

**Die Moral endet am Regal?**  
**Intra-sustainability Trade-offs Between Food Labels: The Role of Values  
and Product Type**

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### **Abstract**

A variety of food labels has been introduced to simplify sustainable food choices. Still, their sheer amount can cause confusion, trust issues and information overload for consumers. Those might focus consequently only on some labels, that are in line with their values and trust, while ignoring others. Thus, the question arises whether customer choices for food products are impacted by intra-sustainable trade-offs between food labels and what role values and product type play. A study was conducted with 353 German participants and measured the interaction between the German organic label, Fairtrade and Nutri-Score. The results of the choice experiment and the qualitative analysis show that most consumers are aware of possible trade-offs and not consciously influenced by them. In fact, most consumers focused on one sustainability dimension per product which was also their primary decision-making factor when choosing a label combination. The participants had specific associations per label and product and tried to match those in order to make coherent decisions. Findings suggest the presence of cognitive biases in this categorization process which lead consumers to over evaluate certain label attributes. Still, the combination of the German organic label and Fairtrade reduced possible intra-sustainability trade-offs for the majority of participants and was for all product types a preferred choice. Overall, the role of product type has to be considered better in current research as label choices are significantly dependent on those. Implications for the development of holistic and multi-level labels were found since value-congruent appeals might be more effective allowing a higher transparency.

*Keywords:* Food label, trade-off, values, product-type, choice experiment, high school students

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## **Intra-sustainability Trade-offs Between Food Labels: The Role of Values and Product type**

Our current food system is not only a major driver for climate change and biodiversity loss but is also linked to a variety of chronic diseases (Clark et al., 2022; De Bauw et al., 2022). It should be realized that food consumption is highly connected to unsustainable behavior. Food production, especially agriculture, makes up 26% of all global greenhouse gas emissions, 50% of habitable land-use and up to 70% of freshwater use in the world (Ritchie & Roser, 2022). Obesity is the main nutritional issue on a global scale with an increase of 200% between 1975 and 2016 (Stiletto & Trestini, 2022). Especially childhood obesity is associated with a higher risk for diseases such as diabetes, cancer and premature mortality (Ducrot et al., 2022).

International institutions are increasingly becoming aware of these issues and trying to combat the problem on an international level. Examples in the EU are the Green Deal with the ‘Farm-To-Fork strategy’ (De Bauw et al., 2021). There are also initiatives at the state-level such as the “IN FORM - Deutschlands Initiative für gesunde Ernährung und mehr Bewegung” launched by the Federal Ministry of Food and Agriculture in Germany (Bundesministerium für Ernährung und Landwirtschaft, 2020). Still, these environmental and health challenges are often addressed separately, even though they are deeply intertwined (De Bauw et al., 2021). The UN definition of a sustainable diet highlights this point by saying that these are “diets with low environmental impacts which contribute to food and nutrition security, and to healthy life for present and future generations.” (Food and Agricultural Organization of the United Nations, 2010). Thus, there is a need for an integrated dietary approach that aligns health and the different dimensions of sustainability (Van Loo et al. 2021).

To change nutritional habits and facilitate healthy food choices, a variety of food labels, Front-of-pack package labels (FOPLs), have been introduced (Sonntag et al., 2023; Egnell et al., 2019; De Bauw et al., 2022). These are ranging from social labels (Fairtrade label), ethical labels (animal welfare), health labels (Nutri-Score) and environmental friendliness labels such

as the organic label. Some food labels are simpler such as Fairtrade unlike multi-level labels such as Nutri-Score (Sonntag et al., 2023). In addition, labels like Nutri-Score are introduced on an international scale in opposition to local labels such as “Haltungsform” in Germany. Most of them are voluntary while some, such as the EU organic label, are mandatory (Van Loo et al., 2021; Sonntag et al., 2023).

Even though they refer to separate aspects of sustainability, they first do not take all aspects of the concept into account. Up to date, no label covers carbon emissions based on the life-cycle-assessment (Sonntag et al., 2023). Secondly, with an increasing number of food labels, consumers are faced with too much information at once, which can result in confusion, trust issues and information overload (Lemken et al., 2021). In their decision-making as well as for pro-environmental behavior in general, values play an important role (Gifford & Nilsson, 2014; Steg et al., 2014). With the exposure of different food labels to the consumers, as cues, a conflict between several values may arise (van den Broek et al., 2017). Consumers, in the end, might focus on some labels that are in line with their values and trust while ignoring others thus making intra-sustainable trade-offs. Still, some values can be overlapping and halo effects, meaning the over-evaluation of positive attributes, are possible (De Bauw et al., 2022; Steg et al., 2014). Therefore, the question arises: Are customer choices for food products impacted by intra-sustainable trade-offs between food labels?

Up to date, the combination of several sustainability labels is rarely the focus of research (Sonntag et al., 2023). This study, by Sonntag et al. (2023), was one of the first ones to explore the complex interaction effects of different scores on a product in Germany. Still, there is a need for more investigation on the interaction effects of specific labels such as the German organic label, Fairtrade label and Nutri-Score and holistic research focusing on qualitative and quantitative responses of participants. This might be especially interesting since the Nutri-score was recently introduced in Germany in 2020 and has to establish itself besides a variety of labels. With the rise of veganism in Germany, the focus should also be on food labels on vegan

products (USDA, 2020). Additionally, all age groups were surveyed in this study including high school students who are an important target consumer group for the future. Therefore, this research aims to detect whether there are sustainable trade-offs by taking the latter mentioned aspects into account.

To do so, this paper offers background information on the general decision-making process of food choices and pro-environmental behavior regarding food consumption. In that context, the conceptual approach of values is applied. Secondly, the role of food labels is introduced as well as intra-sustainability trade-offs between FOPLs. The presentation of the mixed-methods approach follows with an explanation of the quantitative and qualitative approach. The results of the questionnaire are analyzed in the results section. Findings might justify an integrated label such as the Mediterranean Index by Clodoveo et al. (2022) to simplify customers' decision-making. Suggestions for possible design changes, marketing and policymakers are made in the discussion section, followed lastly by a conclusion. On a broad scale, this research advocates for a holistic approach of sustainability when it comes to food labels and consumption to highlight that consumers should not have to choose between health, social aspects and the environment.

## **Conceptual Approach**

### **General Decision-making Process of Food Choices**

The decision-making process of consumers buying food is influenced by a variety of factors (Gerini et al., 2016; Hallez et al., 2021). There are individual factors, demographic factors and situational factors at play. Among the individual factors, price and taste are the most influential ones. Especially when there is an information overload, those factors become the primary purchase attribute (Sonntag et al., 2023; De Bauw et al., 2022). This is connected to egoistic motives which have a high impact on purchase intention. While healthy food choices are also driven by egoistic motives, environmentally friendly food choices are rather influenced

by altruistic motives being another important driver in food purchase decisions (De Bauw et al., 2022; Sonntag et al., 2023). Those motivations often arise from a general interest in a specific lifestyle which is connected to certain values. Values such as egoism, hedonism, altruism and biospherism, are guiding principles in life and influence pro-environmental behavior (Steg et al., 2014). In general, attitudes and normative beliefs impact consumers' decision-making behaviors (Hallez et al., 2021).

In that context, the influence of past consumption behaviors and habits should not be underestimated (Sirieix et al., 2013). Under time pressure, people rather choose food impulsively. This is also very much related to one's ability to process information for instance by FOPLs, which is linked to knowledge and skills (De Bauw et al., 2022). A theory that explains the complex nature of decision-making is the dual system of reasoning by Kahneman (2003). There are two ways in which information is processed and consumers are persuaded: One is the peripheral route which operates automatically and influences consumers unconsciously. The central route involves reflective information processing which is longer lasting but also involves more effort and leads to more predictable changes in dietary patterns (Sonntag et al., 2023). Still, it can be said that buying behavior overall is an informed choice process rather than a subconscious, habitual one (De Bauw et al., 2022). In this choice process, the role of emotions also has to be taken into account. For instance, antecedent emotions such as confidence and guilt impact sustainable choices (Luchs & Kumar, 2017).

Apart from those individual factors, demographic factors such as age and gender also play a significant role (Hallez et al., 2021). For instance, studies have shown that women are more likely to look at food labels than men (Hallez et al., 2021). Lastly, situational factors such as hunger or an enabling environment should not be underestimated. They decide if and which values are activated (Steg et al., 2014). They can also explain why people do not act on their intentions and motives. Overall, it can be said that there are many factors influencing decision-

making. Sustainability information and altruistic motives remain less important for consumers' decisions while price and taste are the most important drivers (De Bauw et al., 2022).

### **Pro-environmental Behavior, Values and Food Consumption**

This changes when it comes to pro-environmental behavior and food consumption where altruistic and biospheric motives dominate (Steg et al., 2014; Faletar et al., 2021). The role of altruistic, biospheric, egoistic and hedonic values is mostly studied in the general field of pro-environmental behavior and will be aligned in this section with research on the role of values in sustainable food consumption. The most important theories in relation to the topic are the theory of planned behaviour (Ajzen, 1991), the norm activation theory (Schwartz, 1977) and the value-belief-norm model (Stern, 2000; Gifford & Nilsson, 2014). The norm activation theory shows that the activation of personal norms leads to a significant and positive influence on pro-environmental intention and behavior (Faletar et al., 2021). The activation process is impacted by awareness of consequences, perceived behavior control and social norms, relating to the theory of planned behaviour. When activated, a personal norm is a feeling of moral obligation to act in accordance with one's value system (Klößner & Ohms, 2009). Values influence personal norms through one's beliefs, which is highlighted by the value-belief-norm theory (van den Broek et al., 2017). In the process of norm activation, values also affect the problem awareness of individuals and how they evaluate the consequences of pro-environmental behavior.

Values are guiding principles in life and can be described as trans-situational objectives (Steg et al., 2014). Every individual has a set of values that can consist of self-enhancement values, such as egoistic and hedonic ones, and self-transcendence values including altruistic and biospheric values (Steg et al., 2014; van den Broek et al., 2017). While hedonic values reflect pleasure and effort reduction, egoistic values make a person protect one's resources and focus on the self. Altruistic values reflect the importance of the welfare of others and biospheric



values portray a concern for the environment. The extent to which individuals endorse specific values differs per person.

Research by Faletar et al. (2021) and Klöckner and Ohms (2009) show that biospheric as well as altruistic values play a significant role in organic food purchasing behavior. On the other hand, people who endorse strong egoistic and/or hedonic values are less likely to behave pro-environmentally (Steg et al., 2014). This highlights a very important point, namely the fact that values can conflict when it comes to pro-environmental behavior and sustainable food consumption (Gifford & Nilsson, 2014). Concerning the latter, additional factors such as knowledge, problem awareness and biases are at play (Hallez et al., 2021). Biases include for instance the halo effect which describes the over-evaluation of positive attributes which can lead to an overall positive image of a certain product (Sonntag et al., 2023; De Bauw et al., 2022). Again, situational factors should not be underestimated which are situational cues that activate or deactivate different types of values (Steg et al., 2014). These cues are especially influential in the context in which decisions are being made. In conclusion, especially altruistic and biospheric values can affect sustainable food decision-making through the process of norm activation.

### **The Role of Food Labels in the Decision-making Process**

FOPLs can serve as cues at the point of purchase. Their purpose is to simplify complex product information and illustrate intangible characteristics (Van Loo et al. 2021; Sonntag et al., 2023; De Bauw et al., 2022). In doing so, they can empower consumers to act according to their values and attitudes (Sonntag et al., 2023). Thus, they assist consumers in making healthy and sustainable food choices (Van Loo et al., 2021; Hallez et al., 2021). Results show that this is the case with an overall increase in the buying trend for sustainable labels, increasing their importance for marketing strategies (BMEL, 2022a). Firstly, the choice of consumers to focus on certain food labels depends on the goals that consumers want to satisfy or are willing to

sacrifice (Luchs & Kumar, 2017). Personal goals such as social welfare can to a certain extent be embodied in food labels relating to consumers' values. The use of the information provided by FOPLs in consumers' decision-making process also depends majorly on their motivation (De Bauw et al., 2021). FOPLs influence product-related information processing via the central route as they involve cognitive effort. In contrast, when product information is processed peripherally, cognitive biases are more likely to occur (Sonntag et al., 2023).

The halo effect is especially present for the organic label. It is often associated with many additional positive attributes other than the organic production process. Attributes include healthiness, taste and climate friendliness and can lead to a product being bought for the wrong motive (De Bauw et al., 2022; Sonntag et al., 2023). For instance, consumers assume that a product with an organic label is healthier which is not necessarily true.

Other important factors determining the influence of FOPLs on decisions are brand association and familiarity (Sirieix et al., 2013). New labels that are mostly unfamiliar to consumers are often trusted less and will not increase the purchase of a certain product (Sirieix et al., 2013; Van Loo et al., 2014). Oversimplified messages provided by food labels result in a lack of trust and are thus ignored by consumers as well (De Bauw et al., 2021). Additionally, consumers' awareness and knowledge can be limited which is becoming problematic since this reduces their cognitive effort to consider FOPLs (Sonntag et al., 2023). This can be related to situational factors such as visual distraction which can act as barriers to considering FOPLs (De Bauw et al., 2021). Visual distraction can reduce the effectiveness of labels by limiting the objective understanding as well as the easy interpretability and thus inhibiting positive attitudes. This becomes more prominent in the current consumption environment where a variety of labels are present.

### **Food Labels and Intra-sustainability Trade-offs**

The variety of labels can potentially lead to intra-sustainability trade-offs which is the main research focus of this paper. Firstly, it is important to realize that trade-offs are an essential part of every decision-making process (Sonntag et al., 2023). Consumers always have to decide between different product attribute levels which include price, taste, quality claims and labels. However, with an increasing number of food labels, consumers are flooded with information about one product which can result in a variety of consequences. Next to information overload, there is confusion, a lack of trust and market failure (Sonntag et al., 2023; De Bauw et al., 2022; Van Loo et al., 2014). In line with this, Gerini et al. (2016) have shown that multiple labels on one product do not lead to an ever-increasing willingness to pay. Therefore, possible trade-offs have to be taken into account. Even though a combination of labels can be positive when they are complementary, this combination can also contribute to increasing competition in the consumer's decision-making process and have negative consequences (Sirieix et al., 2013; Van Loo et al., 2014). Sirieix et al. (2013) found that perceived contradiction between a combination of labels resulted in rejection from the participants' side. Van Loo et al. (2014) suggest for meat-labelling a combination of two labels such as a free-range claim and an organic label while taking into account that a combination of three ethical/environmentally-friendly labels would result in information overload.

