzone et al., 2020; Feucht et al., 2017). Although considering the functionality of carbon footprint labeling method and capability of combining it with traffic-light color labeling for calories and carbon footprint of food, the

method has not been executing in many countries and the author couldn't find any Estonian cafeteria where they use the traffic-light color labeling method on their menu.

The main research problem of this study is due to the complexity of implementing accurate labels on food menu and lack of unique standard traffic-light color labeling method in Estonia, the efficiency of using traffic-light color labeling on food menu needs to be investigated. The problem leads the author to the main interest and the aim of the study which is to find out the effectiveness of traffic-light color labeling implemented on food menu on consumers purchase decision. By applying traffic-light color labeling method on menu, the author will be able to answer following questions:

- 1) Does the traffic-light color labeling provide clear information for consumers to change their eating habits?
- 2) Are consumer's belief and awareness regarding both environmentally friendly and healthier diet aligned with their real actions?

The research tasks in this thesis are first, to find out the research problems and conducting literature review and gather background information in order to develop appropriate research methods, reforming a food menu, creating survey. Second, analyzing the gathered data using statistical techniques in order to interpret the findings and drawing conclusions.

This paper will include quantitative research method to describe the findings. First the online survey in both English and Estonian got published, both local and international asked to participate in the study. Second, based on analyzed data the results and conclusion have been conducted. The first chapter of the thesis will be concentrated on the theory of consumers behavior, and background research related to food's environmental impact and finding the connection between the traffic light color labeling method and reducing food's environmental impact. The paper will be followed by the second chapter which will mostly be focused on justifying and designing research method. The chapter will include the relative information about the survey. The third chapter will cover analyzed data and findings from quantitative approaches and the thesis will end with recommendation and conclusions. The last pages will cover references, and survey questions.

1. LITERATURE REVIEW

In the first part of this chapter the author is focusing on consumer purchase decision and the process such as personal, psychological, social, and cultural which influences on individual purchasing behaviour (Hoyer et al., 2012, p.10). The first part covers the explanation and comparison between three different consumer purchase decision theories which the research questions of the study were developed based on. The expected rise in population will result in an increased demand for food, which will consequently lead to a surge in the environmental effects of food production, including climate impact (Hartikainen et al., 2014). The second part of this chapter will be consecrated on food's environmental impact which will lead the author to present the third part of this chapter which will cover the connection between traffic-light colour labelling and reducing food's environmental impact as it has been reflected by consumer purchase decision.

1.1. Consumer purchase decision

Consumer purchase decision and factors which have impacts on the consumers decision have been studied for decades. One of the theories that has kept the validity and has been using in different studies is Value-Belief-Norm (Stern et al., 1999) which explained five variable, personal value (PV), the new ecological paradigm (NEP), awareness of adverse consequences (AC), ascription of responsibility to self (AR), personal norms (PN) and the theory has proven all the values aims to promote pro-environmental behaviors by targeting an individual values, beliefs and norms. The VBN strategy has recognized first, each individual who has stranger environmental value, the possibility of engaging in pro-environmental behaviors is higher. The strategy also found out it is important for individuals to receive support from the community. Individuals are more likely to engage in pro-environmental behaviors when they perceive that their behaviors are accepted and are the norms in the community (Ibid).

Although, consumer purchasing behavior occurs within a specific context and can be influenced by external factors, leading to variations in the behavior (Groening et al., 2018). Another theory is

Behavior Context (ABC) theory which emphasized that individual behavior is influenced by external conditions (Stampa et al., 2020). ABC theory emphasizes that by understanding the factors that occur before the behavior and the outcomes of the behavior, the behavior can be modified by changing the context in which it occurs.

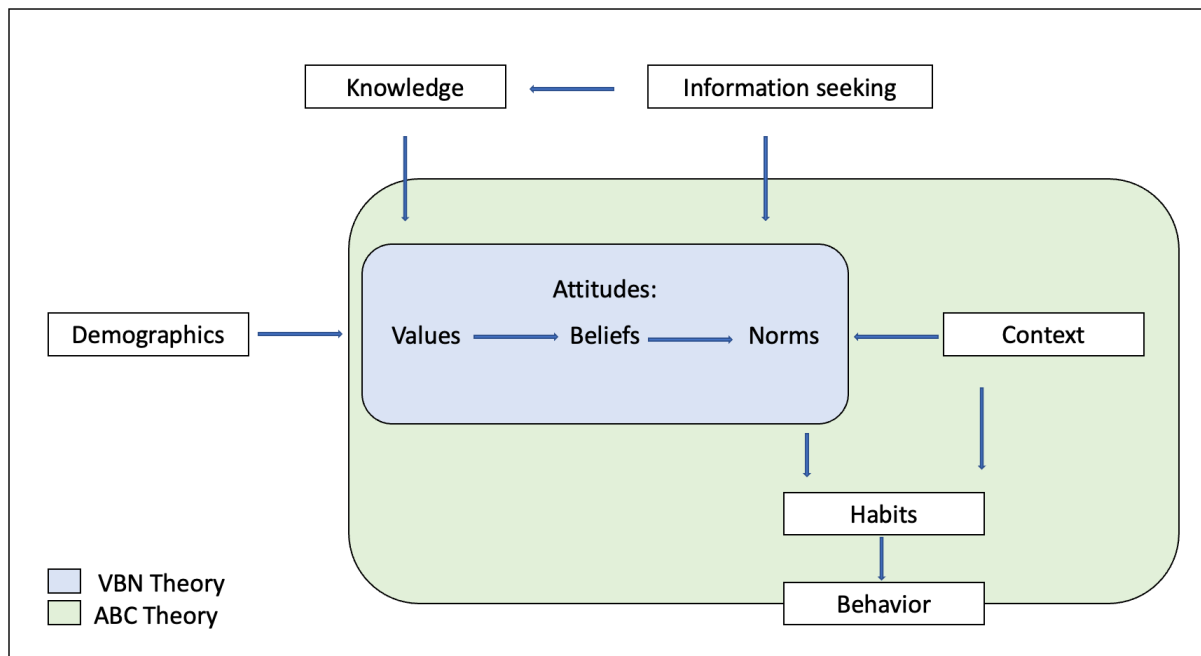


Figure 1. The Alphabet Theory framework
 Source: Zepeda & Deal (2009), adapted Schäufole & Hamm (2017)

Alternatively, a relatively recent theory which is a combination of VBN and ABC theories has been developed in a single framework which is Alphabet theory (Zepeda & Deal, 2009). The Alphabet theory (see Figure 1) is a framework for understanding the relationship between values and behavior regarding food consumption. The theory added four dimensions to the previous (VBN and ABC) theories, demographics (D), knowledge (K), information seeking (IS) and habits (H). The framework will provide the visibility for understanding how individuals and groups interact with information and sharing it with different audiences. The alphabet theory will consider the demographic aspect as a way of each individual will have access to use information. Knowledge is about people’s understanding of particular topics, and it emphasizes that people will interpret new and existing information based on prior knowledge and experience. The most relative aspects are information seeking and habits. Information seeking is reflected by people’s strategies to find information which can be influenced by the perceived value of the information and motivation. Habits refers to the pattern of people’s behaviors which has been developed over time. Habits can also influence how people approach information and the types of sources they use to

find it. As purchasing food is a repetitive activity, it is important to consider the influence of habits when explaining consumer behavior. For instance, habits related to cooking and dietary preferences can significantly affect the decisions consumers make when purchasing organic food. (Zepeda & Deal, 2009). Recent literature reviews on the topic have demonstrated the validity of using the Alphabet theory as a framework for analyzing consumer behavior regarding sustainable food (Feldmann et al., 2015; Schäufele et al., 2017; Rivaroli et al., 2020).

1.2. Food's environmental impact

Food consumption's environmental impact has gained attention in recent decades and is now a part of the environmental agenda. Although the emissions of greenhouse gases (GHG) have been the focus, the food sector has a significant impact on the environment in various other ways (Röös et al., 2013).

The top three main categories which are responsible for 70% of having the most environmental impacts are housing, transport, and food (Tukker & Jansen, 2006). Around 20-30% of the environmental burdens of total consumption can be attributed to food consumption, with meat and dairy products playing a significant role in the overall environmental impact in Europe (Notarnicola et al., 2017).

