What’s on your menu?

Team 2270
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Preface

Our ACT project was not only successfully completed by our own efforts, but also through the help of others. Hereby, we would like to share our thanks to:

- The Wageningen University for providing the course ‘Academic Consultancy Training’ and the Green office, for giving us the opportunity to work in a team on an official project.
- Our coach Cunera van Hal, who guided us through the whole process with a lot of kindness and expertise.
- Our academic advisor Arnout Fischer, who assisted us in the provision of scientific knowledge, methods for the study design and amusing feedback on the draft version.
- The caterers of the WUR restaurants and contract manager, who took time out of their busy schedule to have a dialogue with us.

Executive summary

This project was commissioned by the Green Office of Wageningen University and Research. They have the goal to give all students and employees access to sustainable options in their workplace. Therefore, the aim of the project was to include more vega(n) foods and drinks in the WUR restaurants.

The integrative aim of our consultancy team was to provide the Green Office with convincing, applicable, feasible and scientific knowledge about consumer motivations in relation to sustainable foods, about vega(n) alternatives, and about interventions on promoting the consumption of sustainable foods. This was done through literature studies about sustainable nutrition and successful strategies to increase the vega(n) food supply and consumption. Furthermore, a cross-sectional consumer study was performed through an online survey based on the Personal Food System and the Salutogenic Perspective.

Results of the literature study about sustainable nutrition showed that a plant-based diet is more sustainable, feasible in terms of animal product replacement, cheaper and also healthy. The results about effective strategies showed that consumers can be influenced into making a more sustainable food decision. This can be done through a combination of nudging and providing information and will not restrict the consumer in their food choices. The results of the cross-sectional consumer study firstly showed statistically significant relations between motivations for food choice/ rating of the food offer, and the choice for specific food products: (1) Consumers who ascribe more importance to 'health' are more likely buy salads and warm dishes, (2) Consumers who ascribe more importance to the value 'convenience' are more likely to buy snacks. Secondly, the results show statistically significant relations between the perception of sustainability of the consumers and their food choice: (1) Most of the consumers (67,84%) indicated that they are willing to pay more for foods with a low impact on the environment, as long as the increase in cost is below the 10%. Consumers that are most willing to pay more, often buy salads. (2) More than half of the consumers (53.7%) indicated that they would choose vegan or vegetarian foods when the prices are the same. If the vega(n) foods would be cheaper, this percentage would increase with 13.3% (total of 74%). These consumers buy sandwiches most often. (3) Consumers showed an interest in being informed about the environmental impact of their food choices.

The consultancy team put the results of the three studies together to provide advice for the Green Office of Wageningen University and Research on how to increase the vega(n) food offer and consumption at Wageningen University. The consultancy team has made two sets of advices: the first advice is a general advice for the Green Office on how to increase the vega(n) food offer and consumption, the second advice is tailored to the four different caterers and their needs. The general advice consists of the information gathered from the two literature studies (sustainable nutrition and strategies to increase vega(n) consumption) and the cross-sectional consumer study.

Based on the results of the study on sustainable nutrition, meat products should be replaced with plant-based alternatives like tempeh, tofu, legumes, pulses, mushrooms and mycoproteins. Specific foods can replace eggs, such as chickpea flour and tofu. Plant-based alternatives are for example almond butter, soy butter and margarine. Recipes like eggplant salad on bread, tofu omelet and a white bean burger with roasted bell pepper could be implemented. The website of veganwiki is an example on where to find vegan recipes. In order to make the identification of certain foods easier, the consultancy team advises the Green Office to introduce the mobile application Eaternity to the caterers. This is a paid application that will give the user information on health, costs, sustainability and other information about

a certain food product. This will make it easier for the caterers to make a sustainable and healthy decision.

Furthermore, three strategies are suggested for making more sustainable food choices by changing parts of the environment, without restricting the consumer in their choices. Firstly, to make vega(n) options more visible. Secondly, to provide consumers with more vega(n) meals on the menu. And thirdly, to provide the consumer with information about the meal itself.