There are also trade-offs to be considered between product sustainability and other valued product attributes (Luchs & Kumar, 2017). For instance, people more likely choose a sustainable product when they trade off hedonic value rather than utilitarian value. Those decisions depend majorly on the extent to which consumers value sustainability attributes.

Another type of conflict is intra-sustainability trade-offs between interpretative labels (Sonntag et al., 2023; De Bauw et al., 2022). Products can score high on one sustainability dimension while scoring lower on another one (Sonntag et al., 2023). For instance, healthier diets are not necessarily sustainable (Galazoula et al., 2021). Clark et al. (2022) identify so-

called win-lose aisles in the supermarket with products containing a good nutrition composition but an above-median environmental impact. Those include fish, seafood and nuts. There are also lose-win aisles with products low in nutritional quality but below median environmental impact such as sweet cakes, sugary drinks, frozen desserts and table sauces. This could result in a potential conflict of contradiction and congruence for consumers. While De Bauw et al. (2021) have shown that a combination of Nutri-Score and Eco-Score improves the nutritional values of food choices, this is not the case for the environmental impact of those. They assume that both labels are too complex so that consumers in the end focus on the Nutri-Score which is in line with their health values being more important than altruistic reasons. Another study by Sonntag et al. (2023) showed interestingly that the presence of one sustainable FOPL did not decrease the marginal utility of another one. Still, some interaction effects were found. For instance, when the two labels of Nutri-Score B and the organic label were combined, the latter diminished the marginal utility of the Nutri-Score.

Overall, labels are very selective and show only limited aspects of a variety of product attributes (Hallez et al., 2021; Clark et al., 2022). There is a need for more uniform communication which has been highlighted by consumers, industry and policymakers. Therefore Sirieix et al. (2013) proposed to combine several aspects into one label while Clodoveo et al. (2022) go even a step further and proposed a holistic FOP label taking nutritional, environmental and social sustainability into account.

Van den Broek et al. (2017) investigated the persuasiveness of value-congruent messages, influenced by the extent to which individuals prioritize biospheric and egoistic values. Their results suggest that messages tailored to the recipient's values, either egoistic or biospheric, are more persuasive than combined appeals. Regarding the contradicting results of past studies, the present study aims to take the role of values more into account. Overall, the strength of trade-offs depends on consumers' goals and values, cognitive biases but also habits and situational factors as well as the type of trade-off and specific combination of labels

involved. In the current consumer environment, not all labels/ label combinations are available on the different products within a product category. Thus, consumers are presented with some sustainability information while never receiving a holistic view. Hence, it is important to understand consumers' perceptions and how their choices change from the availability of one label to a combination of two labels.

Thus, the following questions will be answered: (1) Which sustainability label and which label combination do most consumers choose? (2) Are their choices of the first experiment (one label) correlated with the ones of the second experiment (label combinations)? (3) Are consumers aware of possible intra-sustainability trade-offs? (4) What factors impact their choices and do values play a role in their decision-making?

## **Methodology**

### **Label Selection**

For the current study, the following three labels were chosen: Fairtrade label (representing social dimension), Nutri-Score (health dimension) and German organic label (environmental dimension). Before looking at possible trade-offs between the dimensions, it is important to understand the consumers' motivations for buying each of the labels. In general, organic labels indicate that the production of organic food takes place without pesticides and other artificial ingredients (BMEL, 2020). The most important drivers for buying organic food are motives related to the environment and health (Gerini et al., 2016; Van Loo et al., 2014; Faletar et al., 2021). People do not only perceive organic food to be environmentally friendly and healthier but also safer and better in terms of animal welfare (Van Loo et al., 2021). Customers choosing the organic label are the most interested in problems related to the environment and animal welfare (Gerini et al., 2016; Faletar et al., 2021). Thus, they show a higher problem awareness for such topics and a general interest which can be connected to biospheric and altruistic values (Sonntag et al., 2023). Van Loo et al. (2014) identified that the

national organic label was more preferred by participants than the EU organic label. That is why the German organic label, henceforth organic label, was chosen for this study which is the most important sustainability label in the German food market (Jürkenbeck et al., 2023). BMEL (2022b) shows that with roughly 90%, the most important reasons for German consumers buying organic food are animal welfare standards, regional origin, a healthy diet. The demand for organic products in Germany is the highest for eggs as well as fruits and vegetables, followed by potatoes, milk products and meat products. 36% of the respondents indicate that they frequently buy organic products.

Fairtrade is a label employed on an international scale, based on third-party certification and indicates that the products were produced in a socially responsible manner (Berry & Romero, 2021). With increasing globalization, consumers demand higher transparency and become more socially conscious (Meyerding et al., 2019; Berry & Romero, 2021). In addition, consumers feel concerned about working conditions in low-income countries (Brécard et al., 2012). Therefore, altruistic motives drive the purchase of fair trade labels (Brécard et al., 2012; Berry & Romero, 2021). Interestingly, consumers tend to overgeneralize the healthiness of food based on the fair trade claim (Berry & Romero, 2021). The halo effect suggests that also healthy motives might play a role when choosing Fairtrade. Overall, we can see in Germany that social sustainability is becoming a more important purchase criterion (Ahrens, 2022).

Lastly, Nutri-Score is a multi-level nutrition label that transforms numerical information on nutrition into five categories of nutritional quality (Andreeva et al., 2021). Those range from A to E, while A indicates most nutritious and E least nutritious (Clark et al., 2022). The choice for a product with such a label is mostly motivated by egoistic motives relating to health (Sonntag et al., 2023). It has been introduced in the EU in several countries and has proven itself as the most effective nutrition label which is also the case in Germany (Andreeva et al., 2021; Ducrot et al., 2022; Egnell et al., 2020). Pape (2022) investigated a possible halo effect

associated with the Nutri-Score but found no evidence that products with the label had a perceived green value in the participants' eyes.

### **Research design**

This study combines a quantitative and qualitative approach (mixed methods study) to investigate possible intra-sustainability trade-offs. To do so, a questionnaire was set up with the following structure: After a short introduction, socio-economic information such as age, gender, federal state, occupation and diet was collected (see Appendix A). In the first part of the study, participants were asked to evaluate the importance of certain topics related to food (production) (Table 1) on a 5-point Likert scale. Those topics were related to biospheric, altruistic, egoistic and hedonic values and the aim was to measure their strength. All options were randomized. Participants were also asked whether they usually paid attention to sustainable food labels when shopping at the supermarket.

A choice experiment was chosen for this research as it is an established method to evaluate consumers' choices and preferences (Auger et al., 2010; Gerini et al., 2016; Rousseau, 2015; Sonntag et al., 2023; Van Loo et al. 2021). Two experiments were performed. Given a large number of probable combinations of labels, we selected a subset of combinations that ensured including all possible label combinations regardless of their location. The goal was to identify which labels/label combinations people choose in light of possible intra-sustainability trade-offs between labels. First of all, participants were not informed beforehand about the meaning of the three labels (Fairtrade, Nutri-Score B and the organic label) unlike other studies. This is closer to reality where labels are usually not explained either. As mentioned beforehand, the three labels were chosen since they each represent one sustainability dimension. As Nutri-Score, unlike the other labels, is a multi-level label, only Nutri-Score B was used to indicate a positive nutritional value of the product. For both experiments, participants were given pictures of five different products (see Appendix B).

**Table 1**

*Topics Included in the Importance Ratings and Their Connection to Values and Label-type.*

| Topic  | Value      | Label                |
|--|------------|----------------------|
| Reduced CO2 emissions in product manufacturing                     | Biospheric | German organic label |
| Organic agriculture (e.g. no use of chemical-synthetic pesticides) | Biospheric | German organic label |
| Balanced diet  | Egoistic   | Nutri-Score          |
| Healthy diet for the prevention of diet-related diseases           | Egoistic   | Nutri-Score          |
| Ban on child labor in product manufacturing                        | Altruistic | Fairtrade            |
| Fair wages for workers in product manufacturing                    | Altruistic | Fairtrade            |
| Price  | Egoistic   | -                    |
| Taste  | Hedonic    | -                    |

*Notes.* The question given to the participants was “how important are these topics to you with regards to food (production)?”. It should be noted that this table is a simplification of values and for the purpose of analysis only the most important value category per label is shown. The connection between values and the specific topics were made by the author based on available literature (Steg et al., 2014; van den Broek et al., 2017). The connection between values and the specific labels are based on available research as well (Brécard et al., 2012; Van Loo et al., 2014; Sonntag et al., 2023).



The products were displayed without packaging to avoid any influence on product choice other than the presence or absence of labels. The five chosen products were potatoes, milk, chocolate, nuts and bananas. Less processed food was chosen since people tend to care more about the sustainability of those (Sonntag et al., 2023) and the products are in line with most dietary patterns. At the same time, it was important to have some kind of variety of fruits, vegetables, dairy products, treats and nuts to detect possible differences. For the first experiment, the participants were given the following instruction:

*“Imagine you are shopping in the supermarket. You want to buy potatoes, milk, chocolate, nuts and bananas. For each of the five products you have different sustainability labels. Please choose one of the four options for each product, as you would do in the supermarket. The price doesn't matter and if you are not familiar with a label, choose the option you would most likely take.”*

It should be noted that for the five products, three options included one of the three labels while the fourth option was a non-labeled product as a reference category. All options displayed were randomized. For the second choice experiment, participants were given four options per five products again. This time, three options were label combinations, namely Fairtrade and Nutri-Score, Nutri-Score and the organic label and lastly the organic label and Fairtrade (see Appendix C). The way the labels were structured next to each other was not of importance and indicated to the participants. Again, a fourth option, a product without label, was offered and all options were randomized. After both rounds, participants were asked to justify their choices and to explain which factors influenced them. This type of self-reported answer is intended to help with the analysis and contextualization of the quantitative data.

In the last part of the questionnaire, participants had to fill out a 5-point Likert scale rating their familiarity with each of the labels, similar to Sonntag et al. (2023). Afterwards, another 5-point Likert scale was portrayed where participants had to indicate the sustainability of each label and a product without a FOPL. Again, for the two scales, the four options were

randomized. This was followed by the two following questions which could be answered with yes/no and additional comments: (1) “I am aware that I have to choose between sustainability seals on products when I shop every day, as not all sustainability seals are always present on a product.” (2) “Would you say that a food label that combines several sustainability aspects would help you to make a sustainable food choice?”. The questionnaire was rounded off with a section for any final remarks.

### **Data Collection and Participant Recruitment**

The questionnaire was set up in Qualtrics and distributed in Germany. This country was chosen as a study site since the national context matters very much and some labels are country-specific such as the organic label (Egnell et al., 2020; Auger et al. 2010). The German consumer market is dominated by high-consumption patterns (Zander, 2020) with a high demand for frozen food, meat, dairy products and baked goods. The awareness for sustainable products is increasing steadily while 60% of the participants in BMEL (2022a) indicate that they always/usually pay attention to the organic label. 55% look at labels for sustainable fishing and 53% look at fair trade labels. Being a German researcher will help to interpret the results in the national context while still receiving insights from my Colombian supervisor.

After a trial period, the adjusted questionnaire was active between April, 13th and May, 10th 2023. For the data collection, the snowball sampling method was applied. An anonymous link with the same questionnaire for everyone was distributed to approximately 100 friends and relatives via social media platforms. In addition, the link was sent to a local Facebook group and also via mail to a list of researchers and students of one high school from the 9-12<sup>th</sup> grade. The link was distributed further by the participants which explains the final number of 353 participants and allows for a better representation of society. The decision to include under-18-year-olds has been made to involve the younger generation more as policies made in the present will affect their lives most and they are an important consumer group (Ducrot et al., 2022).

The inclusion of participants from the age of 15 onwards brings about ethical implications as children are a vulnerable participant group. Therefore, a research application was approved by the Ethics Committee of Campus Fryslân permitting to conduct and publish the research. In addition, there was close communication to the teacher in charge and the high school. Since the questionnaire set-up was easily understandable, the topic non-sensitive, the fill-out process not more than 10 minutes and participation completely voluntary and anonymous, ethical risks are low and the involvement of young adolescence justified. In general, all ethical guidelines were followed and data was safely stored.

Even though the sample size of choice experiments depends very much on their complexity, Yang et al. (2015) suggest a minimum of 200 to 300 respondents for robust quantitative research, which was achieved in this study. Due to the snowball sampling method, the majority of participants are higher-educated, come from higher-income families and generally care about sustainability which has to be taken into account when analyzing the data.

### **Data Analysis**

Due to the mixed methods approach the data analysis consists of two parts, one being the quantitative analysis followed by a qualitative analysis. To analyze the choice experiments, the software R was used and several packages applied (Appendix D). Next to descriptive statistics, several multinomial logistic regression models were applied. The outcome variable for that part was, depending on the analysis, either the choice of label or label combinations. Independent variables included values, product type and label type. All variables were categorical. With the regressions, the probability of choosing a certain label (combination) were calculated. Next, the same regressions were run again while accounting for the product type. Afterwards, the effect of the choice in the first experiment on the second one with combined label choices was investigated. Lastly, the results of the regressions were transformed into plots

depicting the effect-sizes. Thus, the effect-sizes reflect the standardized regression coefficients.

To measure the correlation between values and label choices, a principal component analysis (PCA) was applied as multicollinearity is expected among the values. This method is successful in reducing complex relationships in the area of food labelling (Moreira et al., 2019). Lastly, the influence of familiarity and sustainability of the labels on the first product choice was analyzed with descriptive statistics.

In the second part of the data analysis, the qualitative one, participants' comments after each choice experiment were analyzed. A consumer segmentation according to age group, due to the special composition of the sample, helped to group the results. The aim is to find common themes which were mentioned by many participants. This information not only gives valuable insights into the participants' overall perception of the experiment but also reveals options the researcher did not anticipate and contextualizes the quantitative data.