As the concern related to global warming has been raised and in order to mitigate negative consequences, policy makers and private entities have been establishing objectives to decrease greenhouse gas emission on a global scale (Camanzi et al., 2017) which as a result in the recent conference during the United Nations Framework Convention on Climate Change's Paris negotiations in 2015, more than one hundred countries committed to cooperative measures in addressing global warming and adapting to the impacts of climate change (Stern, 2018, p.6). In order to mitigate the greenhouse gas emission the European Union (EU) has established a roadmap for achieving competitive low-carbon economy by 2050, implementing necessary actions in all emission-causing sectors, including agriculture, since agriculture is one of the categories with relatively high share of greenhouse gas emission, the ultimate objective is to lower greenhouse gas (GHG) emission from agriculture by roughly 30% by 2050, compared to 2005 levels. Since 1990 the EU could decrease GHG more than 24% and about 3% compared to 2005 (Dace et al., 2016; Camanzi et al., 2017).

However, agriculture is only one of the relevant sources of greenhouse gas emission in the food supply chain (Vermeulen et al., 2012, p. 3). Greenhouse gas emissions are generated by the food supply chain throughout its entire life cycle, including the farming process and its inputs, manufacturing, distribution, refrigeration, retailing, food preparation at home, and waste management (Garnett, 2011).

Although in many parts consumers are not able to have direct impacts to reduce the GHG emission, however the consumers role still considered significant. Consumers can reduce their environmental impact by making conscious food choices. The choices they make when purchasing and consuming food have direct consequences on the environment. For instance, consumering can consider the transportation of food from one location to another, food waste and choosing animal-based foods more over than plant-based foods have a significant impact on the environment while making their desions.

Therefore, consumers have the power to make significant changes in reducing the environmental impact of the food industry. By making informed choices and being mindful of their food choices, consumers can contribute to a more sustainable and environmentally friendly food system.

1.3. The connection of traffic-light labelling and reducing food's environmental impact

Consumers have a remarkable role in reducing greenhouse gas emission (GHG), however, there are barriers such as cognitive, psychological, social and material which prevent them from acting climate friendly (Feucht and Zander, 2017). In addition, the main challenge is in converting consumer's food habits and modify them into more sustainable ones (Osman & Thornton, 2019) and this challenge got reflected by consumer's limited knowledge about the impacts of their daily personal food choices and lack of having access to information, for instance most of the consumers are unaware about the significant impact of red meat and its direct relation to GHG emission (Macdiarmid et al., 2016).

Since the consumers have found it challenging to comprehend climate change and its relevance to their daily existence and it's complicated for them to gain the information and measure the carbon

footprint of the food as the environmental impact of the food has been calculated using life cycle method (LCA), Carbon footprint labeling has become a game changer (Röös et al., 2013; Feucht et al., 2017).

According to a study has been conducted in Finland (Hartikainen et al., 2014) consumers are willing to receive information about the environmental impact of their foods. Although another study with relatively larger scale revealed that the majority of EU citizens felt responsible about the product's environmental impacts but the carbon footprint label on the product was not popular and only labels related to "recycle and reuse" got attention (European Commission, 2009). Recycle and reuse which are related to packaging are only one part of life cycle of the product which has been provided for many years, on the other hand carbon footprint labeling is considering the whole life cycle of the product and its more accurate and it is relatively new approach and majority of consumers are not familiar with it.

On the other hand, using traffic light color labelling method can also help consumers to change their behavior regarding to follow more sustainable diet (Osman & Thornton, 2019). The definition of sustainable food can vary based on the context, as it can have multiple dimensions including health, environment, economics, and social influences (Macdiarmid, 2012). It needs to be mentioned in this paper sustainable diet is refers to lower environmental impacts which have nutritional security and healthier diet.

By implementing both health-based and carbon footprint-based traffic light color labels both consumers who are highly aware or willing to aware of nutrition and environmental impact of their foods benefit from this approach (Andrews et al., 2011; Panzone et al., 2020). The use of traffic light labels results in enhanced awareness and improved ability to rank products based on their both carbon footprint and nutrition value which make the communication and gaining information for consumers easier and will allow them to compare any two foods directly, regardless of their respective categories and eventually will make decision making much easier for consumers (Thøgersen et al., 2016; Holenweger et al., 2023).

This study will use three-tier-labeling regarding to provide more visibility for both displaying carbon footprint and nutrition value as it has been proven consumers are typically less invested in the decision-making process and the simpler labeling system is their preferred choice while eating is a daily habit (Thøgersen et al., 2012; Thøgersen et al., 2016).

2. RESEARCH METHODOLOGY

In this chapter, the author outlines the methodology employed in the study, detailing the research method utilized, the research design, data collection procedures, and subsequent data analysis. The chapter covers the research plan and design, data collection, and data analysis. The study uses a quantitative approach. The data was collected from an online survey. The results and findings which will be present in the next chapter are based on analyzed data of this chapter.

2.1. Planning the research

The aim of the study was to find out if the traffic light color labeling on foods is a sufficient communication tool for consumers and if it can help them to act more healthier and environmentally friendly and measuring the impact of traffic light color labeling on consumer purchase decision. In order to gather data, the author chose quantitative approach since most of the related studies have run online surveys (Osman et al., 2019; Rondoni et al., 2021). In addition, quantitative approach concentrates on measurable and structured aspects of social behavior rather than solely exploring and interpreting the meanings that individuals assign to their own actions which allow the author to find the pattern and draw conclusion (Rahman, 2017).

An online survey in both Estonian and English was designed. As the online survey has been proven to have advantages such as higher speed and allowing participant to have more freedom and honestly (Sue & Ritter, 2012, p. 18) and as implementing of traffic light color labeling on food menu is a new approach in Estonia, the author decided to design an online survey in both Estonian and English. The foundation of the survey was conducted in Google forms, however due to the limitation of not supporting multi languages in Google forms, the author proceeded with combining Google form and Pretty form to have a dual language survey.

The survey was designed in five different sections including presenting the traffic-light color labels both for calories and carbon footprint, participants selected dietary habit and food options, rating the statements and eventually demographic questions. The survey started with providing information regarding different labels with different colors. First, labels based on calories in three different colors (green, amber, and red) were explained. Based on previous study (Osman & Thornton, 2019) regarding to three-tier-labeling, the author established the following structure related to calorie's labels: green <500, amber = 501-749 and red >750. Second, three labels (green, amber, and red) based on carbon footprint were presented and explained with the following structure: green <500 g CO₂e, amber = 501-1299 g CO₂e and red >1300 g CO₂e.

The participants were asked to specify their dietary habits before moving to the food selection section. It was noted that the labels were calculated based on non-vegan alternatives and the numbers represented the impact of animal-based products calories and carbon emissions associated with each meal option. Each participant was asked to choose one out of four options for five days. Each food contained two separate labels (calories and carbon food print). In order to improve the accuracy, all the food recipes and calories were collected from the same source, Eat This Much (n.d), and the same food recipes were used to measure carbon footprint labels using alternative tool (My Emissions, 2023). The author made sure that the food selected for the menu was based on well-known dishes with different varieties of ingredients. Hence, each day included a various range of labels which allowed the participant to have different options. In addition to labels, general facts related to carbon footprint from United Nation (2021) and nutrition facts from Fitbod blog (Amanda Dvorak, 2022) were provided for each day in order to examined if the participant's decision was affected by the general information and if the general information has a potential to enhance the participant's decision toward more sustainable and healthier choices.

The survey was followed by four liner-scale questions and asking participants to rate some statements from 1 (not important at all) to 10 (extremely important). The statements aim was to gather information regarding consumer's knowledge, values, and beliefs about sustainable diet. In addition, participants were asked to specify the effectiveness of general facts were used in the last section on their food selections.

The last part of the survey covered the demographic part and participants were asked to specify their gender, age, and occupation. The demographic questions provided information regarding participant's characteristics, and it helped the author to describe the sample.

When the English version of the survey was finished, the author started working on the Estonian version with the assistance of the supervisor and finally, after translation and finalizing, pilot test was conducted. Eventually, after gathering suggestion from pilot test and implementing necessary edits, the survey was ready to be published.