Based on the results of the consumer study several points of recommendation are included in the advice. Firstly to specifically promote the 'health' benefits of salads and warm dishes, when making the products more sustainable and vega(n). Secondly, it is advised to include (more) vega(n) snacks, to make the sustainable choice more convenient. While aiming to make the products more sustainable, it is important to keep in mind the effect of price changes and to make sure the vega(n) options are not rising more than 10% above the prices for meat-based foods. Finally, when promoting vega(n) meals, there should be information available for the consumers on the environmental benefits.

A tailored advice is made for all the four restaurants separately, based on the consumer motivation and rating of these motivations per restaurant. Sodexo (Impulse) could focus on affordability and providing knowledge on vega(n) foods. Good Food (Leeuwenborch) could focus on health benefits when introducing vega(n) foods. Cormet (Forum) could focus on affordability and provide information about health and environmental benefits when promoting vega(n) food. OSP (Orion) could focus on the promotion of being vega(n), as 2/3 of the consumers are vega(n), flexitarian or pescatarian.

Abbreviations

CH_4= Methane

CO_2= Carbon dioxide

CVD= Cardiovascular Disease

EU= European Union

FAO = The Food and Agriculture Organization of United Nations

FCQ= Food Choice Questionnaire

FPQ= Food Preference Questionnaire

GHG= Greenhouse gas

GRR= General Resistance Resources

MUFA(s) = Monounsaturated fatty acid(s)

N_2O= Dinitrogen monoxide

NVV= Nederlandse Vereniging voor Veganisme

OR= Odds Ratio

PUFA(s) = Polyunsaturated fatty acid(s)

Q= Research Question

Q1,2,3= Subquestion 1,2,3

SFA(s) = Short chain fatty acid(s)

SOC= Sense of Coherence

Vega(n) = Vegetarian or vegan

WRI = World Resources Institute

WUR= Wageningen University & Research

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1. Introduction

This consultancy report is written for the Green Office of Wageningen University. The Green Office has the goal to give all students and employees access to sustainable options in their workplace, by making Wageningen Campus an inspiring and 100% sustainable place to work and study (Green Office, 2016). In order to reach this goal, the Green Office has initiated the "Just Vega(n)" project to inspire the caterers of the WUR in the provision of sustainable food. Moreover, "Just Vega(n)" aims to stimulate students to increasingly choose for more vegan and vegetarian options at the WUR restaurants (Green Office, 2016). The need and relevance of the project is strengthened when focussing on the impact of our modern-day food system on the climate, human health, and animal welfare. Therefore, context will be provided about the societal challenges that call for a more sustainable food supply, before elaborating on the problems that will be addressed in this consultancy report.

1.1 Context

1.1.1 Climate impact

In the last decades, it has become clear that humans' current eating habits are the main cause of environmental degradation (Willet et al., 2019). In comparison to meat-based diets, plant-based diets are considered to be more sustainable, because they are far less exhausting on natural resources and less taxing on the environment (Sabate & Soret, 2014). More than 30% of the global land surface, and 70% of the agricultural land is used for animal production (Stoll-Kleemann & O'Riordan, 2015). In Europe meat and dairy products account for 24% of the total Greenhouse Gas (GHG) Emissions. Furthermore, of all the calories produced by the world's crops, 36% are used to feed animals, of which only 12% ultimately contributes to the human diet, in the shape of meat, dairy and other animal products (Mason & Lang, 2017). In relation to the environmental impact of animal-based foods, the Barilla Center for Food & Nutrition developed the inverted pyramid which highlights the big environmental impact of meat and fish, but also of dairy products like cheese (Figure 1).