## **Results**

### **Descriptive Statistics**

The sample for this research contains 353 German participants of which 28.6% identify as male, 69.4% as female and 2.0% as diverse (Table 2). Thus, the sample does not only overrepresent women but it also contains more young than older participants. A reason for this is the online distribution of the questionnaire via the snowball sampling method. There is variation in terms of occupation as well as diet. Still, high school and university students make up half of the sample population. With regards to diet, the largest diet groups are omnivore (39.2%), flexitarian (17.6%) and ovo-lacto-vegetarian (14%) (see Appendix E). The majority of 64.3% usually take sustainable food labels in the supermarket into account which shows that the sampling population already cares about sustainability (see Appendix F).

The importance of values differed very much per topic (Appendix G). For the topics CO<sub>2</sub> reduction, organic agriculture, fair wage and price the highest frequency of choice

occurred with the rating 'important'. Taste, balanced diet, healthy diet to avoid diseases had the highest frequency at the rating 'very important'. The ban on child work was rated by 46% as 'extremely important'.

Regarding the familiarity of the three labels, all seemed familiar to the sample population (see Appendix H). Still, the organic label was more familiar than Fairtrade, lastly followed by the Nutri-Score. While the organic label and Fairtrade were mostly rated very sustainable and sustainable, the Nutri-Score and a product without label were rated rather unsustainable, 47% and 71% respectively (see Appendix H).

**Table 1***Sample description.*

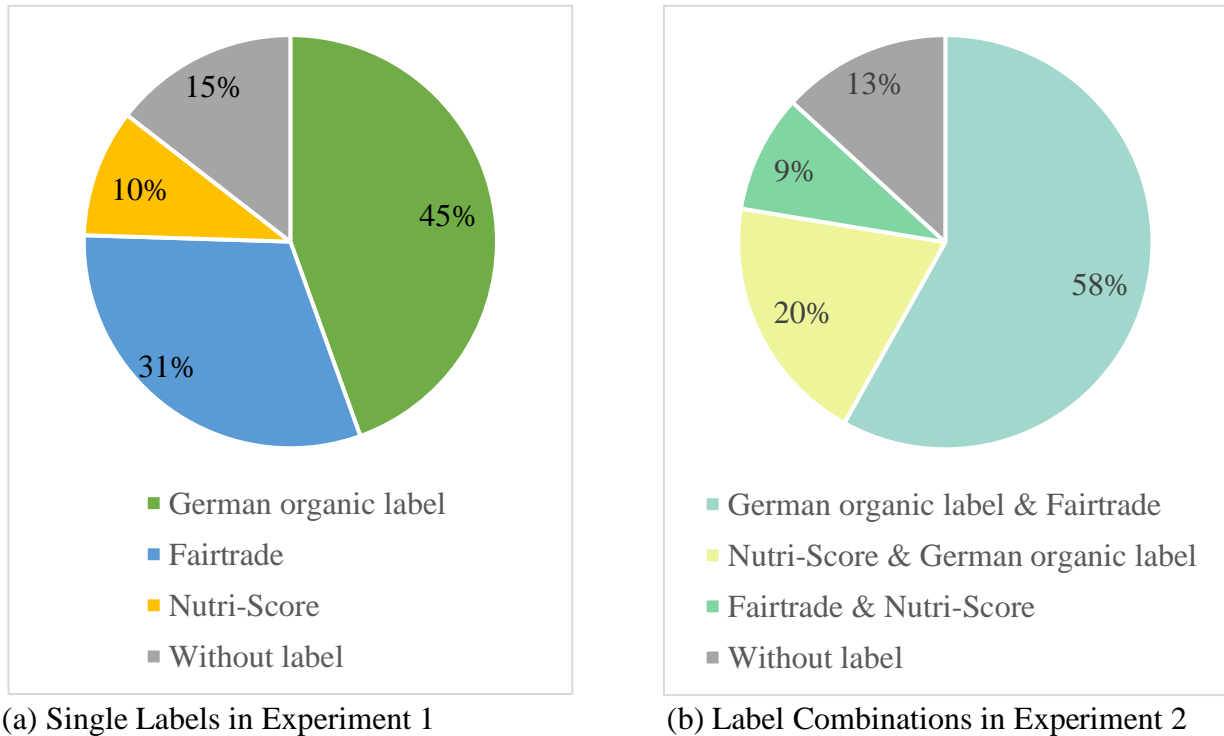
|                        | Total sample<br>n = 353 (%) |
|------------------------|-----------------------------|
| Gender                 |                             |
| Male                   | 28.6                        |
| Female                 | 69.4                        |
| Diverse                | 2.0                         |
| Age                    |                             |
| Under 18               | 19.8                        |
| 18-25                  | 40.5                        |
| 26-30                  | 4.5                         |
| 31-50                  | 7.1                         |
| 51-70                  | 24.4                        |
| 70 and older           | 3.7                         |
| Occupation             |                             |
| High school student    | 24.6                        |
| University student     | 34.0                        |
| Apprenticeship         | 2.3                         |
| Employee               | 18.6                        |
| Self-employed          | 7.4                         |
| Official               | 3.1                         |
| Housewife/Househusband | 1.1                         |
| Retired                | 6.8                         |
| Job seeker             | 0.9                         |
| Voluntary work         | 0.3                         |
| Other                  | 0.9                         |

For the first choice experiment, the organic label was chosen with 45% the most often, followed by the Fairtrade label (31%) (Figure 1). Interestingly, people rather chose the option ‘without label’ than the Nutri-Score label. Proportions changed for the second experiment where participants were given a combination of two labels. Here, the majority of participants, 58%, chose the combination of the organic label and Fairtrade. A much smaller proportion 20% opted for the combination Nutri-Score and the organic label. 13% of the sample population rather chose a non-labelled product over the combination of Fairtrade and Nutri-Score (9%).

**Figure 1**

*Frequency of Chosen Labels and Label combinations in Percentages for all Products*

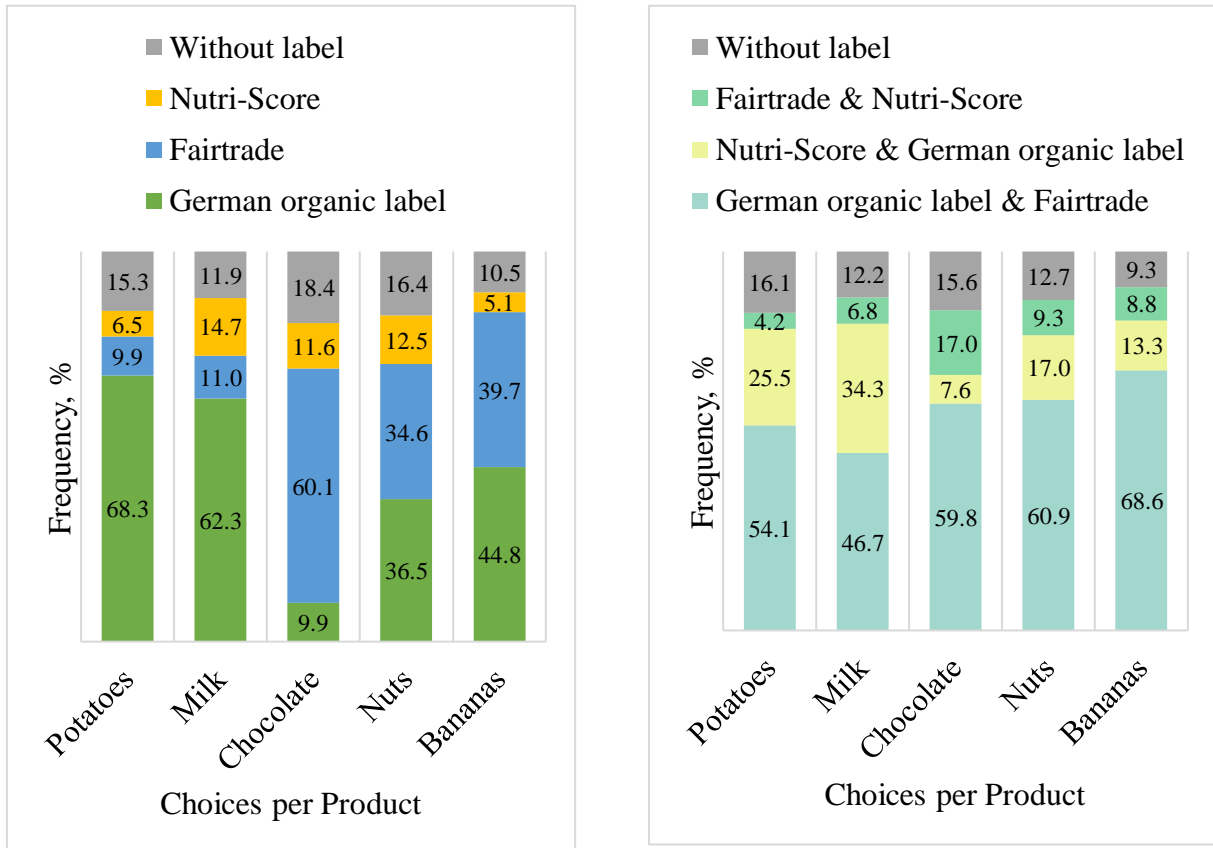
*Combined. (a) Single Labels (b) Label combinations*



When the product type is taken into account, the choice of one label per product varies a lot (Figure 2). For potatoes and milk, the majority, 68% and 62% respectively, choose the organic label. This changes when it comes to chocolate where Fairtrade dominates the choices with 60%. For nuts and bananas, the organic label and Fairtrade almost have an equal amount of share. However, there is less variability in the choices participants made in the second experiment where the majority consistently chose the combination of the organic label and Fairtrade.

**Figure 2**

*Frequency of Chosen Labels and Label combinations per Product in Percentages. (a) Single Labels (b) Label combinations*



(a) Single Labels in Experiment 1

(b) Label combinations in Experiment 2

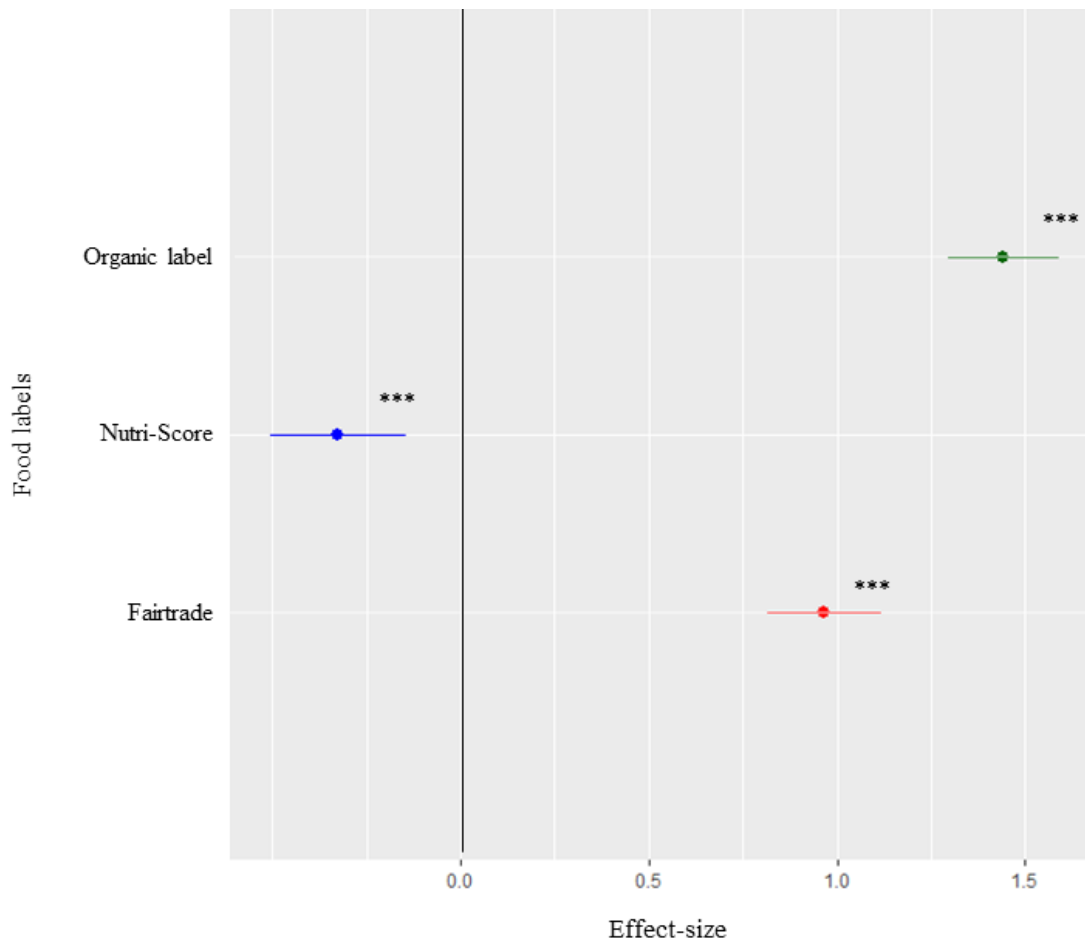
**Analysis of regression**

Several multinomial logistic regression analyses were conducted to measure the standardized effect-size of the independent variables on the product choices in experiments 1 and 2 (dependent variables). For those regressions, the 95% confidence intervals (CIs) were calculated. The first graph depicts the effect-size of each label in the presence of all labels without accounting for product type (Figure 3). All results were of statistical significance ( $p < 0.05$ , Appendix I). The organic label scores the highest in effect-size ( $p < 0.0001$ ), followed by the Fairtrade label with a slightly smaller but still positive effect. However, Nutri-Score showed a negative effect, meaning it is less likely that people will choose this label in comparison to a non-label option.