In order to choose the best sampling method for the study, the author chose the non-probability sampling because it will allow author to draw rich and deep insights of the sample group and as only people who access to internet had the opportunity to participate to the study, non-probability method was chosen. In order to distinguish the participants according to characteristics such as age, gender and occupation, a quota sampling method was used.

2.2. Data collection and analysis method

Data collection period was two weeks starting from 12th of April to 26th of April, and the survey was shared in author's colleague workspace, different Estonian and international social media channels and friends. In total the survey had 151 responses. In addition, the majority of responses in Estonian came from Facebook groups with the help of the supervisor. All the analysis was conducted in MS Excel and IBM SPSS Statistics using a descriptive statistical and correlation method and the respective data can be found in an electronic appendix listed in the list of references. A non-probability method and quota sampling technique used in this paper. The reason for choosing quota sampling for the study was it can help the author to identify relevant characteristics to ensure that the surveyed sample is accurate enough to represent specific characteristics of the studied population. In order to eliminate errors, the author reviewed all the data before analysing them and the figures and tables were designed to help and provide a clearer picture of the results of the survey.

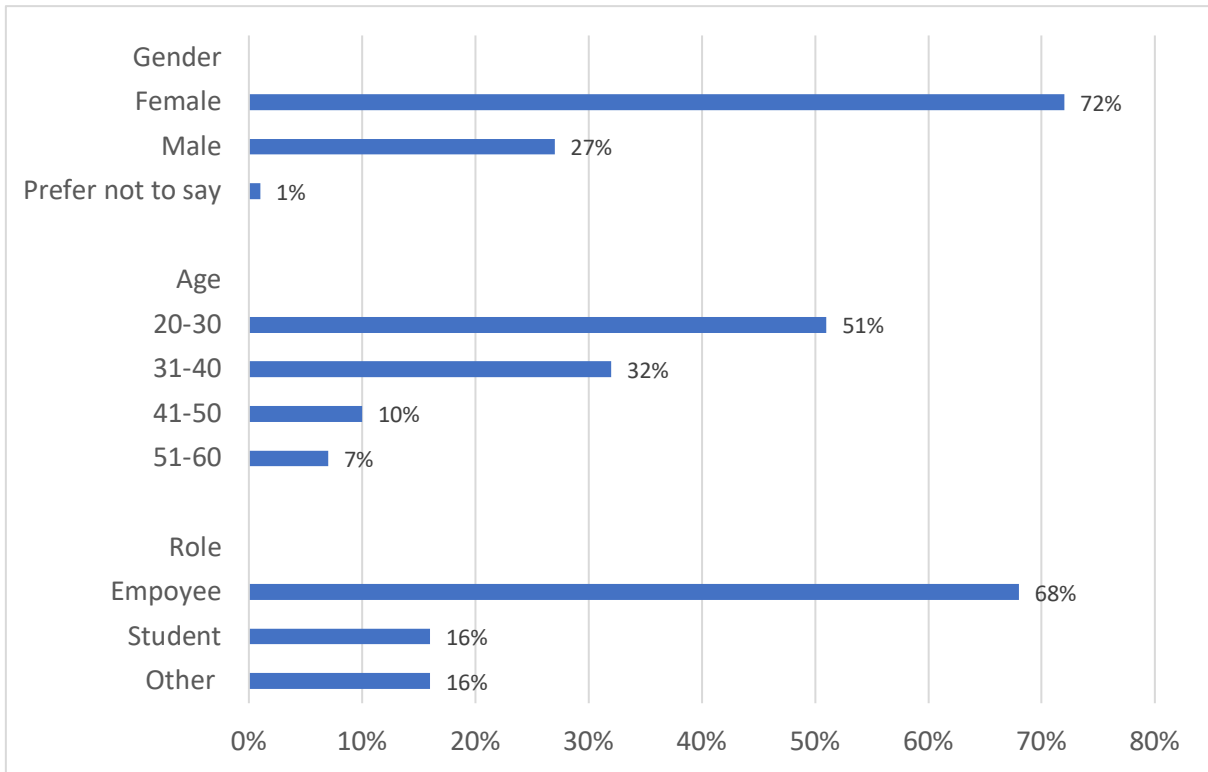


Figure 2. General characteristics of the respondents, n=151
 Source: Composed by the author based on survey data

Figure 2 shows that 72% of respondents were female and 27% of respondents were male meanwhile 1% of respondents preferred not to specify their gender; total of 109 female, total 40 male and total 2 prefer not to say. The respondents were from age 20-60 years old, 51% of them were from age 20-30, 32% of them were from age 31-40, 10% of respondents were from age 41-50 and 7% of them were from age 51-60. According to figure 2. 68% of participants were employees, 16% of them specified that they are students and 16% specified other as their role; total 103 employees, 24 students and 24 other occupations participated in the survey.

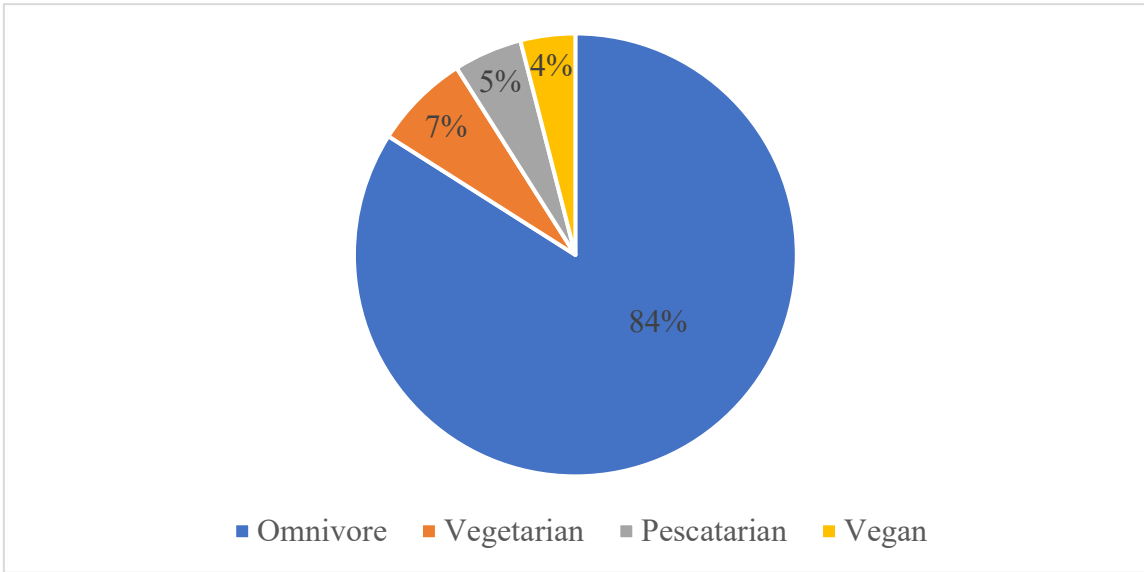


Figure 3. General diet of the respondents, n=151
Source: Composed by the author

The participants were asked to specify their habits before moving to the main section of the survey. Figure 3 demonstrates that 84% of the participants (127 persons) identified as omnivores and respectively 7% (10 persons) vegetarian, 5% (8 persons) pescatarian and 4% (6 persons) vegan.

3. RESULTS AND FINDINGS

In the first part of the chapter the findings from the online survey will be covered. In order to provide answers to the research questions, the data from the survey was taken and will be explained in detail. The second part of this chapter will be focused on discussion of findings and recommendations regarding the study will be covered in the third chapter.

3.1. Research results

In order to provide answers for the research questions, data from the online survey was collected and with the goal of minimum error in data, the author reviewed the data before analyzing the data. Four food options with two different labels were presented each day and participants were asked to select one food for five days. Based on Figure 4 (see Appendix 1) each food has different scores based on carbon footprint label and calorie label. As both categories of the labels contain the same colors, the scoring system was the same for both categories. Starting from color green which has both lowest level in calories and carbon footprint with score 1, amber which was the mid-range score 2 and red which has the highest number in both carbon footprint and calories score 3. Hence, the score for each label became clear and as each option contains two different labels, the scoring range for all food options for each day would be from 2 to 6. The greenest option for each day was assigned to the food which had both green carbon footprint and calories labels and the score of the food was 2. Therefore, score 6 was assigned to the food option which had two red labels which means the least environmentally friendly and highest calories option. Taking into account that participants needed to choose food for five days and based on table 1 the lowest possible score per person is 12 and the highest possible score per person is 28.