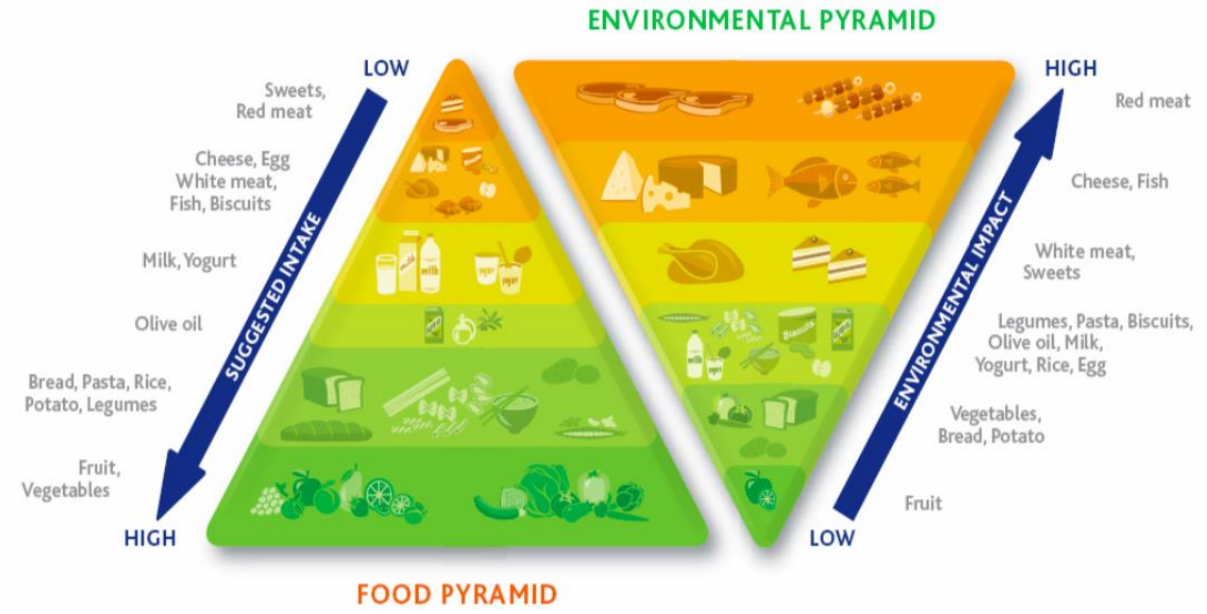


Figure 1. The Food pyramid and the environmental pyramid (Poli, 2010).

1.1.2 Health Benefits

In addition to environmental benefits, a shift towards a plant-based diet also has positive influences on human health. Many people in Western Society adhere to a diet high in meat, dairy and eggs. Diets with such a high share of animal products have proven to be the main dietary cause of cardiovascular disease (CVD), type 2 diabetes and several types of cancer (Mason & Lang, 2017). Consumers have much to gain regarding health when making the transition towards a more plant-based diet. Usually, vegan diets are relatively high in dietary fiber, magnesium, folic acid, vitamins C and E, iron, and phytochemicals. On the other hand; they are low in calories, saturated fat, and cholesterol (Craig, 2009). This results in a lower risk of CVD, obesity, type 2 diabetes, and several types of cancer. All in all, this can be seen as a great motivator for consumers to start eating vegetarian, or even vegan. The health benefits related to specific nutrients will be described in more detail in the literature study.

1.1.3 Animal welfare

A plant-based diet is not only beneficial to human health, but also for animal welfare. In the Netherlands alone, more than 600 million animals were slaughtered in the year 2017, of which the majority consists of broilers who are treated cruelly (CBS, 2019).

1.1.4 Consumer's motivations

Despite the growing amount of knowledge and awareness about the benefits of a plant-based diet, and the media attention for the issues of our modern-day dietary pattern, a minority of people are vegan or vegetarian (Willet et al., 2019). In 2018, the NVV (Dutch Association for Veganism) estimated that there were 100.000 vegans in the Netherlands (NVV, n.d.). Roughly estimated, this entails 0.6% of the Dutch population; leaving a lot of room for growth. Food choices and eating behaviour are determined by biological, psychological, social and cultural influences that shape a person's dietary patterns throughout the life course (Shepherd & Raats, 2006). A first step towards dietary change is an open attitude towards behavioural change. However, despite the fact that consumers appear to be open towards the idea of reducing the consumption of animal-based proteins, they lack the knowledge, motivation or capacity to make such changes (Stubbs, Scott, & Duarte, 2018).