**Figure 3**

*Effect-size of Each Label in the Presence of all Labels Without Accounting for Product Type.*



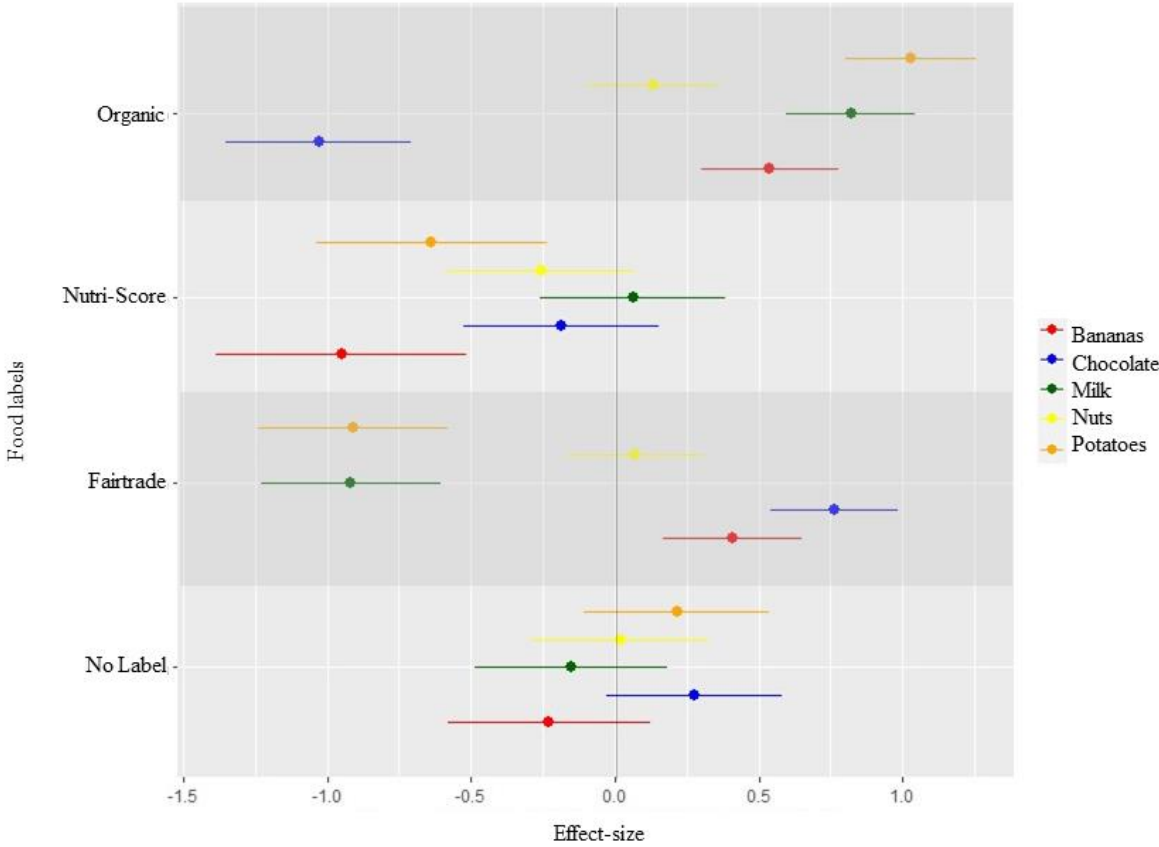
*Notes.* Effect-sizes are standardized regression coefficients of the first choice experiment.

\*\*\*  $p < .001$

When the product types are taken into account, the effect-size of label type on product choice becomes evident. The 95% CIs for the products vary a lot, depending on the Fairtrade, Nutri-Score and the organic label, while they are very similar for the non-label option (Figure 4). It should be mentioned that not all effect-sizes are statistically significant (Appendix I). The positive effect-size of the organic label on the choice of organic potatoes and organic milk is the strongest ( $p < 0.0001$ ). In addition, the Fairtrade label had a clear positive correlation with the Fairtrade chocolate ( $p < 0.0001$ ), while the organic label had a negative correlation with the organic chocolate ( $p < 0.0001$ ).

**Figure 4**

*Effect-size of Each Label per Product Type in the Presence of all Labels.*



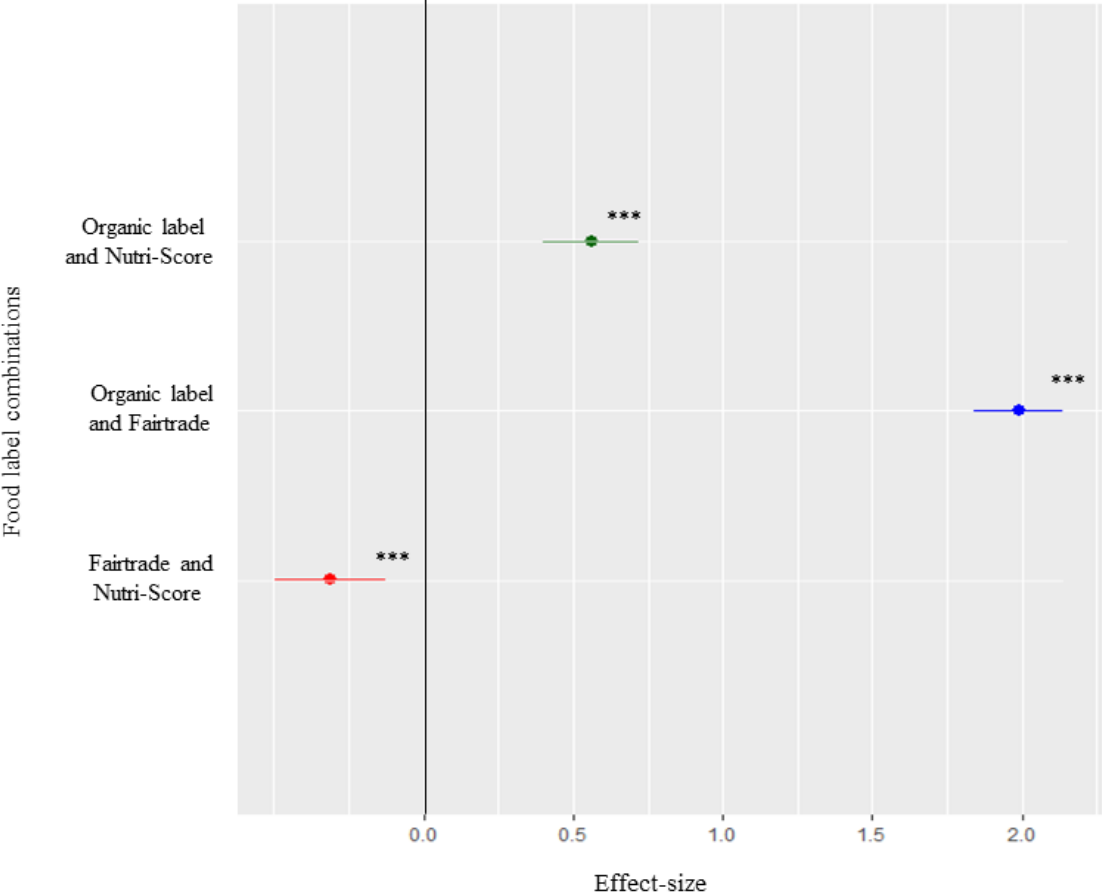
*Note.* Effect-sizes are standardized regression coefficients of the first choice experiment.

Results change when the combination of two labels is included instead of individual labels while not accounting for the product type. All results show significant significance ( $p < 0.05$ , Figure 5, Appendix J). The combination of the organic label and Fairtrade had a higher effect-size than each of the labels individually in Figure 3. In comparison, Nutri-Score and the organic label together showed a smaller but still positive effect. Lastly, a combination of Fairtrade and Nutri-Score showed a negative correlation with the choices. This option is most likely to be less preferred than a non-label option. When the different products are taken into consideration again, the CIs for the different label combinations vary more per product (Figure 6). Again, not all effect-sizes are statistically significant (Appendix J). However, it is striking

that the combination of Fairtrade and the organic label has for all products the highest positive effect-size with all population means lying closely together. Similarly, the CIs vary less for the non-label option but are not statistically significant. In contrast, the combination of the organic label and Nutri-Score as well as Fairtrade and Nutri-Score show more variance of means for the different products. The effect-sizes for both combinations are either negative or statistically insignificant.

**Figure 5**

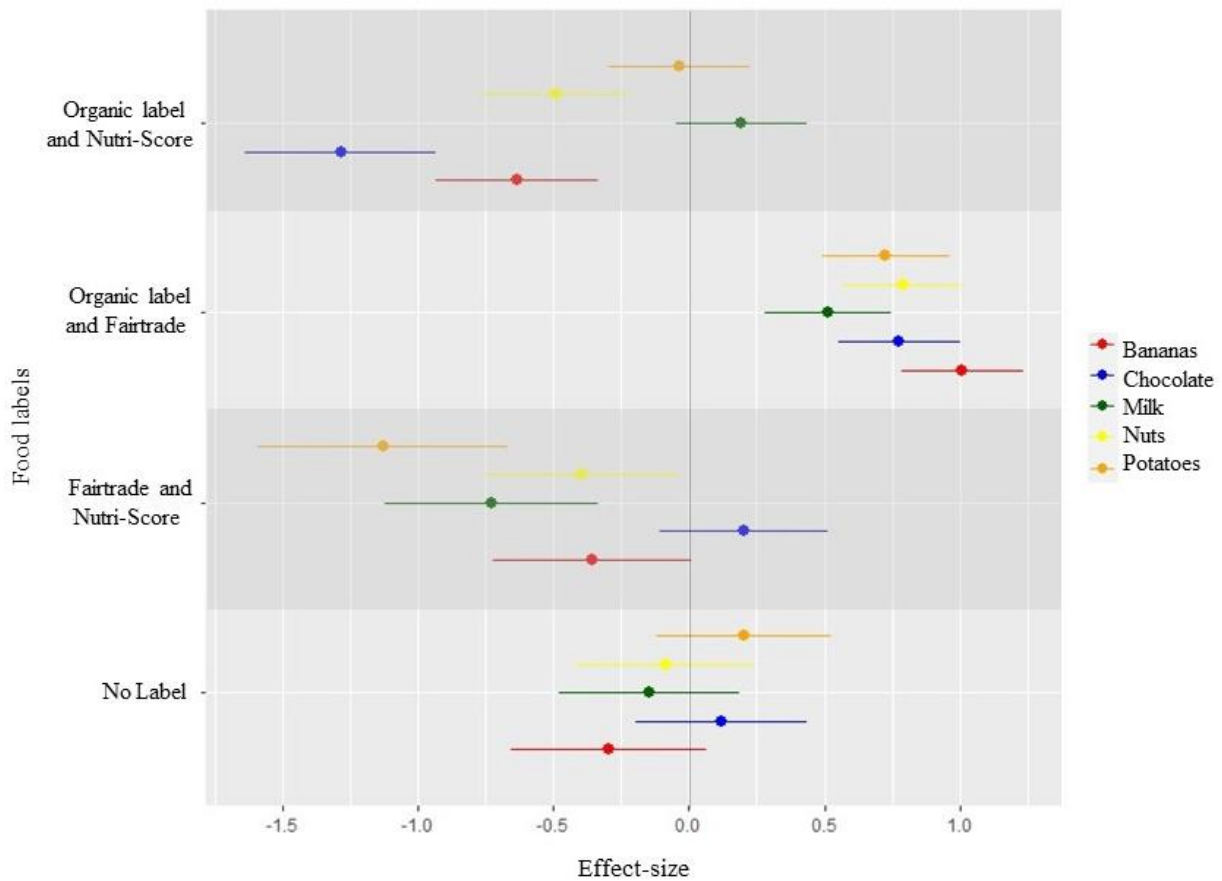
*Effect-size of Each Label Combination in the Presence of all Combinations Without Accounting for Product Type.*



*Notes.* Effect-sizes are standardized regression coefficients of the second choice experiment.  
\*\*\*  $p < .001$

**Figure 6**

*Effect-size of Each Label Combination per Product Type in the Presence of all Label Combinations.*



*Notes.* Effect-sizes are standardized regression coefficients of the second choice experiment.

Moreover, the effect-size of the correlation of the product choice in experiment 1 and the choice in experiment 2 has been examined. The effect-size of the organic label is strongest on the Fairtrade-organic label combination with a positive correlation ( $p < 0.0001$ , Appendix K). This is followed by a slightly less positive effect-size on the combination of organic label and Nutri-Score ( $p < 0.0001$ ). The correlation with Fairtrade and Nutri-Score was insignificant. The effect-size of choosing the Fairtrade label in the first experiment on all label combinations is statistically significant, positive for all results ( $p < 0.0001$ ) and the highest for the organic label and Fairtrade. The relationship between choosing Nutri-Score in the first experiment and the Fairtrade and Nutri-Score combination or organic label and Nutri-score secondly show both a

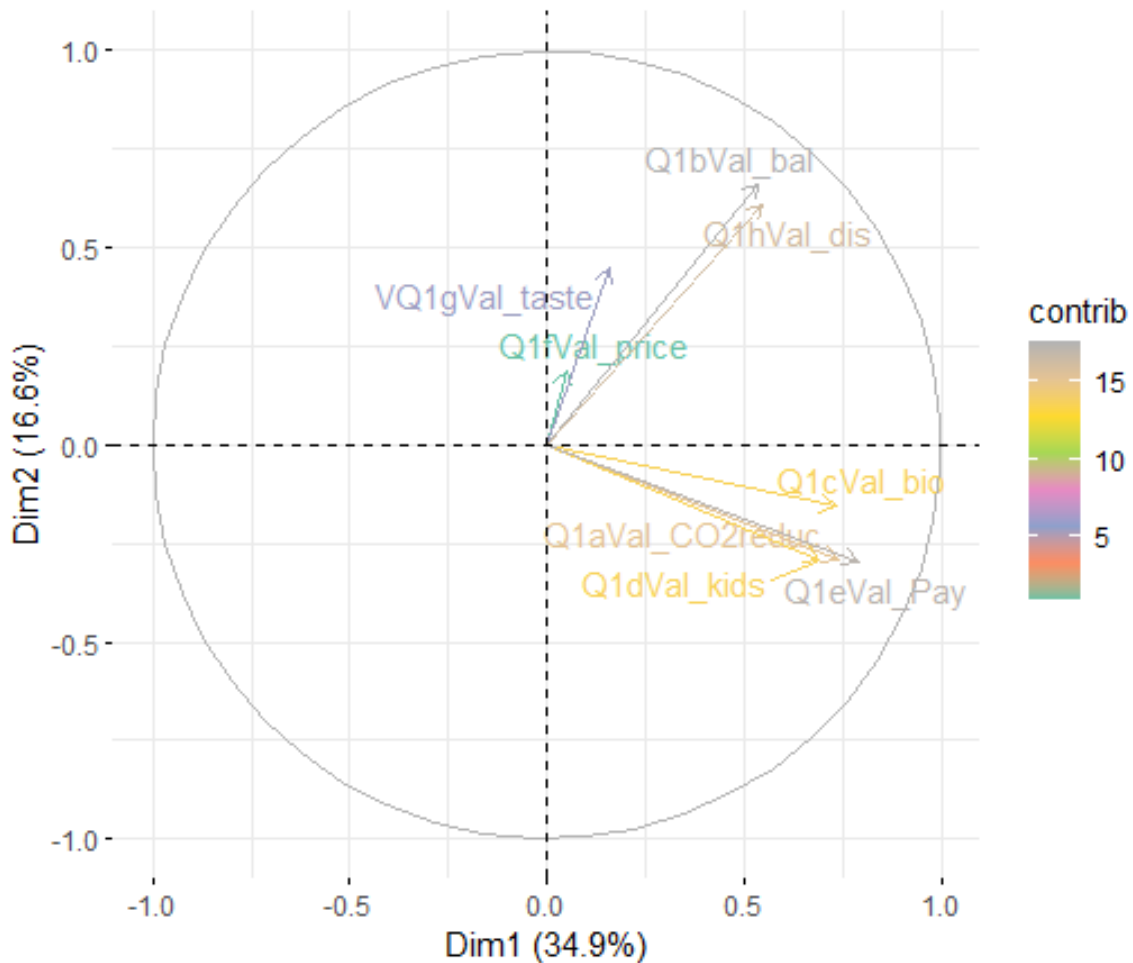
positive correlation ( $p < 0.0001$ ). For the organic label and Fairtrade no significant correlation can be identified. The choice of a non-label option in the first experiment is significantly and negatively correlated to all label combinations with the largest effect-size on Fairtrade and Nutri-Score ( $p < 0.05$ ).