In order to answer the first research question which was “Does the traffic-light color labeling provide clear information for consumers to change their eating habits?”, two different analyses were conducted. First the average score regarding participants’ food selections for five days was analyzed (see Table 1).

Table 1. Average participant’s food selections score for five days

	Day 1	Day 2	Day 3	Day 4	Day 5	Total
Average participants’ food selection score	3.31	4.56	3.03	2.84	2.88	16.7

Source: composed by author based on online survey

Based on the scoring method explained above, each food’s score was calculated (see Figure 4) and Table 1 shows the average daily score based on 151 participants’ food selections. First day, participants participant’s average score based on their decision and the food options they picked is 3.31. Day 2, the average score calculated for 151 participants based on their choices is 4.56. The next day, average score is 3.03 and for fourth day, the average score for all participants calculated is 2.84. Day five, the average score is 2.88. Also, Table 1 shows the total average score for all participants based on their food selection for five days is 16.7.

Participants were asked to specify their dietary habits before moving to the second section of the survey where they could select their food options. To conduct more depth analysis, the average score for each dietary habits was calculated based on their chosen options for five days (see Table 2).

Table 2. Participant’s food selections average score based on dietary habits for five days

Participants’ food selections average score based on dietary habits	Day 1	Day 2	Day 3	Day 4	Day 5	Total
Omnivore	3.5	4.5	3.2	2.9	2.9	17
Pescatarian	2.5	4.7	2.5	2.9	2.9	15.5
Vegan	2	5	2	2	2	13
Vegetarian	2	5.1	2	2	2	13.1

Source: composed by author

Table 2 shows the average score calculated for each dietary habits for five days and the total score for each group. Starting from omnivores, who based on Figure 4. 84.11% of the participants (127 persons) were omnivores, the total average score based on their selected options for five days is 17. Pescatarian, who based on figure 4. Only 5% of total participants were included in this group, total average score is 15.5. Vegan, who was the smallest group, total average score for five days is 13 and the second larger group (see Figure 3), vegetarian's average score based on their food selections for five days is 13.1.

The second analysis was conducted to provide answer for the first research question was related to analyzing data from the third part of the survey. In order to make sure if the impact of only traffic-light color labeling method was enough for participants to change their habits and deeper investigation in the data, a correlation analysis was conducted on the data. On the second section of the survey where participants were asked to choose food for five days, a general fact related to either carbon footprint or health was provided for each day. After the data regarding participant's food selection was collected in the next section of the survey, participants were asked to rate some statements and one of them was regarding the general facts on the second section. Participants were asked to rate whether their decision got affected by the facts or not from 1 (Not important at all) to 10 (Extremely important). The following figure (see Figure 5) presents participants responses regarding the statement divided in five categories starting from participants who considered the general facts were not important at all to participants who considered the general facts were extremely important during their food selection and their average score based on their food selection for five days for each corresponded category.

Figure 5 shows that 25.16% of participants did not pay attention to the general facts and their average score calculated based on their food selections is 17.1. 19.2% of participants considered the general facts slightly important with average score of 16.6 and 27% of the participants rated the general facts were important for them and they considered the facts while choosing their food while the average score for respondents who considered the facts was important is 16.5. 19.86% of respondents took the general facts to consideration and the facts were very important factors while making decision with the average score of 15.2 and only 8.6% of survey takers' decision affected by general facts extremely with the average score of 16.5.

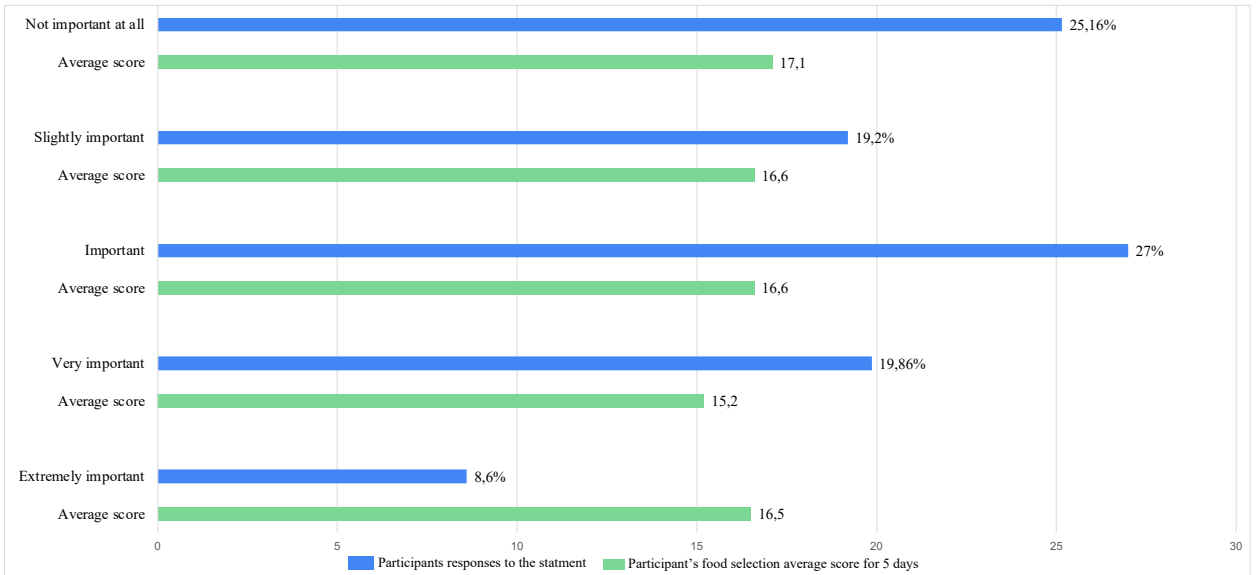


Figure. 5. To what extent participants decision was affected by additional information at the top of every second section's questions and their average food selection score based on their responses, n=151

Source: Composed by author from survey

The second research question was “Are consumer’s belief and awareness regarding both environmentally friendly and healthier diet aligned with their real actions?”. In order to provide the answer to this question, the author mainly focused on the third part of the survey where participants were asked to rate three statements (see Figure 6) regarding both healthy and environmentally friendly diet.

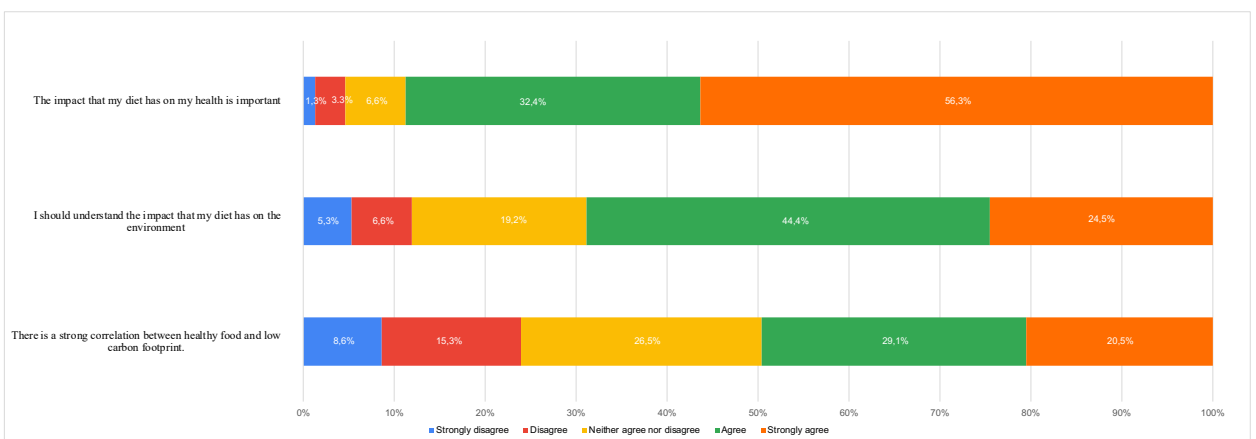


Figure 6. Participants responses to the third part of the survey, n=151

Source: Composed by author

Figure 6 shows participants' level of awareness regarding healthy and environmentally friendly diet. Related to the first statement, where participants were asked to rate if they consider the impact of their diet important on their health, only 1.3% strongly disagreed and 3.3% disagreed. 6.6% of participants neither agree nor disagree with the statement. The majority of the participants either agree or strongly agree with the statement and they consider the impact of their diet on their health. 32.4% of participants agreed and 56.3% strongly agreed. Regarding the second statement where survey takers were asked to rate “I should understand the impact of my diet has on the environment” from 1 strongly disagree to 10 strongly agree, 5.3% of participants strongly disagreed, 6.6% of them disagreed and 19.2% of participants neither agree nor disagree with the statement. On the opposite side, 44.4% of them agreed and 24.5% of participants strongly agreed that they should understand the impact of my diet has on the environment.