1.2 Problem definition

Based on the described context and view of the commissioner

The broader context of environmental degradation, as previously described, strengthens the aim of the Green Office to include more vega(n) foods and drinks in the WUR restaurants. Creating a more sustainable food offer at WUR Campus is in line with the image of the university (Wageningen University and Research, n.d). However, the restaurants have a limited offer of vega(n) products (Schafer, 2018), and the consumers still buy animal-based foods. The complexity of the problem, that counteracts the goal of the Green Office, lies within the interdependence of the supply and demand of vega(n) foods. The four caterers of the WUR, OSP, Cormet, Good Food and Sodexo, are the focus group of this project and need to adjust their food offer towards the demand, in order to make profit. Furthermore, three of the four caterers are part of a bigger cooperation, which comes with a prescription of rules that

have to be followed. Another problem related to the demand is the competition between the caterers and Campus Plaza. The caterers might fear that when they replace animal-based- with plant-based proteins, the consumers will buy their food at Campus Plaza instead of the WUR restaurants. The consumers, consisting of WUR students and staff, have different motivations that determine their willingness to choose sustainable foods. From a behavioural perspective, it is important to investigate the motivations of the consumers to be able to get an overview of the demand and willingness to pay for different food products. Furthermore, a lack of knowledge on nutritionally adequate, healthy and plant-based alternatives can be a problem for the caterers when they want to include more vega(n) options. A first step to overcome this problem would be to acquire knowledge about the vega(n) foods, and about the consumer's motivations.

1.3 Testing the assumptions: Orientation

The Green Office stated that the four WUR restaurants are not sustainable, affordable and healthy enough. As independent and critical researchers, a part of our job as a consultant is to check this assumption. Therefore, observations and stakeholder dialogues were executed to gather background information towards our project.

1.3.1 Observation at the four restaurants

An observation was performed at the four restaurants of the WUR campus. This, in order to observe what is actually offered and present at the canteens. Every restaurant was observed twice during the lunch break; the 2th of June, which was a meatless Monday and the third and fourth of June, which both fell on a normal day. To organize the observation regarding the current food supply, different categories and subcategories were made. The focus of the categories was on the differentiation of vegan, vegetarian or meat/ fish, as the project gives advice towards the increase towards vega(n) foods. These categories and counted amounts of the food offer for each restaurant are shown in Appendix 2.
Overall, every restaurant provided at least one vegan option and multiple vegetarian options during the week. On meatless Monday, all restaurants provided less meat and fish options. In general, Orion provided the most vegan food options and Forum the least.

1.3.2 Dialogue with the caterers and the contract manager

By engaging in a dialogue with the caterers, a collaborative relationship can be established. This way, the experiential knowledge of the caterers can help to guide the project (Ackermann & Eden, 2011). This is important, because the goal of the Green Office is to change the food offer at the WUR restaurants, which is managed by the four caterers. Engaging in a dialogue with the caterers combines the different perspectives of the consultancy team and the caterers, which can lead to an outcome that suits the practical needs better. This outcome will be more likely to be implemented successfully, since it takes into consideration the restraints and motivations of the caterers.

In the dialogue with the caterers and the contract manager the focus lies on the following three questions - '*Who are the stakeholders?*', '*What do they want?*', and '*How are they trying to get it*?' (Ackermann & Eden, 2011). The first question is for orientation; in order for the consultancy team to get a clear overview of who the caterer is and what external and internal members are

important to take into consideration. Furthermore, this question includes how the caterers see themselves in terms of power. The last two questions are to help understand what the different caterers want (where does their interest lie), and to understand how likely they are to work towards achieving their goals (also related to the power they have). After having these three questions answered for the different caterers, the dialogue will focus specifically on the goal of the Green Office of creating a shift towards more sustainable, healthy and affordable protein options at WUR campus. The dialogue with the Contract Manager adds to the caterers' dialogues by providing a more complete view on dynamics at the four restaurants. Furthermore, it is important to view the WUR restaurants from the broader image of Wageningen University, which includes the vertical power chain. The Contract Manager can give insights in the interdependencies of the executive board and the four caterers, and provide information on other powerful parties included. The important content can be seen in table 2 and a more specific structure for the dialogue with the caterers and the contract manager can be found in Appendix 3.

1.3.2.1 Summary of Caterers Dialogue

The dialogues with the caterers are summarized according to the main topics of conversation. Table 1 shows the information that was described by the caterers as being of highest value to them according to this project. Full recordings of the meetings are kept by the secretary of the ACT team, until the 30th of August 2020.