### **PCA Analysis**

To evaluate the effect of values on the label choices in experiments 1 and 2, a PCA was conducted with the following results. In Figure 7, the first and second principal components together (PC1–PC2) accounted for 51.5% of the data variance. PC1 represents the horizontal axis which is related to biospheric and altruistic values (Table 1). The 34% explained data variance is relatively small and is only 16.6% for PC2. PC2 displays the vertical axis which is related to egoistic and hedonic values. While none of the values are negatively correlated to one another, they show multicollinearity to a certain extent. Altruistic and biospheric values are closer correlated to each other than the egoistic and hedonic values. The importance of altruistic, biospheric and egoistic values relating to one's health was rated the highest. The egoistic values relating to price and taste were rated less significant by the participants. Figure 8 presents the effect of each value on label choice. While it is expected to see a grouping of data points around each of the value axes, none of this is visible in the graph. Particular values do not seem to have an important effect on the label choice. This is the same when product types are taken into account. Still, depending on the values, the distributions of data points differ between the products.

**Figure 7**

PCA visualization of the correlation between the principal components of altruistic and biospheric values (PC1) and egoistic and hedonic values (PC2).



*Notes.* Axes show topics that are related to specific values (Table 1).

Egoistic values: Q1bVal\_bal - Balanced diet, Q1hVal\_dis - Healthy diet for the prevention of diet-related diseases, Q1fVal\_price - Price

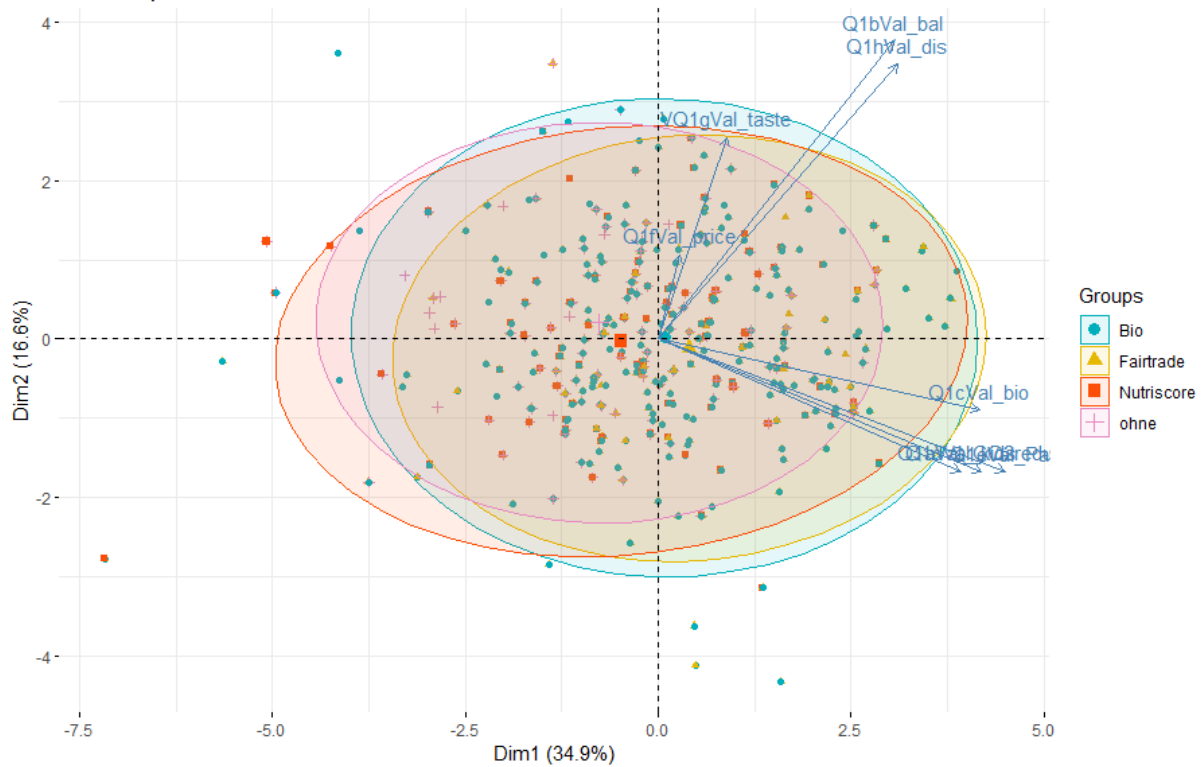
Hedonic values: VQ1gVal\_taste - Taste

Altruistic values: Q1dVal\_kids - Ban on child labor, Q1eVal\_pay - Fair wages for workers

Biospheric values: Q1aVal\_CO2reduc - Reduced CO2 emissions, Q1cVal\_bio - Organic agriculture

**Figure 8**

PCA visualization of the principal components of altruistic and biospheric values (PC1) and egoistic and hedonic values (PC2) in relation to the different labels.



*Notes.* Axes show topics that are related to specific values (Table 1).

Egoistic values: Q1bVal\_bal - Balanced diet, Q1hVal\_dis - Healthy diet for the prevention of diet-related diseases, Q1fVal\_price - Price

Hedonic values: VQ1gVal\_taste - Taste

Altruistic values: Q1dVal\_kids - Ban on child labor, Q1eVal\_pay - Fair wages for workers

Biospheric values: Q1aVal\_CO2reduc - Reduced CO2 emissions, Q1cVal\_bio - Organic agriculture

Groups represent the different labels from experiment 1: Bio – German Organic label, Fairtrade, Nutri-Score and ohne – no label

## Qualitative Analysis

The majority of participants commented on their choices and their answers are in line with the quantitative results but offer important deeper insights. The presence of the labels indeed guided their choices. In the younger age groups, participants often stated that the combination of organic and Fairtrade would be good. This led in their eyes to a reduction of trade-offs when they only could choose one label in the first experiment. Especially participants older than 18 and onwards did not favor the Nutri-Score; there was a high sceptic.

Next to the direct pointing out of specific labels, the label choice was very much related to the associations that people have with the labels and problem awareness. For younger participants the 'origin' of the product was very important and often mentioned: "With products that come from another country or continent I look for Fairtrade, but if they come from Germany, I look for BIO [organic]". Bananas and chocolate but sometimes also nuts were seen as products with crucial working conditions whereas potatoes and milk as regional ones. A differentiation was also made between plant-based and animal-based products:

"In the case of plant products, the 'Fairtrade' label is particularly important to me, since bananas, for example, have a long supply chain behind them, which should be fair for everyone involved. For dairy products, the 'Bio' label is important to me, because it is a question here of the species-appropriate husbandry."

This connects to high awareness and overall demand for animal welfare. The organic label was often chosen also for better animal standards. Next to that, participants also demanded a label indicating CO2 emissions and also indicated the use of other labels in the survey.

Interestingly, there did not seem to be any trade-offs between labels. Participants felt that due to the availability of several labels, they were able to make informed choices. One participant stated that instead of having a holistic label it is better to "target one goal at a time". They made their choices very specific depending on their knowledge of the product and



associated issues. Only twice a participant wished for the presence of all three labels on one product. Still, 81 % of all participants indicated that a label which combines several sustainability aspects would help them make a sustainable food choice (see Appendix F).

In contrast, the largest trade-off was mentioned between price and sustainability attributes. Price is a more important criterium from 18+ onwards. Participants aged 18-25 also perceived Fairtrade and the organic label as expensive. Looking at the price difference between products with and without labels they decide. Only three times trade-offs between taste and Fairtrade and organic label were mentioned.

Younger age groups (under 18 and 18-25) also mentioned several times the influence of (school) education: “We had recently discussed the Fairtrade label in geography class“. They often displayed a high knowledge about all three labels and explained their perceived meaning. In contrast, three participants of the age group 70+ mentioned that they were not familiar with the “colourful” label (Nutri-Score). From 18+ onwards more skepticism is present regarding the labels and lacking trust in their sustainability which is especially high in age groups 26-30, 31-50, 51-70. Some participants also mentioned that media influences their knowledge about food labels and products. There was a general demand for more and better knowledge transfer and transparency. Supermarkets, according to them, should also guarantee certain standards.

Only few people mentioned ‘values’ as crucial decision-making factors. Many also acknowledged subconscious decision-making by stating keywords such as ‘habit’, ‘intuition’ and ‘feeling’. Interestingly, family habits were mentioned as important decision-making factors.

Lastly, one participant raised a very important point: “The sustainability of a product cannot be determined by a single label.” Participants mentioned that labels do not always have to play an important role when bought at the local farmer or local market. Overall, the results highlight the complexity of factors influencing the decision-making process.

## Discussion

### Discussion of Results

With an increasing number of FOPLs on food products, consumers face more complex decision-making processes. Due to time constraints and limited resources, they might not focus on all labels on one product but only those that are in line with their values. Therefore, this research investigated whether customer choices for food products are impacted by intra-sustainable trade-offs between food labels. In light of this, the interaction effects of the organic label, Fairtrade label and Nutri-Score have been investigated and qualitative responses collected to answer the following questions: (1) Which sustainability label and which label combination do most consumers choose? (2) Are their choices of the first experiment (one label) correlated with the ones of the second experiment (label combinations)? (3) Are consumers aware of possible intra-sustainability trade-offs? (4) What factors impact their choices and do values play a role in their decision-making?

The results of the first experiment suggest that the organic label, in the presence of the other three options, is the most popular one. In line with Gerini et al. (2016) and Van Loo et al. (2014), my qualitative results underline that this is related to a high familiarity but also biospheric and altruistic motivations. People perceive organic food as more environmentally friendly and healthier but also better in terms of animal welfare (Van Loo et al., 2021). However, Sonntag et al. (2023) found that in a trade-off situation, the most prominent label was the Nutri-Score B, followed by the climate label and the outdoor access animal welfare label whereas the organic label was less preferred. Consequently, within one sustainability dimension, there can be labels more favored than others, such as the climate label, which were not taken into account in this research. Interestingly the organic label in my study was much more prominent than Nutri-Score B. The latter showed a negative effect in the regression analysis. This might have to do with the fact that Nutri-Score competed with the organic label. Sonntag et al., 2023 showed that when the two labels of Nutri-Score B and the organic label

were combined, the latter diminished the marginal utility of the Nutri-Score. Moreover, for Jürkenbeck et al. (2023) lower income is associated with higher use of Nutri-Score, which is not the case for the majority of this sample. Another reason could be the health halo as some participants mentioned to perceive organic food as healthier also suggested by De Bauw et al. (2022). The label did not seem so familiar either to the oldest age group and was rated by almost half of the participants as unsustainable. Even though, it is true that the label does not give any direct information on social and environmental sustainability but still (planetary) health overall should be part of sustainability.

When the participants had to choose between the combination of two labels, the combination of the organic label and Fairtrade was with 58% most popular. This combination had a higher effect-size than each of the labels individually in Figure 3. In line with the qualitative results, the combination of the two labels resulted in a reduction of intra-sustainable trade-offs. Participants did not have to choose between the social and environmental dimensions.

This is highlighted in the regression analysis when product types were included and the Fairtrade and organic label combination was chosen, with statistical significance, by the majority for all 5 products. The CIs varied much less than for the first regression analysis, where participants could only choose one label. The finding of the importance of product type on label choice is a very prominent one and not that thoroughly researched and acknowledged yet. When consumers are exposed to labels, their associations with the labels but also products drive their decisions. This is very much connected to knowledge and problem awareness as well as the personal goals embodied in the labels (Luchs & Kumar, 2017). Qualitative results show that participants identified chocolate but also bananas and to a certain extent nuts as imported products, with a longer supply chain, often coming from low-income countries with labour issues. Next to that, they associated Fairtrade with better working conditions and the ban of child work. Since these associations matched each other, they decided for choosing Fairtrade

for chocolate (60%) but also for bananas (40%); both statistically significant. The popularity of a fair trade label on chocolate instead of organic claims is also highlighted in a study by Rousseau (2015). The authors assume that chocolate is perceived as a self-indulgent treat making an organic indication unnecessary as organic is usually seen as healthy. My qualitative results have shown that consumers become more socially conscious and feel concerned about working conditions in low-income countries (Brécard et al., 2012; Meyerding et al., 2019; Berry & Romero, 2021).