The third statement was about a strong correlation exists between healthy food and low carbon footprint and participants were asked to rate the statement from 1 strongly disagree to 10 strongly agree. 8.6% strongly disagreed and 15.3% disagreed. 26.5% of participants neither agree nor disagree with the statement. 29.1% agreed and 20.5% strongly agreed that healthy food choices are strongly correlated with a low carbon footprint.

Regarding finding out if participants who considered the impact of their diet was important on their health and if their level of awareness and real actions are in the same direction, an analysis based on their food selections for five days and their level of awareness regarding the impact of their diet on their health was conducted (see Figure 7). Out of a total of 151 participants, 134 individuals (88.7% of participants) both agreed and strongly agreed with the first statement (see Figure 6) and the impact of their diet on their health considered important for them. Figure 7 demonstrates 134 participants food selection based on only the health label for five days. For day 1, 79% of respondents selected the food with green calorie label and only 21% chose food with red calorie label. Day 2, 28% selected food with green label for health and 18% picked amber and 54% of them picked the food with red calorie label. Regarding day 3, 80% of participants selected the green and healthy option and only 20% picked high calorie food. Day 4, as all the options (see Figure 4) had green label regarding to the health, 100% selected green label and for the last day 94% picked green label and 6% picked red.

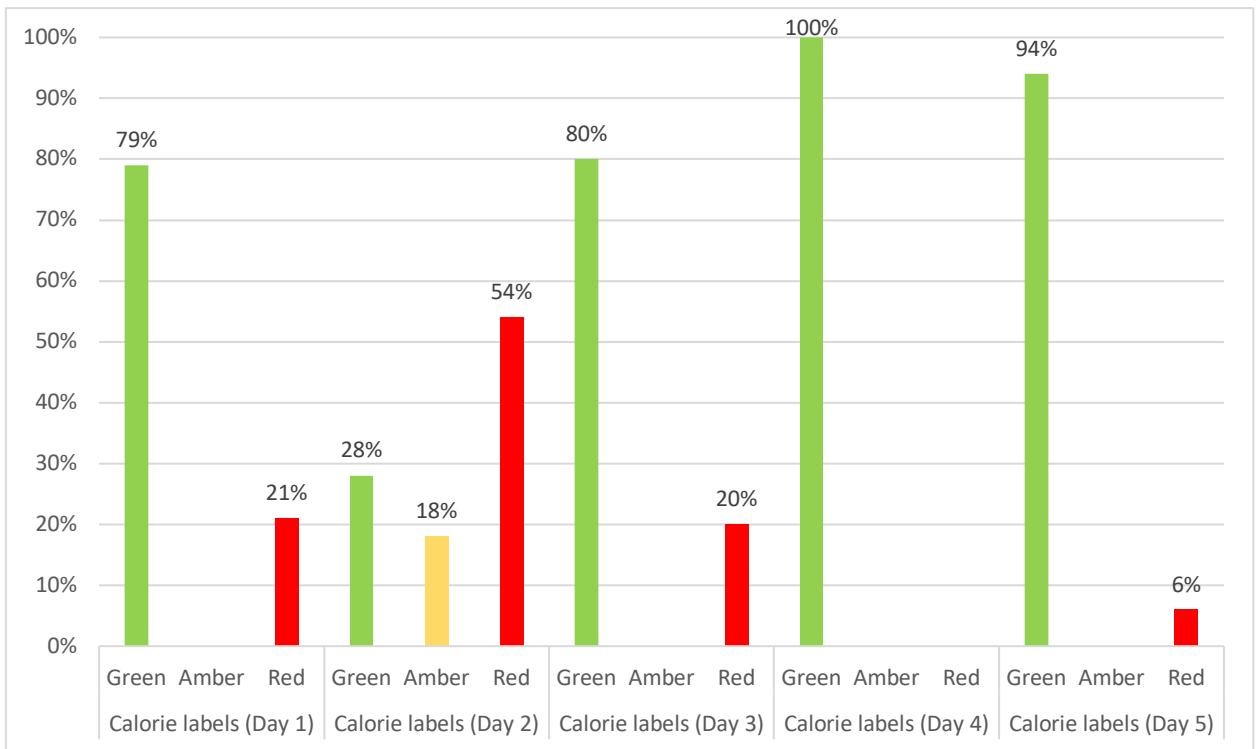


Figure 7. Frequency of calorie labels per day for 88.7% of participants who considered the impact of their diet on their health is important, n=151
 Source: Composed by author

Regarding providing the answer for the second part of the research question the same technique was implemented and this time only on carbon footprint label and participants who agreed and strongly agreed with the second statement (see Figure8). Based on figure 6 approximately 70% of individuals considered the impact of their diet was important on the environment. Figure 8 shows 104 participants, who agreed and strongly agreed with the statement, food selections based on carbon footprint label for five days. On the first day 57% of participants picked food with green carbon footprint label, 18% picked the amber label and 25% picked red label. On the second day, as there wasn't any green label for carbon footprint 72% of participants selected amber label and 28% picked food with red carbon footprint. For the third day 65% selected green label, 14% selected food with amber carbon footprint label and 21% picked red label. Based on Table 1 there wasn't any red label regarding carbon footprint for day 4 therefore, 18% picked green and 82% selected amber label. For the last day 40% of participants selected food with low environmental impact, 53% selected amber and only 7% picked label with high environmental impact.

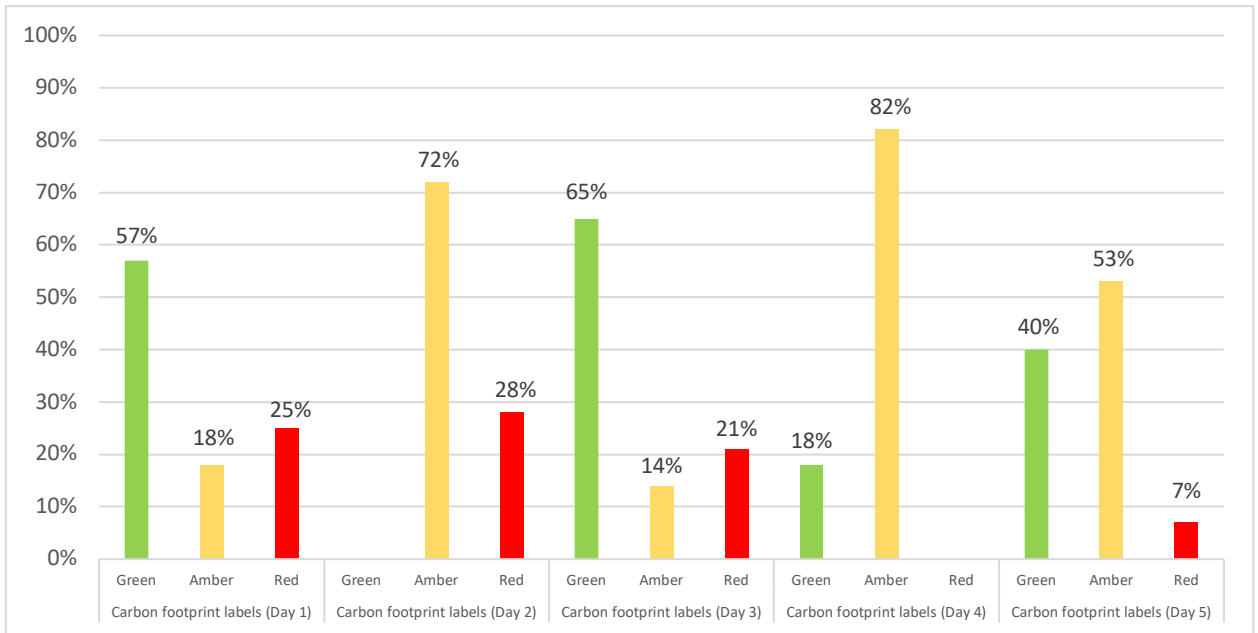


Figure 8. Frequency of carbon footprint labels per day for 70% of participants who considered the impact of their diet on environment is important, n=151
Source: composed by author

Participants were asked to rate if they agree with strong correlation between healthy diet and low carbon footprint in the third part of the survey (see Figure 6) and the statement includes two aspects, health, and environment, which consumers were asked about them separately. In order to provide clear visibility of participants focus of direction and comparing responses regarding two aspects, health, and environment Figure 9 was designed.