Table 1. Summary of four Caterers Dialogue's divided per discussions topic

	Summary	**Relevant for tailored advice**
Sodexo (Impulse)	**Context:** Sodexo focuses on them being a commercial company that is responsible for their own revenue, without support from the WUR. They are already integrating sustainable aspects in their restaurant. **Sustainable ventures:** mindful, Meatless week, vega(n) lunch **Obstacles:** healthy alternatives are less profitable due to the lower amounts and intensive meal preparation. **Desired:** know what the consumer wants; what is the consumer willing to pay, are they looking for more vega(n) options, do they know the current assortiment and what is their perspective towards the restaurant. Advice on a variety of feasible vegan alternatives (recipes). Top down approach: Search for possibilities to include the board of the WUR.	Study on consumer motivation, differentiating on Impulse. What consumers are willing to pay. Feasible alternatives for animal-based proteins. What is the perspective of the consumers towards the restaurant.
Good Food (Leeuwenborch)	**Context:** Good Food focuses on the quality and authenticity of their products; everything is prepared by themselves, with great detail for freshness and taste. **Sustainable ventures:** inclusion of Alpro, organic croquette, 95% vegan soups **Obstacles:** Campus Plaza, the label "vegan", intention-behaviour gap of consumers attitude towards vega(n) and healthy food. **Desired:** what does the consumer really buy? Focus on the actual behaviour, which is mostly irrational. Respect for the caterer and acknowledgement of sustainable ventures. Information about vega(n) alternatives is appreciated.	Objective information about what the consumer does. Feasible alternatives for animal-based proteins with focus on taste.

Cormet (Forum)	**Context:** focus on having an extensive offer that fits the demands of all the customers. **Sustainable ventures:** vegan oesterzwam croquette, typical sustainable, less plastic from suppliers, new (secret) project about food product that is 100% plant-based. **Obstacles:** attitude of consumers, plant-based is less profitable, meatless monday; consumers go to campus plaza. **Desired:** to spread the word about what sustainable ventures they already implement, for consumers to look more critical at their own behaviour, what does the consumer really buy.	To know specifically what the consumer eats. Get out the word about what is already done about sustainability.
OSP (Orion)	**Context:** focus on the complete gastronomic experience; eating good (sustainable) food at a nice place, with friendly people who work there. **Sustainable ventures:** only vegan snacks, sustainable replacements within existing recipes, removing soda as a "visible" option, norm is vegetarian. **Obstacles:** consumer do not know what is already there/been done (already a lot of sustainable ventures). **Desired:** preferences of consumers; how much vega(n)?, differentiations between lunch and dinner (bread or meal), get the word out about what is already done about sustainability.	The preference of the consumers; how much vega(n) do they want? Why do they visit the Spot; food, ambiance, friends.

1.3.2.2 Summary of Dialogue with the Contract Manager

The dialogue with the contract manager has a more exploratory structure, in order to create an open conversation to elaborate on what is deemed most important. This dialogue has as purpose to explore opportunities for change and creating an overview of the interdependencies of the influential parties related to the food offer at the four restaurants. These discussed parties are presented in table 2.

Table 2. Summary of the Contract Managers Dialogue divided per influential party

Chain of demand:	Information from the contract manager
Executive Board (WUR)	**Aims:** to remain neutral in the discussion on sustainable food supply at WUR campus, because of the divided interest related to pro- and anti-meat consumption. **Vision:** Their vision is outdated (2011) and vague about the requirements of the four restaurants; they should be "healthy"(Projectgroep Visievorming Catering, 2011).
Director Facility Management	**Aims:** to help research and education at Wageningen University & Research by working on an environment for current and future employees and students.
Product Manager	**Vision:** there is no desire for more direction of the Executive Board towards a more sustainable food supply.
Contract Manager (Lisette herself)	**Desires:** more guidance towards sustainable food supply from the Executive Board; including more specific guidelines for the caterers. For example, the percentage of products, including meat. But caterers should be free to choose the specific products. Caterers now have a commercial contract and are, with the exception of some standardized requirements, free in what they offer to consumers.