This is different for potatoes and milk which were identified as regional products and the majority chose the organic label. Especially for milk, the organic label signaled to the consumers improved animal welfare standards. This is in line with BMEL (2022b) emphasizing a high consumer demand for organic potatoes and milk products in Germany. Brécard et al. (2012) is the only study where similar three labels were chosen. Interestingly, for a seafood product, the health label ranked first, followed by the eco-label second and lastly the fair trade label. This is very different to my results, which might have to do with the fact that this study was conducted in France and included different product types than mine.

The regression analysis of the effect of the first choice of one label and the second choice of a label combination showed statistically significant results. Most people chose a combination of labels which included their first label choice or if they chose the no-label option before, stayed with an unlabeled product. This does not only show a degree of consistency but there is also a certain sustainability dimension people focus on per product which remains important when presented with a combination of labels. This is in line with the qualitative results where several participants mentioned that only one label determined their choice of combinations and that the second option was rather a 'nice-to-have' add-on. Some mentioned that they would have preferred only one label in general instead of combinations.

This has implications for the awareness of intra-sustainability trade-offs. First of all, roughly 83% of participants indicated that they are aware of the fact that they have to choose

between sustainability labels on products as not all sustainability labels are always available on one product. It seems as if people were aware of possible intra-sustainable trade-offs in general and, according to the qualitative results, not really negatively impacted by them. Negative consequences such as information overload and confusion, mentioned by De Bauw et al. (2022) and Van Loo et al. (2014), were not very evident. However, a lack of trust in the promises made by label certifications was visible which had very much to do with the fact that the labels were introduced voluntarily.

The perceived absence of intra-sustainable trade-offs might have to do with the specific associations people have per label and product. In the absence of price, they try to match those to make decisions that are in line with both label and product. In this categorization process, cognitive biases play a role, as a reduction process leads consumers to only take those product and label attributes into account that are most easily available in their minds. Thus, at the point of purchase intra-sustainable trade-offs might not be so evident to the consumers, even though they claim the opposite. For instance, people often chose Fairtrade for chocolate and nuts and highlighted their social issues but comments on environmental impacts were rather scarce. That is surprising since chocolate and nuts in general have an above-median environmental impact (Clark et al., 2022). This was not highlighted by the participants.

In line with the absence of strong intra-sustainable trade-offs is the finding of the PCA that the participants' values related to different sustainability dimensions did not compete in this study. This is surprising as one would expect a conflict between egoistic and altruistic values as mentioned by Steg et al. (2014) and Gifford and Nilsson (2014). Moreover, values did not have a significant influence on the label choice in experiment 1. This might have to do with the fact that there was a high variation in the importance ratings of values. Another reason might be the fact that values in the end, in opposition to the initial assumption, only play a minor role as they only take influence on the decision-making process via personal norms and norm-activation. It could be the case that personal norms were not activated enough by the food

labels which diminished the importance of values. This would be surprising as several researchers, Sonntag et al. (2023) and Hallez et al. (2021), have highlighted the influence of motives and values. Thus, the methodological approach of measuring values, that was chosen in this study, plays a role concerning non-findings. Even though, with the exposure of different food labels as cues to the consumers, no conflict between values was measured in the quantitative analysis, this is different for the qualitative one. Here, three participants actually mentioned 'values' as important factors for their decision-making. Also, trade-offs between price and sustainability attributes were often mentioned, which is in line with Luchs and Kumar (2017). This indicates a conflict between egoistic and altruistic and biospheric values. In general, every individual has a set of all values, only the extent to which they are present differs per person. The importance of values thus should not be diminished as they were able to explain 51.5% of the data variance in the PCA. Some participants mentioned that they preferred separate labels rather than a holistic one which is in line with value-congruent messages found by Broek et al. (2017).

Thus, when considering holistic labels such as the Eco-score or even a label combining several sustainability dimensions, not all consumers will prefer such types of labels as they lack transparency and do not show specific aspects anymore, such as animal welfare, which they might care most about. Still, this should not discourage the creation of more combined labels as 81% of the participants agreed that a food label that combines several sustainability aspects would help them to make a sustainable food choice. In the end, FOPLs only indicate sustainable attributes and just because a product does not have specific FOPLs does not necessarily mean it is unsustainable. As some participants rightly mentioned, products from the local farmer or market can be more sustainable than products from the supermarket. Sustainable choices in the end depend a lot on the knowledge people have, their problem awareness and their conception of sustainability.

### **Implications for Policy and Industry**

The results of this research have important implications for a variety of stakeholders regarding FOPLs. Firstly, sustainable FOPLs are successful in increasing the perceived sustainability of a product which helps marketing managers with product placement. However, with the wide introduction of private and voluntary labels, their meaning and transparency have to be highlighted more. Policymakers should take into account that combining certain sustainability dimensions into one label has implications as transparency is reduced and some people prefer value-congruent appeals. Therefore, the implementation of multi-dimensional/holistic labels has to be coupled with enough training and background provision on the label to ensure familiarity and trust.

In general, education should be more the focus of the stakeholders to ensure the appropriate use of food labels. The qualitative analysis has shown that younger generations have more positive attitudes towards labels due to school education. Therefore, older generations should receive age-appropriate education as well. If older generations, such as in the current study, do not use the Nutri-Score or do not understand it, then the goal of the Nutri-Score simplifying healthy food choices is missed by the Ministry. Media channels play a significant role there and have to be used by policymakers to the largest extent possible. Advertisement has to take the interests of the target group but also the practices, that the food choices are embedded in, into account.

Future research should therefore focus more on the influence of education, values as well as family habits on food – and label choices. The probably most important implication for future research is the fact that the product type has a major influence on label choice, which should be taken to a greater extent into account.

**Limitations**

Even though this paper offers valuable results for the understanding of decision-making processes involving food labels, these processes are very complex and only measurable to a simplified extent. Therefore, this research displays several limitations regarding sample choice, label choice and products included. Similar to Hallez et al. (2021), gender bias and self-selection bias are present in the sample population. This has to do with the snowball sampling method and distribution of an anonymous link which will most likely only be opened by people already interested in the topic. Unlike on a national scale, the majority of participants already care about sustainability. Still, the results are interesting, as the participants embraced sustainability dimensions to a different extent. Unfortunately, participants older than 70 were underrepresented due to the online survey format.

Next to that, participants only made simplified and hypothetical choices while taking their past behavior into account. Consequently, their choices will look (partially) differently in the supermarket. This is related to price, being the most important factor for food choices, which was left out in the study (Sonntag et al., 2023). In addition, only three out of a variety of labels were chosen and combinations of only two labels were investigated. The labels were only selectively randomized either. In the supermarket setting, there are many more labels and combinations possible while some of the combinations in the survey might not exist in the same way there. Lastly, the influence of values on label choice was not statistically significant which might have to do with the fact that personal norms were not measured.

Regarding the five products included, four of them were unprocessed ones, which has implications for the effectiveness of the Nutri-Score. Moreover, bananas, potatoes and milk are very popular for being bought with an organic label (BMEL, 2022b) and might create a biased sample of products. Still, the results per product type were significant and all products were applicable for special diets.



### **Conclusion**

Our current food system is not only a major driver for climate change and biodiversity loss but is also linked to a variety of chronic diseases. Even though the introduction of a variety of FOPLs can simplify sustainable food choices, their sheer amount can cause confusion, trust issues and information overload. Consumers, in the end, might focus on some labels that are in line with their values and trust while ignoring others thus making intra-sustainable trade-offs. Thus the question arises, whether customer choices for food products are impacted by intra-sustainable trade-offs between food labels.

The results of the choice experiment and the qualitative analysis show that most consumers are aware of possible trade-offs and not consciously influenced by them. Most consumers focused on one sustainability dimension per product which was also their primary decision-making factor when choosing a label combination. The participants had specific associations per label and product and tried to match those to make coherent decisions. In this categorization process, cognitive biases play a role due to limited cognitive resources, time and other situational factors. They lead consumers to only take those product and label attributes into account that are most accessible in their minds. Consequently, participants over-evaluated the social sustainability dimension for nuts and chocolate while neglecting the environmental implications. Still, the combination of the organic label and Fairtrade reduced possible intra-sustainability trade-offs for the majority of participants and was for all product types a 'sustainable' choice. The findings highlight the importance of taking product type in research into account as label choices are significantly dependent on those.

Following the results, there are implications for the development of holistic or multi-level labels. While 80% claimed that a food label combining several sustainability aspects would help them to make a sustainable food choice, many participants mentioned that they prefer several labels per sustainability dimension to focus on those aspects that matter most to them. Therefore value-congruent appeals might be more effective as they simultaneously allow

higher transparency. Any implementation of a multi-dimensional label has to be coupled with enough training and background provision to ensure familiarity. In general, education should be more in the stakeholders' focus as a tool to ensure the use of food labels. Only if consumers are educated and involved, a sustainable transition of the food system is possible.

### **Acknowledgements**

Complex issues require inter-disciplinary cooperation in the spirit of Campus Fryslân. Therefore, I would like to thank everyone who participated in this research project. Dear Carol, thank you very much for your optimistic and positive spirit throughout the past months. It was a lot of fun to explore the statistics together and connect the dots. Without your help, I would have not dared to lay my hands on R again. Next, big thanks to all my friends and family who supported me with distributing the questionnaire. We made it; 353 participants! Großes Dankeschön an Euch! I am really happy to have received valuable insights from the retail industry, another food label researcher and various psychology professors at our campus. To my former Biology teacher: Your support was very appreciated to make it possible to include high school students in this study as well.

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## Appendix A

### Questionnaire in German version

## Food labels questionnaire

---

Beginn des Blocks: Default Question Block

Q1 Liebe Teilnehmer/innen,

in dieser Umfrage erwartet Euch ein spannendes Choice-Experiment und einige Fragen über die Ihr wahrscheinlich noch nicht so oft nachgedacht habt. Vielen Dank, dass Ihr Euch die Zeit für die Umfrage nehmt. Sie dauert auch nur ca. **10 min**, versprochen!

Die Befragung führe ich im Rahmen meiner Bachelorarbeit an der Fakultät Campus Fryslân der Universität Groningen durch. Gemeinsam mit meiner Supervisorin Dr. Carol Garzon Lopez untersuche ich das **Kaufverhalten in Supermärkten und die Rolle von nachhaltigen Lebensmitteletiketten/ Nachhaltigkeitssiegel**.

Alle Daten werden anonym erhoben, ausgewertet und danach gelöscht. Zudem werden sie nicht an Dritte weitergeleitet. Bei weiteren Fragen zu dem Thema könnt Ihr Euch gerne an mich wenden: [c.hahn.2@student.rug.nl](mailto:c.hahn.2@student.rug.nl)

Ich hoffe, Ihr habt Spaß beim Antworten und seid ehrlich und spontan. Es gibt keine richtigen oder falschen Antworten.

Vielen Dank im Voraus!

Eure Carina

Carina Hahn  
Campus Fryslân, Universität Groningen  
Wirdumerdijk 34  
8911CE Leeuwarden, Niederlande

---

Ende des Blocks: Default Question Block

Beginn des Blocks: Block 1: Soziodemografie

Geschlecht Mit welchem Geschlecht würdest Du dich identifizieren? \*

- männlich (1)
  - weiblich (2)
  - divers (3)
  - andere (4) \_\_\_\_\_
- 

Alter In welcher Alterskategorie befindest Du dich?

- unter 18 (1)
  - 18-25 (2)
  - 26-30 (3)
  - 31-50 (4)
  - 51-70 (5)
  - 70+ (6)
-

Bundesland In welchem Bundesland lebst Du?

- Baden-Württemberg (1)
  - Bayern (2)
  - Berlin (3)
  - Brandenburg (4)
  - Bremen (5)
  - Hamburg (6)
  - Hessen (7)
  - Mecklenburg-Vorpommern (8)
  - Niedersachsen (9)
  - Nordrhein-Westfalen (10)
  - Rheinland-Pfalz (11)
  - Saarland (12)
  - Sachsen (13)
  - Sachsen-Anhalt (14)
  - Schleswig-Holstein (15)
  - Thüringen (16)
-

Beruf Welcher beruflichen Tätigkeit gehst Du im Moment nach?

- Schüler/in (1)
  - Student/in (2)
  - In der Ausbildung/Lehre (3)
  - Angestellte/r (4)
  - Selbstständige/r (5)
  - Beamter/in (6)
  - Hausfrau/Hausmann (7)
  - Renter/in (8)
  - Arbeitssuchende/r (9)
  - Freiwilligenarbeit (10)
  - andere (11) \_\_\_\_\_
-

Ernährung Wie ernährst Du dich?

- Ich bin Omnivore (Ich esse alles, auch Fleisch und Fisch) (1)
- Ich bin Flexitarier (Ich esse nur zeitweise oder ganz selten Fleisch bzw. Fleisch- und Fischprodukte) (2)
- Ich bin Pescetarier (Ich esse kein Fleisch, aber Fisch) (3)
- Ich bin Ovo-Lacto-Vegetarier (Ich esse keinen Fisch und kein Fleisch, aber Milchprodukte und Eier) (4)
- Ich bin Veganer (Ich esse überhaupt keine tierischen Produkte z.B. auch keine Milchprodukte, Eier oder Honig) (5)
- Ich ernähre mich glutenfrei (6)
- Ich ernähre mich laktosefrei (7)
- Ich ernähre mich cholesterinarm (8)
- Ich ernähre mich natriumarm (Ich esse salzreduziert und achte auch bei industriell gefertigten Produkten darauf) (9)
- Ich ernähre mich zuckerreduziert (10)
- Ich habe eine koschere Ernährung (11)
- Ich habe eine muslimische Ernährung ( Ich esse kein Schweinefleisch, kein Wild und verwende keinen Alkohol und ernähre mich von ausschließlich nach halal Richtlinien zertifizierten Fleisch- und Geflügelprodukten) (12)
- Ich folge den Speisevorschriften im Hinduismus (13)
- Sonstiges: (14) \_\_\_\_\_
-

Q7 Der erste Teil ist geschafft, jetzt kann es richtig losgehen!