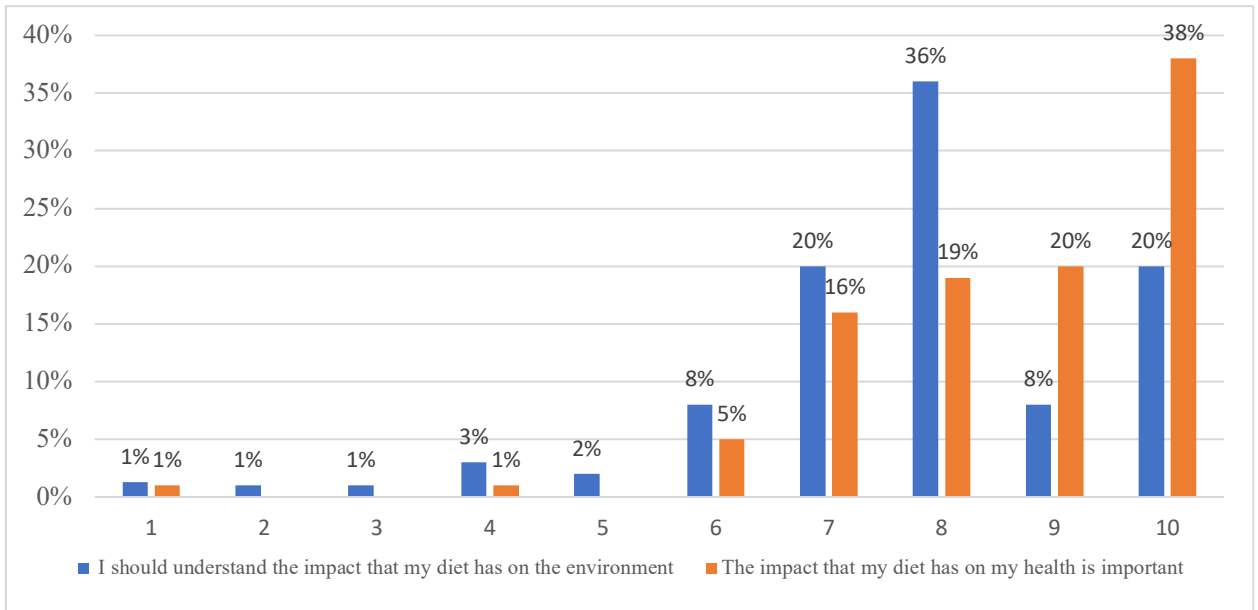


Figure 9. Participants who were agree and strongly agree with a strong correlation between healthy food and low carbon footprint, n=151
Source: Composed by author

Figure 9 shows the correlation related to the third section of the survey. The third statement asked participants about the correlation between healthy food and low carbon footprint. Based on figure 6 around 50% of participants both agree and strongly agree with the statement. Figure 9 shows the correlation between 50% of participants who considered the third statement important and their separate aspects regarding healthy diet and sustainable diet.

3.2. Discussion of findings

The main aim of the study is to find out the effectiveness of traffic-light color labeling implemented on food menu on consumers purchase decision by answering to two main research question:

- 1) Does the traffic-light color labeling provide clear information for consumers to change their eating habits?
- 2) Are consumer's belief and awareness regarding both environmentally friendly and healthier diet aligned with their real actions?

Regarding providing an answer for the first research question analysis on data collected from survey has been conducted. With the aim of finding if any changes in habit occurred, the focus was mostly on omnivores as the majority of participants were omnivores and based on Figure 4 the highest scores were assigned to mostly meat-based dishes, taking omnivores as a separate sample group, and analyzing them provided clear result if the traffic-light color labeling helped them to pick lower carbon footprint and healthier food. Based on Figure 4 the highest score that can be assigned per individual regarding their food selection for 5 days is 28. Based on table 1 the average score for all participants based on their food chosen is 16.7 and 17 based on table 2 only for omnivores. Comparing the highest possible score and omnivores' score it can be deduced traffic-light color labeling method helped omnivores to move toward healthier and more sustainable diet.

In order to analyze if traffic-light color labeling provided clear information for participants to change their habit and if their decisions were only boosted by traffic-light color labeling method, an analysis on participants' food selections average score and the impact of general facts on their decision was conducted. Based on Figure 5. the highest participant's average score belongs to the group who did not pay attention to general facts about either nutritional value or carbon footprint while making their decisions is 17.1 and the lowest average score belongs to the group whose decision got influenced and they considered the fact very important during their decision making is 15.2. It can be inferred as combining the highest traffic-light color labeling and general facts seems effective and can enhance consumer's decision toward lower carbon footprint and healthier diet.

Regarding the second research question which is to find out if consumer's belief and awareness about environmental-friendly and healthy diet and their actions are in the same direction, data from the third part of the survey, where participants were asked to rate statements related to healthy and sustainable diet, was analyzed (see Figure 6). Among 151 participants 134 considered the impact of their diet on their health very important and extremely important. Based on figure 7 participants level of awareness and their food selections are in the same direction since the percentage of selected food with green calorie label is relatively higher than other color labels. Moreover, with the aim of implementing the same analysis method to find out if participants belief and awareness related to the impacts of their diet on environment and their behavior are in the same direction data from 104 participants who believed their diet has impact on the environment were analyzed. According to figure 8 participants behavior regarding their food selection is not significant as

Figure 7. Although the percentage of selected green carbon footprint labels are higher than red labels, the frequency of amber label is obviously high. It needs to be mentioned, based on Figure 1 on day 4 three out of four food had amber labels for carbon food print and there was only 1 green option therefore, the high percentage of amber carbon footprint label could be expected. However, based on Figure 9 it clearly demonstrated that participants paying more attention on health aspect and the trend regarding the impact of diet on health is more significant and stable compare to and participants awareness related environment aspect.

3.3. Recommendations

According to the results, traffic-light color labeling seems an effective way and it can help consumers to behave healthier and more sustainable. In addition, implementing traffic-light color labeling on food menu is relatively new in Estonia and the author could not find any single cafeteria where they have traffic-light color labeling on the menu. Therefore, there is a need to investigate the effectiveness of implementing traffic-light color labeling on food menus in Estonia to promote healthier and more sustainable food choices. However, there are many aspects that need to be studied in future research. This paper studied only three-tier traffic-light color labeling which has been proven that it can grab consumer's attention and they don't need to invest much time for making decision and it can make all decision making easier for consumers. However, five-tier traffic-light color labeling is in more detail and potentially could increase transparency. Therefore, a comparison study between three-tier and five-tier traffic-light color labeling can identify consumers preference and provide a more comprehensive analysis of the topic.

While implementing traffic-light color labeling method on food menu, it would be better to consider the impacts on businesses operating in the food industry. Conducting further research on the effectiveness of traffic-light color labeling with the focus on businesses can improve transparency and provide road map for business related to adapting and prompting the business values. Also, it can encourage food industry stakeholders to adapt and implement traffic-light color labeling in their food menus, including restaurants and cafeterias. Implementing traffic-light color labeling method on food menus in Estonia can establish collaboration between health and nutrition experts and local cafeterias to develop accurate and effective menus which can help to increase consumers awareness and understanding of traffic-light color labeling and its significance in promoting healthier and more sustainable food choices.