Other stakeholders:	Information from the contract manager
Student Council	Can be approached to get in contact with the Executive Board. Names that were mentioned are ‘Bo Briggermans” and “Roos Verstege”.
Green Office	Lisette desired more consultation with the Green Office, regarding (ACT) projects that concern the caterers at the WUR. They could approach the board, together with the student council, in order to give and advice coming from the “target group” of caterers, who desire a more sustainable food offer.
Campus Plaza	Is also a part of the WUR, but counteracts the enterprises of the four caterers regarding sustainable food offers.

1.3.2.3 Confirmation with the Green Office

New insights were gained through the dialogue with the caterers and contract manager. This changed our perspective towards the goal of our research study. Namely, most of the caterers want to act towards health and sustainability in their food offer and try to do so. However, they experience constraints regarding the wishes of the consumer, competition from Campus Plaza and their need to make profit. According to them, an advice could be useful to some extent, but mayor changes in their food supply will not occur through advice within this project. By getting to know their perspectives through intensive dialogues, it became clear that the impact of the survey will not reach to its full potential when the caterers are considered solely. In order to change, a clear vision from above is needed. This project can provide convincing and valuable knowledge for the board to take a stronger and more specific position regarding sustainability. After speaking with the commissioner, it became clear that the Green Office was flexible in receiving advice. This made it possible to look further than the caterers and focus on other strategies to improve the availability of vega(n) food at WUR campus. Due to the time availability within the project, these new insights from the dialogues will be taken into account, but not be explored further through research.

1.4 Stakeholder analysis

Based on the dialogues with the caterers and the contract manager, the Executive Board of the WUR is added to the stakeholder shortlist and power interest grid (figure 2).

1.4.1 Stakeholder shortlist

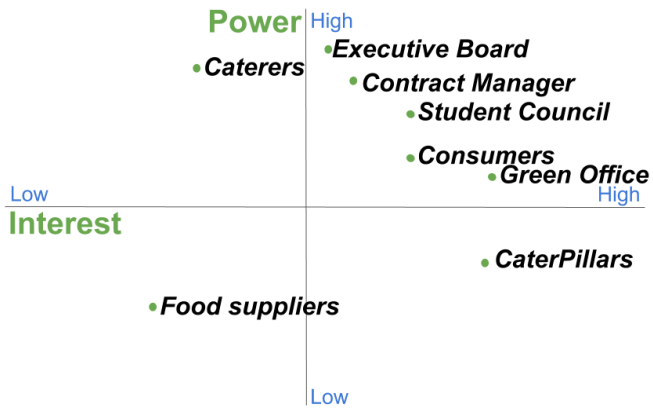
The main stakeholders that directly relate to the project are:

- ***Green Office of the WUR***: the commissioner of this project. The end product will consist in an advice for the commissioner on how to work towards its purpose, a shift towards more vega(n) products at the WUR restaurants.
- ***(Potential) consumers of the WUR restaurants****:* the (potential) consumers of the WUR restaurants can be subdivided in two subgroups, the staff and the students. These stakeholders play an important role in the project development because their insight is going to influence the solutions of the problem. They are going to be affected by the food offer in the restaurants, being the ones that decide to consume it or not.
- ***Caterers of the WUR restaurants****:* are the end target group of the commissioner. They are the group that will have to put the advice given by the consultancy team to the Green Office, into practice. The restaurants that this project will focus on are “The

Spot" in the Orion building, the "Forum Restaurant" and "Grand Cafe" in the Forum building, the "Futurum" in the Impulse building and the restaurant and coffee corner in the Leeuwenborch building. These restaurants and cafes belong to four different caterers according to each building, OSP (in the Orion building), Cormet (in the Forum building), Good Food (in the Leeuwenborch building) and Sodexo (in the Impulse building) (Wageningen Campus, n.d.).
The focus will be specifically on these four caterers due to feasibility matters according to the time available for the project development. It is a suggestion to address other food suppliers of the WUR campus or caterers at student plaza in a further project.