Ende des Blocks: Block 1: Soziodemografie

---

Beginn des Blocks: Block 2



Werte Wie wichtig sind Dir die folgenden Themen im Bereich Lebensmittel (-herstellung)?

|   | Unwichtig (1)         | Nicht sehr wichtig (2) | Wichtig (3)           | Sehr wichtig (4)      | Äußerst wichtig (5)   |
|---|-----------------------|------------------------|-----------------------|-----------------------|-----------------------|
| Reduzierter CO2 Ausstoß bei Produktherstellung (1)  | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ausgewogene Ernährung (2)   | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ökologische Landwirtschaft (z.B. kein Einsatz von chemisch-synthetischen Pflanzenschutzmitteln) (3) | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Verbot von Kinderarbeit bei der Produktherstellung (4)  | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| fairer Arbeiterlohn bei der Produktherstellung (8)  | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Preis (5)   | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Geschmack (6)   | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| gesunde Ernährung zur Vorbeugung von ernährungsbedingten Krankheiten (7)                            | <input type="radio"/> | <input type="radio"/>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

---

Awareness Achtest Du normalerweise beim Einkaufen im Supermarkt auf nachhaltige Lebensmitteletiketten?

Ja (1)

Nein (2) \_\_\_\_\_

Ende des Blocks: Block 2

---

Beginn des Blocks: Block 3

Q9 Jetzt kommen wir zum Choice Experiment:

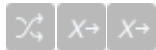
Stell Dir vor, Du bist im Supermarkt einkaufen. Du willst noch Kartoffeln, Milch, Schokolade, Nüsse und Bananen kaufen. Für jedes der fünf Produkte hast Du unterschiedliche Nachhaltigkeitssiegel.

**Bitte wähle pro Produkt eine der vier Varianten aus, so wie Du es im Supermarkt machen würdest.** Der Preis spielt keine Rolle und falls Du welche der Siegel/Zeichen nicht kennst, so wähle das, was Du am ehesten nehmen würdest.

Ende des Blocks: Block 3

---

Beginn des Blocks: Block 4



Kartoffel 1 Kartoffeln

Image:Kartof nutri (1)

Image:Kartof bio (2)

Image:Kartof fairtrade (3)

ohne Siegel (4)



Milch 1 Milch (an spezielle Ernährung angepasst, z. B. vegan, laktosefrei, usw.)

- Image:Milch nutri (1)
  - Image:Milch bio (2)
  - Image:Milch fairtrade (3)
  - ohne Siegel (4)
- 



Schokolade 1 Schokolade (an spezielle Ernährung angepasst, z. B. vegan)

- Image:Schokolade nutri (1)
  - Image:Schokolade bio (2)
  - Image:Schokolade fairtrade (3)
  - ohne Siegel (4)
- 



Nüsse 1 Nüsse

- Image:Nuss nutri (1)
  - Image:Nüsse bio (2)
  - Image:Nüsse fairtrade (3)
  - ohne Siegel (4)
- 





Banane 1 Bananen

- Image:Banane ntri (1)
- Image:Banane bio (2)
- Image:Banane fairtrade (3)
- ohne Siegel (4)

Ende des Blocks: Block 4

---

Beginn des Blocks: Block 5

Factors 1 Wie hast Du Deine Entscheidungen getroffen? Welche Faktoren haben diese beeinflusst?

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Seitenumbruch

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Q22 Ein weiteres Choice-Experiment:

Es sind wieder die gleichen 5 Produkte vorgegeben, für die Du jeweils einer der 4 Optionen auswählen kannst. Drei Optionen stellen eine Kombination aus zwei Nachhaltigkeitssiegel dar, während die vierte Option ohne jegliche Siegel ist. Die Anordnung der zwei Siegel auf dem Produkt (rechts oder links) ist nicht relevant.

**Bitte wähle so aus, wie Du es auch im Supermarkt tun würdest.**

Ende des Blocks: Block 5

---

Beginn des Blocks: Block 6



Kartoffel 2 Kartoffeln

- Image:Kartof nutri bio (1)
- Image:Kartof fair bio richtig (2)
- Image:Kartof nutri fairtrade (3)
- ohne Siegel (4)



Milch 2 Milch (an spezielle Ernährung angepasst, z. B. vegan, laktosefrei, usw.)

- Image:Milch nutri bio (1)
- Image:Milch fairtrade bio (2)
- Image:Milch ntri fairtrade (3)
- ohne Siegel (4)



Schokolade 2 Schokolade (an spezielle Ernährung angepasst, z. B. vegan)

- Image:Schoko nutri bio (1)
- Image:E richtig schoko bio fairtrade (2)
- Image:Schoko nutri fairtrade (3)
- ohne Siegel (4)



Nüsse 2 Nüsse

- Image:Nüsse nutri, bio (1)
- Image:Nüsse fair bio (2)
- Image:Nüsse nutri fairtrade (3)
- ohne Siegel (4)



Bananen 2 Bananen

- Image:Banane nutri bio (1)
- Image:Banane fairtrade bio (2)
- Image:Banane nutri fairtrade (3)
- ohne Siegel (4)

Ende des Blocks: Block 6

---

Beginn des Blocks: Block 7

Factors 2 Wie hast Du Deine Entscheidungen getroffen? Welche Faktoren haben diese beeinflusst?

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Seitenumbruch

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Q25 Letzte Runde!



Familiarity Wie vertraut sind Dir die jeweiligen Lebensmitteletiketten?

|                               | nicht sehr vertraut (1) | eher vertraut (2)     | vertraut (3)          | sehr vertraut (4)     | äußerst vertraut (5)  |
|-------------------------------|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Image:Fairtrade (Fairtrade)   | <input type="radio"/>   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Image:Bio (BIO)               | <input type="radio"/>   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Image:Nutriscore (Nutriscore) | <input type="radio"/>   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |



Sustainability Wie **nachhaltig** würdest Du ein Produkt mit dem jeweiligen Lebensmitteletikett bewerten?

|  | nicht sehr nachhaltig (1) | eher nachhaltig (2)   | nachhaltig (3)        | sehr nachhaltig (4)   | äußerst nachhaltig (5) |
|--|---------------------------|-----------------------|-----------------------|-----------------------|------------------------|
| Image:Fairtrade (Fairtrade)                | <input type="radio"/>     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  |
| Image:Bio (BIO)                            | <input type="radio"/>     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  |
| Image:Nutriscore (Nutriscore)              | <input type="radio"/>     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  |
| Produkt ohne Nachhaltigkeitsetikett (ohne) | <input type="radio"/>     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>  |

---

Seitenumbruch

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Awareness Stimmst Du der folgenden Aussage zu?

Ich bin mir bewusst, dass ich mich beim täglichen Einkauf zwischen den Nachhaltigkeitssiegeln auf Produkten entscheiden muss, da nicht immer alle Nachhaltigkeitssiegel auf einem Produkt vorhanden sind.

Ja ich stimme zu. (1) \_\_\_\_\_

Nein ich stimme der Aussage nicht zu. (2)  
\_\_\_\_\_

---

Holistic label Würdest Du sagen, dass ein Lebensmitteletikett, dass mehrere Nachhaltigkeitsaspekte zusammenfasst, Dir bei der nachhaltigen Auswahl eines Lebensmittels helfen würde?

Ja (1) \_\_\_\_\_

Nein (2) \_\_\_\_\_

---

Final remarks Abschließende Anmerkungen:

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Ende des Blocks: Block 7

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Beginn des Blocks: Block 8

Q32 **Du hast es geschafft!** Vielen Dank und bei weiteren Anmerkungen oder Fragen kannst Du Dich gerne an mich (c.hahn.2@student.rug.nl) wenden.

Ende des Blocks: Block 8

Disclaimer: I did not include the answers of the questionnaire in the appendix due to confidentiality reasons. Insights into the data are possible upon request.

**Appendix B**

**Product and Food Label Options in the First Choice Experiment**

Nüsse



Kartoffeln



Schokolade (an spezielle Ernährung angepasst, z. B. vegan)



Milch (an spezielle Ernährung angepasst, z. B. vegan, laktosefrei, usw.)



Bananen







Since some participants could be lactose-intolerant or vegan, it was specified that milk and chocolate would be suitable for the person's specific diet.

Appendix C

Product and Food Label Options in the Second Choice Experiment

---

|   |   |   |  |
|---|---|---|--|
|  |  |  | ohne Siegel<br> |
| <input type="radio"/>   | <input type="radio"/>   | <input type="radio"/>   | <input type="radio"/>  |

---

Kartoffeln

|   |   |   |  |
|---|---|---|--|
|    |    |    | ohne Siegel<br> |
| <input type="radio"/>   | <input type="radio"/>   | <input type="radio"/>   | <input type="radio"/>  |
|  |  |  |               |
| <input type="radio"/>   | <input type="radio"/>   | <input type="radio"/>   | <input type="radio"/>  |

---

Milch (an spezielle Ernährung angepasst, z. B. vegan, laktosefrei, usw.)

|   |   |   |  |
|---|---|---|--|
|  |  |  | ohne Siegel<br> |
| <input type="radio"/>   | <input type="radio"/>   | <input type="radio"/>   | <input type="radio"/>  |

---

Nüsse

|   |   |  |   |
|---|---|--|---|
|  |  | ohne Siegel<br> |  |
| <input type="radio"/>   | <input type="radio"/>   | <input type="radio"/>  | <input type="radio"/>   |



## Appendix D

### Packages Used in R (Version 2023.03.0+386) for Choice Experiment Analysis

*For the regression:*

Libraries:

- `library(dfidx)`
- `library(ggplot2)`
- `library(survival)`
- `library(mlogit)`
- `library(marginaleffects)`
- `library(tidyverse)`
- `library(nnet)`
- `library(reshape)`
- `library(ggstance)`

*For the PCA:*

Libraries:

- `library(factoextra)`
- `library(ggplot2)`
- `library(survival)`
- `library(mlogit)`
- `library(marginaleffects)`
- `library(tidyverse)`
- `library(nnet)`
- `library(reshape)`
- `library(factoextra)`
- `library(RColorBrewer)`

**Appendix E****Descriptive Statistics of Participants' Diet**

|                      | Total sample<br>n = 353 (%) |
|----------------------|-----------------------------|
| Nutrition            |                             |
| Omnivore             | 39,2                        |
| Flexitarian          | 17,6                        |
| Pescetarian          | 3,4                         |
| Ovo-Lacto-Vegetarian | 14,0                        |
| Vegan                | 4,8                         |
| Gluten-free          | 1,2                         |
| Lactose-free         | 3,4                         |
| Low-cholesterol      | 1,4                         |
| Low-salt             | 3,5                         |
| Low-sugar            | 9,2                         |
| Muslim               | 0,7                         |
| Hindi                | 0,2                         |
| Other                | 1,4                         |

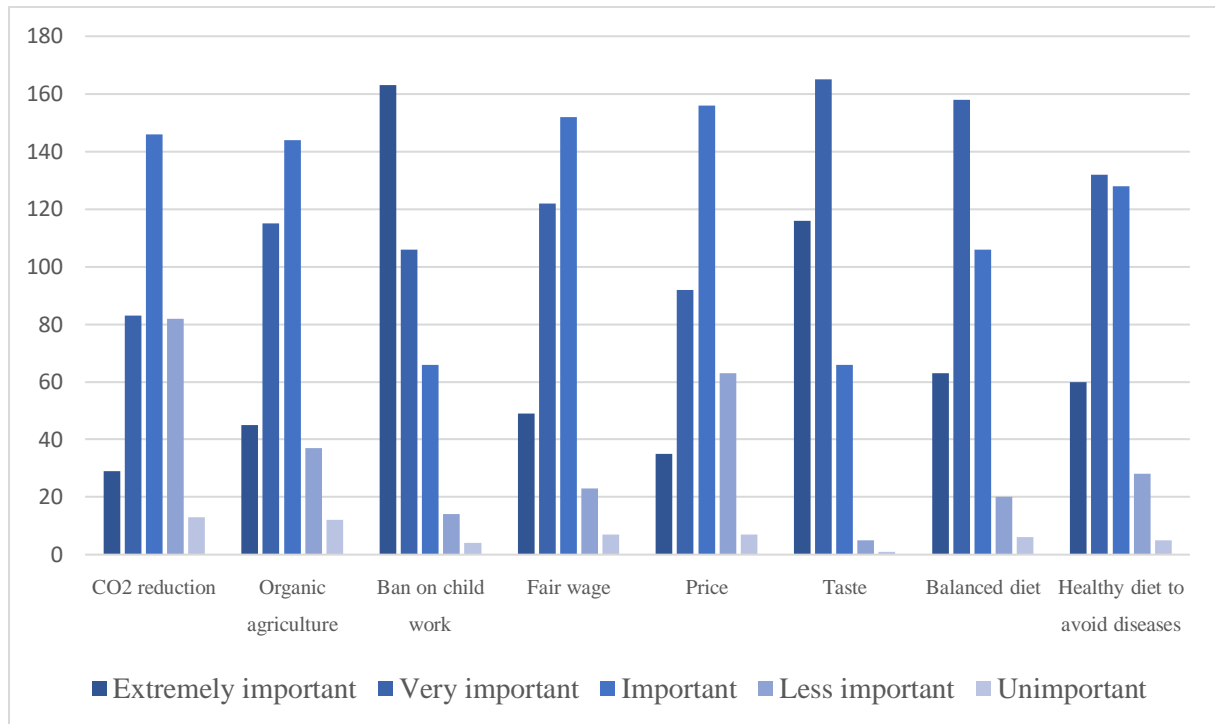
### Appendix F

#### Perceptions of Intra-sustainability trade-offs between Food Labels.

| Question  | Answer option | Total sample n = 353 (%) |
|---|---------------|--------------------------|
| Do you normally take sustainable food labels into account when going to the supermarket?  | Yes           | 64.3                     |
|   | No            | 35.7                     |
| Do you agree with the following statement? I am aware that I have to choose between the sustainability labels on products when I shop every day, because not all sustainability labels are always available on one product. | Yes           | 82.9                     |
|   | No            | 17.1                     |
| Would you say that a food label that combines several sustainability aspects would help you make a sustainable food choice?   | Yes           | 81.0                     |
|   | No            | 19.0                     |

Appendix G

Descriptive Statistics of Values Importance Rating

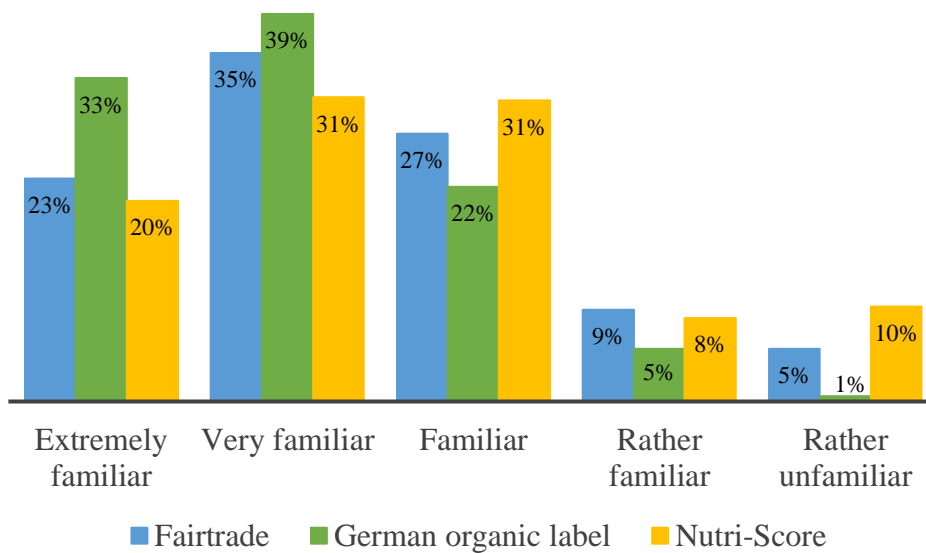


Notes: The bar chart displays the results of the 5-point Likert scale. The frequency for each rating (from unimportant to extremely important) per topic is shown. The connection between values and the specific topics were made by the author as shown in Table 1.