Based on data participants were highly involved with the health-related labels and less on carbon footprints labels. A recommendation for future study would be to investigate in depth the reason behind why participants were more focused on health. There is a possibility that incorporating education and awareness campaigns are needed to improve consumers understanding of the traffic-light color labeling system and its significance in reducing environmental impact. Moreover, another area that needs to be studied in future is measuring consumers trust regarding traffic-light color labeling. A deep study related to consumers' level of trust about traffic-light color labeling can provide clear understanding of participants feelings and opinions and it can help business and policymakers to design more effective and acceptable sustainability interventions. This could be done by conducting surveys or focus groups to gather more in-depth insights from consumers.

Additionally, further research can investigate the impact of traffic-light color labeling on various demographic groups, such as age, gender, education level, and income, to ensure that the labeling system is effective and inclusive for all consumers. By addressing these areas of future research, we can continue to improve our understanding of how consumers perceive and respond to food's environmental impact, and how we can promote more sustainable food choices.

According to respondent's feedback there is a possibility that using only colors to demonstrate the labels would not be applicable to all consumers. Considering colorblind consumers, it may not be effective to differentiate labels solely based on color. Alternative methods such as using alphabet letters in conjunction with colors can help make the labeling system more accessible and understandable for all consumers, which needs to be studied in future.

CONCLUSION

The current state of climate change is a result of decades of unsustainable habits, highlighting the need for a global shift in human behavior. With the increasing attention given to reducing carbon footprint and addressing climate change, the food system has been identified as a significant contributor to the issue. Consumers can make a substantial contribution to promoting both personal health and environmental sustainability by making informed food choices. In order to enhance consumers to adopt to more sustainable and healthier food choices providing resources and tools are required.

The traffic-light color labeling is a tool that enables consumers to have a clear view of the impact of their choices on both the nutritional value and carbon footprint of products and foods. This tool can be implemented on food menus and products, providing consumers with the necessary information to make more sustainable and healthy choices.

The research questions of this study which were designed based on consumers behavior theories were 1) Does the traffic-light color labeling provide clear information for consumers to change their eating habits? and 2) Are consumer's belief and awareness regarding both environmentally friendly and healthier diet aligned with their real actions? And the objective of this study was to evaluate the impact of using traffic-light color labeling on food menu, and its effectiveness in influencing consumer purchase decisions.

The alphabet theory was chosen as it provides a framework for understanding different factors that influence consumer purchase decisions. Previous literature related to foods environmental impact and connection between traffic-light color labeling and foods environmental impact has been reviewed which helped the author to have depth understanding for designing the research.

To find out the effectiveness of traffic-light color labeling on food menu an online survey in both Estonian and English was conducted to gather data for analysis. The online survey was sent out through different social media channels and in a period of two weeks 151 responses were gathered.

According to analyzed data traffic-light color labeling helped participants, especially omnivores, to change their eating habits to more environmentally friendly and healthier. In addition, the combination of implementing traffic-light color labeling on online menu in the survey and providing general facts related to nutrition and carbon footprint can also help consumers to make healthier and more sustainable food decision.

Consumers awareness regarding the impact of their diet on both health and environment were alighted with their food purchase decisions and they mostly believed the correlation between healthy food and low carbon footprint is strong. Although based on results consumers were focused on health aspect more than environment which requires deeper understanding and needs to be studied in future.

There are some limitations in this study. The sampling method used in this study was non-probability sampling and the problem with the selected sampling method is the whole population doesn't get represented. As the survey published in different social media channels only people with access to internet could participate. When using online questionnaires, there is a risk of respondents providing less than truthful responses and exhibiting a tendency to agree with all questions presented.

In order to gain a deeper understanding of the research problem, future studies could benefit from utilizing qualitative research methods and exploring the extent of trust that consumers have regarding traffic-light color labeling method. In addition, the gap between stronger consumers awareness toward the impact of their diet on health than environment can be studied and provide clear unpretending and road map for both consumers and businesses. This study suggests that business operating in food industry such as restaurants and cafeterias need adapt their strategies and values and should start presenting a new version of menu included traffic-light color labeling which can help consumers to make more informed choices regarding their health and carbon footprint.

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APPENDICES

Appendix 1. Traffic-light color labels based on survey’s food options and food scores

Labelling Context	Days of the Week				
	day 1	day 2	day 3	day 4	day 5
	Roasted Beef and cheddar Sandwich	Cream Cheese Pasta	Pork Cutlets	Spinach Soup	Roasted Salmon
Nutrition	Green	Red	Green	Green	Green
Environment	Red	Red	Amber	Green	Amber
Score	4	6	3	2	3
	Philly cheesesteak Sandwich	Avocado Pesto Pasta	Parmesan Chicken Cutlets	Chicken Soup	Curry Chicken
Nutrition	Red	Red	Red	Green	Green
Environment	Amber	Amber	Red	Amber	Amber
Score	5	5	6	3	3
	Falafel Sandwich	Spaghetti with Meat Sauce	Creamy Tomato Soup	Chicken Caesar salad	Barbeque Ribs
Nutrition	Green	Green	Green	Green	Red
Environment	Green	Red	Green	Amber	Red
Score	2	4	2	3	6
	Barbecue Tuna Sandwich	Chicken Bolognese	Savory Mushroom Soup	Tuna Avocado Salad	Spring Rolls
Nutrition	Green	Amber	Green	Green	Green
Environment	Red	Amber	Green	Amber	Green
Score	4	4	2	3	2

Figure 4. Details of the allocation of the traffic labelling color scheme for each meal option presented for each of the 5 days

Source: Composed by the author

Appendix 2. Survey results

Table 3. survey result

Demographical aspects		Number of participants
Gender	male	27
	female	72
	prefer not to say	1
Age	20-30	51
	31-40	32
	41-50	10
	51-60	7
Occupation	student	16
	employee	68
	other	16
Dietary habits	omnivore	127
	pescatarian	8
	vegetarian	10
	vegan	6

Source: Composed by author from online survey

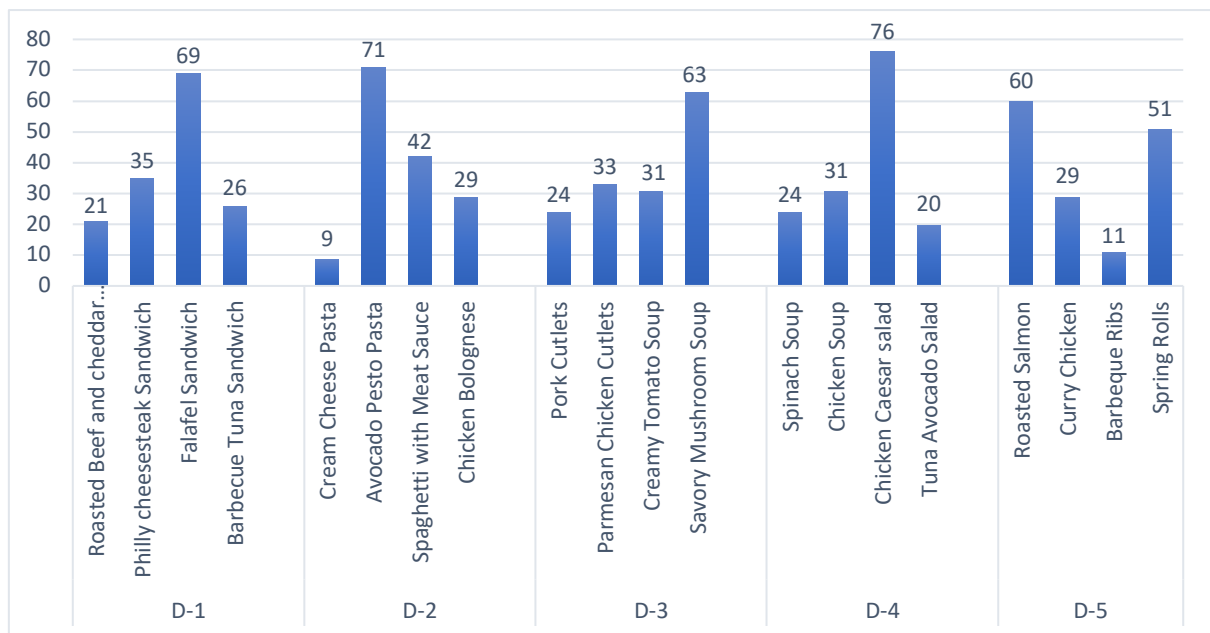


Figure 10. Participants' food selections for five days

Source: Composed by the author

Appendix 2 continued

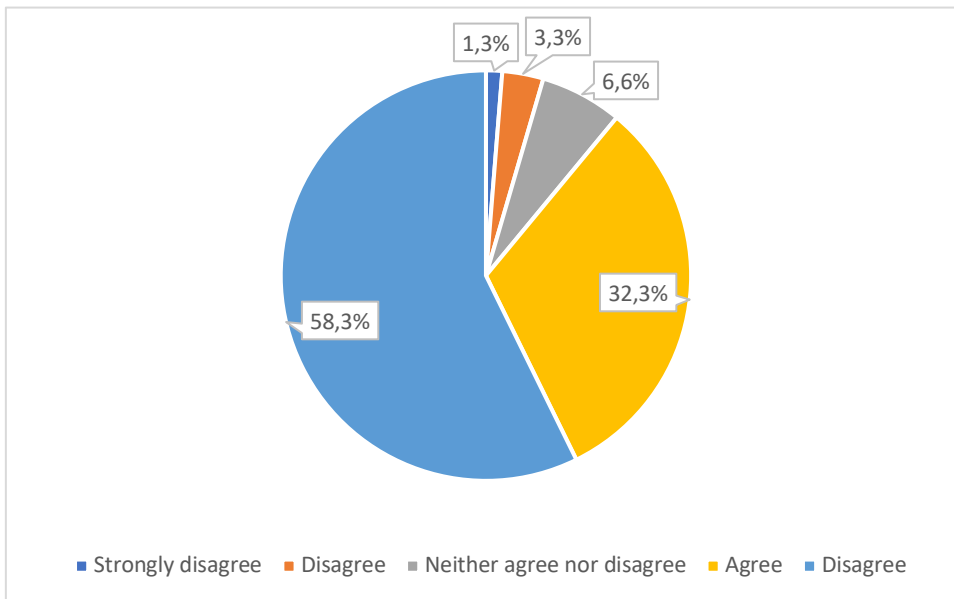


Figure 11. Participants' responses to the statement of "The impact that my diet has on my health is important." on the survey

Source: Composed by the author

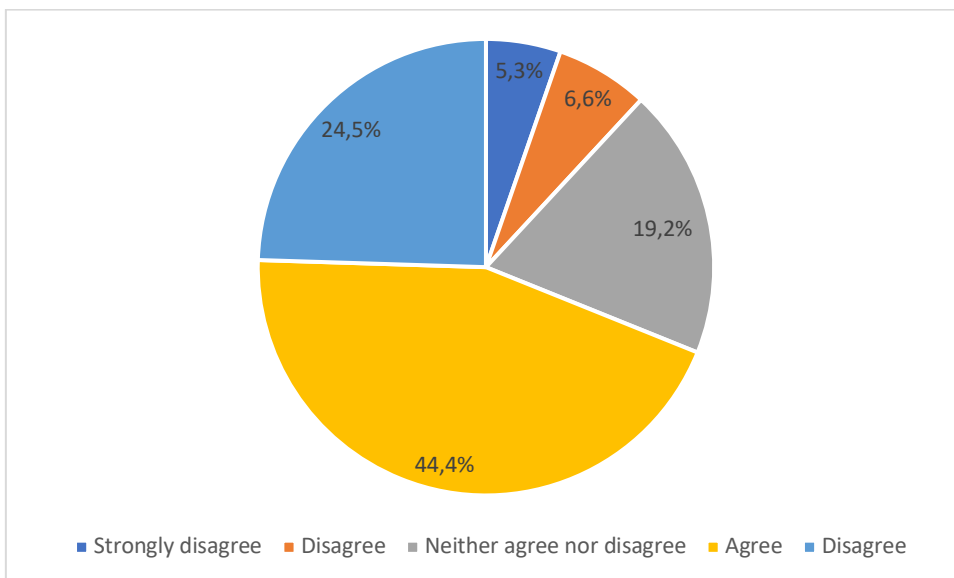


Figure 12. Participants' responses to the statement of "I should understand the impact that my diet has on the environment." on the survey

Source: Composed by the author

Appendix 2 continued

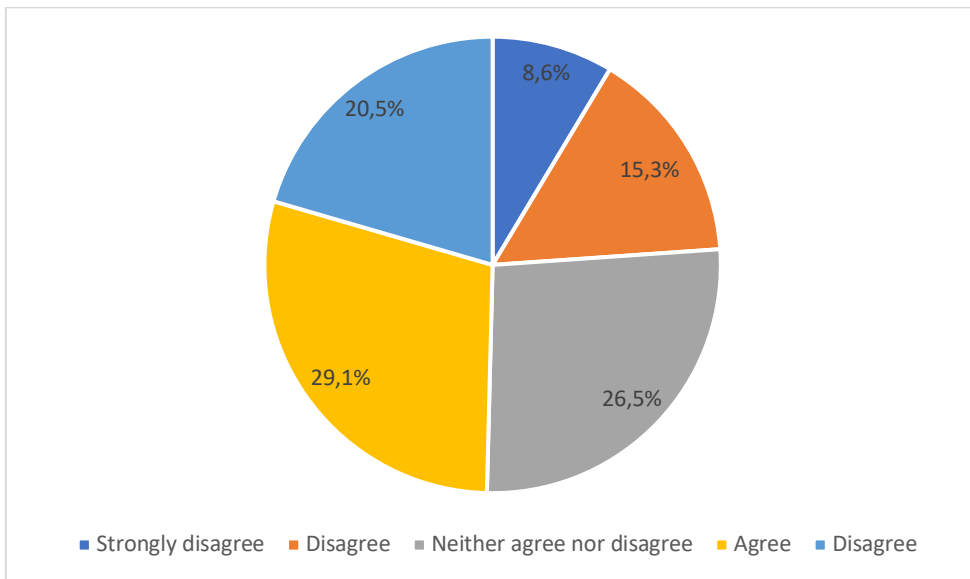


Figure 13. Participants' responses to the statement of "There is a strong correlation between healthy food and low carbon footprint." on the survey
Source: Composed by the author

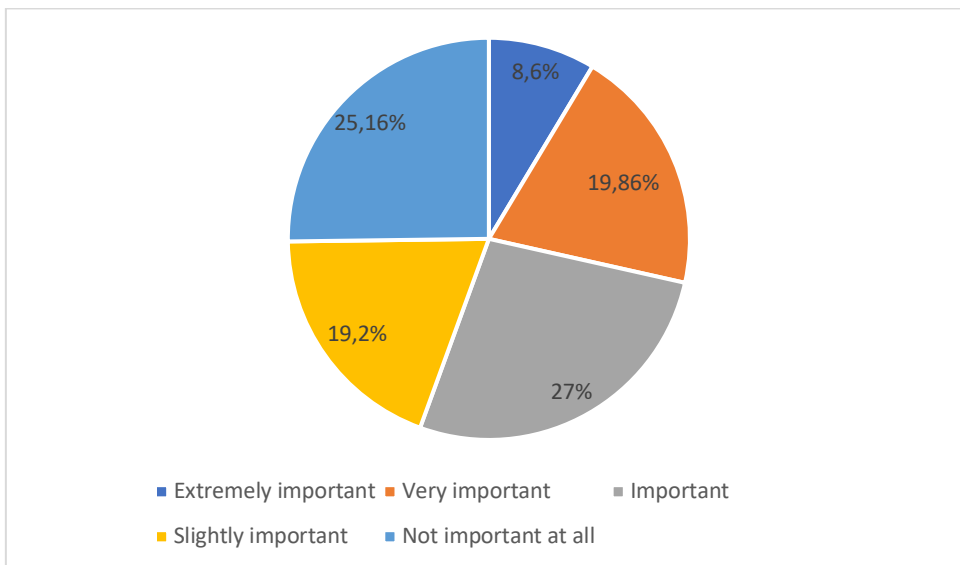


Figure 14. Participants' responses to the question of "To what extent your decision was affected by additional information at the top of every second section's questions?" on the survey
Source: Composed by the author

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