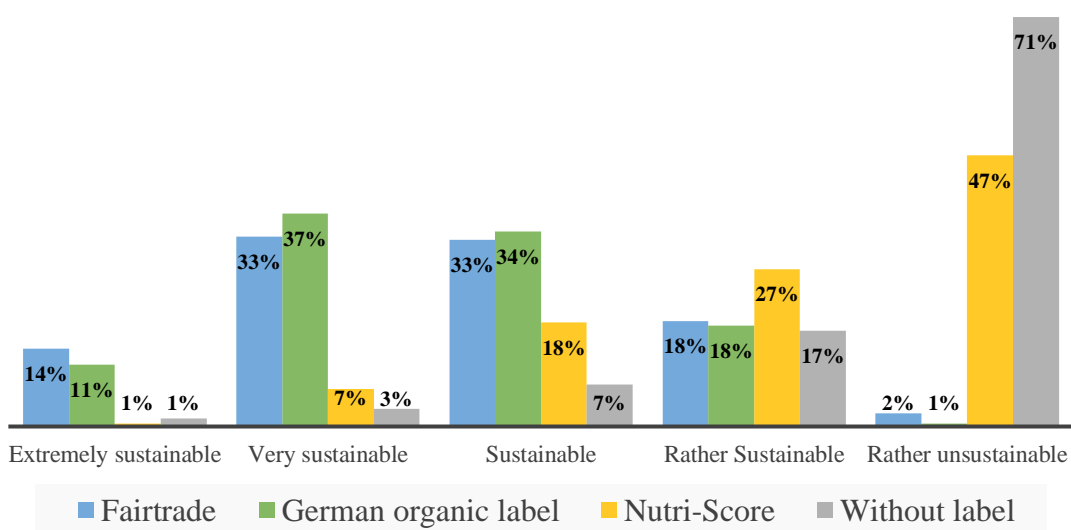
**Appendix H**

**Descriptive Statistics of (a) Familiarity and (b) Sustainability per Label**

*Figure A: Frequency (%) of familiarity rating per label*



*Figure B: Frequency (%) of sustainability rating per label*



Appendix I

Summary of Regression Analysis Experiment 1

*Regression Analysis of label type in presence of all labels without accounting for product type*

| y.level | term             | estimate | std.error | statistic | p.value  | conf.low | conf.high |
|---------|------------------|----------|-----------|-----------|----------|----------|-----------|
| 1       | Organic value    | 1.44     | 0.0752    | 19.2      | 7.16e-82 | 1.29     | 1.59      |
| 2       | Fairtrade value  | 0.965    | 0.0769    | 12.5      | 4.21e-36 | 0.814    | 1.12      |
| 3       | Nutriscore value | -0.327   | 0.0921    | -3.55     | 3.87e-4  | -0.507   | -0.146    |

*Regression Analysis of label type in presence of all labels per product*

| y.level | term                 | estimate | std.error | statistic | p.value  | conf.low | conf.high |
|---------|----------------------|----------|-----------|-----------|----------|----------|-----------|
| 1       | banana zBio          | 0.537    | 0.122     | 4.41      | 1.02e-5  | 0.298    | 0.775     |
| 2       | banana Fairtrade     | 0.407    | 0.123     | 3.30      | 9.69e-4  | 0.165    | 0.649     |
| 3       | banana aaa           | -0.230   | 0.180     | -1.28     | 2.00e-1  | -0.582   | 0.122     |
| 4       | banana Nutriscore    | -0.951   | 0.222     | -4.28     | 1.89e-5  | -1.39    | -0.515    |
| 5       | chocolate zBio       | -1.03    | 0.165     | -6.24     | 4.47e-10 | -1.35    | -0.706    |
| 6       | chocolate Fairtrade  | 0.763    | 0.113     | 6.73      | 1.71e-11 | 0.541    | 0.986     |
| 7       | chocolate aaa        | 0.274    | 0.156     | 1.76      | 7.87e-2  | -0.0315  | 0.580     |
| 8       | chocolate Nutriscore | -0.186   | 0.173     | -1.08     | 2.80e-1  | -0.525   | 0.152     |
| 9       | milk zBio            | 0.820    | 0.113     | 7.24      | 4.48e-13 | 0.598    | 1.04      |
| 10      | milk Fairtrade       | -0.919   | 0.159     | -5.76     | 8.37e-9  | -1.23    | -0.606    |
| 11      | milk aaa             | -0.152   | 0.172     | -0.883    | 3.77e-1  | -0.488   | 0.185     |
| 12      | milk Nutriscore      | 0.0621   | 0.163     | 0.380     | 7.04e-1  | -0.258   | 0.382     |
| 13      | nuts zBio            | 0.134    | 0.119     | 1.13      | 2.60e-1  | -0.0988  | 0.366     |
| 14      | nuts Fairtrade       | 0.0692   | 0.119     | 0.579     | 5.62e-1  | -0.165   | 0.303     |
| 15      | nuts aaa             | 0.0188   | 0.157     | 0.119     | 9.05e-1  | -0.290   | 0.327     |
| 16      | nuts Nutriscore      | -0.257   | 0.168     | -1.54     | 1.24e-1  | -0.586   | 0.0710    |
| 17      | potato zBio          | 1.03     | 0.116     | 8.86      | 7.98e-19 | 0.800    | 1.25      |
| 18      | potato Fairtrade     | -0.911   | 0.167     | -5.44     | 5.41e-8  | -1.24    | -0.582    |
| 19      | potato aaa           | 0.216    | 0.165     | 1.31      | 1.89e-1  | -0.107   | 0.539     |
| 20      | potato Nutriscore    | -0.637   | 0.205     | -3.11     | 1.89e-3  | -1.04    | -0.235    |

*Note. Term shows the different label options: zBio – German organic label, Fairtrade, aaa – without label and Nutri-Score*

Appendix J

Summary of Regression Analysis Experiment 2

*Regression Analysis of label combination in presence of all label combinations without accounting for product type*

| y.level | term                  | estimate | std.error | statistic | p.value   | conf.low | conf.high |
|---------|-----------------------|----------|-----------|-----------|-----------|----------|-----------|
| 1       | zBio.Fairtrade value  | 1.99     | 0.0766    | 25.9      | 1.97e-148 | 1.84     | 2.14      |
| 2       | zBio.Nutri value      | 0.559    | 0.0821    | 6.82      | 9.42e-12  | 0.398    | 0.720     |
| 3       | Fairtrade.Nutri value | -0.312   | 0.0949    | -3.28     | 1.02e-3   | -0.498   | -0.126    |

*Note.* Term shows the different label options: zBio. Fairtrade – German organic label and Fairtrade combination, zBio.Nutri – German organic label and Fairtrade.Nutri - Nutri-Score and Fairtrade

*Regression Analysis of label combination in presence of all label combinations per product*

| y.level | term                      | estimate | std.error | statistic | p.value  | conf.low | conf.high |
|---------|---------------------------|----------|-----------|-----------|----------|----------|-----------|
| 1       | banana zBio.Fairtrade     | 1.01     | 0.115     | 8.81      | 1.29e-18 | 0.786    | 1.24      |
| 2       | banana Fairtrade.Nutri    | -0.360   | 0.187     | -1.92     | 5.47e-2  | -0.727   | 0.00723   |
| 3       | banana aaa                | -0.297   | 0.184     | -1.61     | 1.06e-1  | -0.658   | 0.0635    |
| 4       | banana zBio.Nutri         | -0.637   | 0.153     | -4.16     | 3.14e-5  | -0.937   | -0.337    |
| 5       | chocolate zBio.Fairtrade  | 0.777    | 0.114     | 6.80      | 1.05e-11 | 0.553    | 1.00      |
| 6       | chocolate Fairtrade.Nutri | 0.204    | 0.159     | 1.29      | 1.98e-1  | -0.107   | 0.516     |
| 7       | chocolate aaa             | 0.118    | 0.162     | 0.726     | 4.68e-1  | -0.200   | 0.435     |
| 8       | chocolate zBio.Nutri      | -1.29    | 0.180     | -7.15     | 8.70e-13 | -1.64    | -0.934    |
| 9       | milk zBio.Fairtrade       | 0.513    | 0.118     | 4.34      | 1.42e-5  | 0.281    | 0.745     |
| 10      | milk Fairtrade.Nutri      | -0.730   | 0.201     | -3.63     | 2.80e-4  | -1.12    | -0.336    |
| 11      | milk aaa                  | -0.147   | 0.171     | -0.858    | 3.91e-1  | -0.483   | 0.189     |
| 12      | milk zBio.Nutri           | 0.194    | 0.123     | 1.57      | 1.15e-1  | -0.0475  | 0.437     |
| 13      | nuts zBio.Fairtrade       | 0.792    | 0.114     | 6.97      | 3.07e-12 | 0.570    | 1.02      |
| 14      | nuts Fairtrade.Nutri      | -0.397   | 0.183     | -2.17     | 2.97e-2  | -0.755   | -0.0392   |
| 15      | nuts aaa                  | -0.0869  | 0.169     | -0.515    | 6.07e-1  | -0.418   | 0.244     |
| 16      | nuts zBio.Nutri           | -0.492   | 0.142     | -3.48     | 5.11e-4  | -0.770   | -0.215    |
| 17      | potato zBio.Fairtrade     | 0.727    | 0.120     | 6.07      | 1.25e-9  | 0.492    | 0.962     |
| 18      | potato Fairtrade.Nutri    | -1.13    | 0.237     | -4.78     | 1.79e-6  | -1.60    | -0.668    |
| 19      | potato aaa                | 0.202    | 0.164     | 1.24      | 2.16e-1  | -0.118   | 0.523     |
| 20      | potato zBio.Nutri         | -0.0339  | 0.133     | -0.254    | 7.99e-1  | -0.296   | 0.228     |

*Note.* Term shows the different label options: zBio. Fairtrade – German organic label and Fairtrade combination, zBio.Nutri – German organic label, Fairtrade.Nutri - Nutri-Score and Fairtrade and aaa – without label

## Appendix K

### Summary of Regression Analysis of Correlation Between Choices in Experiment 1 and Experiment 2

| Choice 1      | y.level         | term  | estimate | std.error | statistic | p.value  | conf.low | conf.high |
|---------------|-----------------|-------|----------|-----------|-----------|----------|----------|-----------|
| Bio           | zBio.Fairtrade  | value | 4.41     | 0.215     | 20.5      | 5.09e-93 | 3.98     | 4.83      |
|               | zBio.Nutri      | value | 2.44     | 0.217     | 11.3      | 2.00e-29 | 2.02     | 2.87      |
|               | Fairtrade.Nutri | value | -0.179   | 0.300     | -0.597    | 5.50e-1  | -0.766   | 0.408     |
| Nutri-Score   | zBio.Fairtrade  | value | -0.124   | 0.287     | -0.430    | 6.67e-1  | -0.686   | 0.439     |
|               | zBio.Nutri      | value | 1.12     | 0.244     | 4.60      | 4.24e-6  | 0.643    | 1.60      |
|               | Fairtrade.Nutri | value | 1.84     | 0.237     | 7.77      | 7.62e-15 | 1.38     | 2.31      |
| Without label | zBio.Fairtrade  | value | -2.79    | 0.205     | -13.6     | 4.34e-42 | -3.19    | -2.39     |
|               | zBio.Nutri      | value | -3.45    | 0.244     | -14.1     | 2.78e-45 | -3.92    | -2.97     |
|               | Fairtrade.Nutri | value | -3.99    | 0.293     | -13.6     | 3.96e-42 | -4.57    | -3.42     |
| Fairtrade     | zBio.Fairtrade  | value | 5.07     | 0.365     | 13.9      | 7.77e-44 | 4.35     | 5.79      |
|               | zBio.Nutri      | value | 3.12     | 0.368     | 8.48      | 2.17e-17 | 2.40     | 3.84      |
|               | Fairtrade.Nutri | value | 2.35     | 0.376     | 6.23      | 4.58e-10 | 1.61     | 3.08      |

*Note.* The effect of choosing a certain label (Bio – German organic label, Fairtrade, Nutri-Score or without label) in experiment 1 on the choice of label combinations in experiment 2 was investigated.

Y-level shows the different label combinations in experiment 2: zBio. Fairtrade – German organic label and Fairtrade combination, zBio.Nutri – German organic label and Fairtrade.Nutri - Nutri-Score and Fairtrade