- ***Contract manager of the caterers of the WUR restaurants:*** the contract manager represents the WUR interests towards the caterers and has a close and direct relationship with them. The contract manager imposes rules to the caterers but, has stated above, the caterers have still some freedom to make their own decisions on which food to offer and how to organize the restaurants.
- ***Executive Board of the (WUR):*** Consist of multiple layers with different powers and responsibilities. They represent a neutral and outdated vision within the discussion on sustainable food supply at WUR campus (Projectgroep Visievorming Catering, 2011).

1.4.2 Power-Interest grid



A power-Interest grid with all the involved stakeholders is visualized in Figure 2. the long-list of all the stakeholders with a more extensive and detailed explanation is stated in Appendix 4.

Figure 2. Power-Interest grid

1.5 Project specific problem definition

After observing the food offer at the four restaurants of the WUR and having a dialogue with the caterers and the contract manager, the wider scope of the problem became clear.
Firstly, all four restaurants already try to include implementations that support a sustainable food supply, like 'meatless Monday' and the availability of a vegan option in every restaurant. From the dialogues with the caterers can also be presumed that the way that consumers perceive sustainable food offer differs per restaurant. Consumers are either positive or negatively influenced by the provision of knowledge about a product being vegan or vegetarian, in relation to their purchasing behaviour. Insight is needed on consumer motivations for food choice in relation to the actual choice of specific products and sustainable foods.

Secondly, there is a lack of scientific, feasible and applicable knowledge on vega(n) alternatives. This scope of the knowledge is desired on different levels by multiple

stakeholders. The Green Office requires scientific knowledge in order to back up the benefits of vega(n) alternatives for sustainability, including the environment and human health. The Green Office and the caterers both express the need for vega(n) alternatives that are feasible and applicable, in order to make them more attractive to consumers. For the caterers, there is a need for the vega(n) alternatives to be feasible. They have a 'commercial contract', which means that they are self-dependant on their profit.

Thirdly, there is a lack of knowledge on how to successfully implement sustainable foods in canteens and on how to promote this to the consumers. This relates to the previously mentioned problems on consumer motivations and vega(n) alternatives. In order to successfully produce knowledge that can be provided to solve these problems, information is needed on the promotion of the vega(n) alternatives towards to consumers.

Finally, from the dialogue with the caterers and the contract manager, it became clear that there is a desire for more guidance towards a sustainable food supply from the Executive Board of the WUR. The vision of the board in relation to sustainable food offers in the restaurants is outdated (from 2011) and does not provide specific guidelines for the caterers on how to make their food supply more sustainable (Projectgroep Visievorming Catering, 2011). These insights suggest that a top-down approach with clear guidelines, provided by the executive board, could help to create a more sustainable food supply in the restaurants, that is supported by both the caterers and the consumers. However, in order to stay within the scope of this project, this problem is not included within the research, but will be taken into consideration for the advice.

The three problems that are included in this consultancy advice can be summarized into the following problem definition: There is a lack of scientific, feasible and applicable knowledge on 'consumer motivations in relation to the consumption of sustainable foods', on 'vega(n) alternatives at the WUR restaurants' and on how to successfully implement the vega(n) alternatives.

1.6 Project purpose and research questions

1.6.1 Project purpose

The integrative purpose of our consultancy team is to provide the Green Office with convincing, applicable, feasible and scientific knowledge about consumer motivations in relation to sustainable foods, about vega(n) alternatives, and about interventions on promoting the consumption of sustainable foods. In order to stay within the scope of this consultancy project, the aim is to provide the Green Office with this knowledge, which they can use to influence the caterers and the consumers. The advice will differentiate between the four caterers, based on the observations, information gained in the dialogue with the caterers and the consumer study. This will make it easier for the Green Office to give clear guidelines towards the caterers and the contract manager.

1.6.2 Research questions

The project purpose leads to the main research question(Q), that can be answered by asking three sub-questions (Q1, Q2, Q3) which are based on the three challenges posed in the 'project specific problem definition'.

Q: *What scientific, applicable and feasible knowledge about consumer motivation and vega(n) alternatives can be used by the Green Office to increase the sustainable and healthy food offers at WUR restaurants in the long term?*

The following three sub-questions are directly related to answering the main research question. All sub-questions are further specified within the methodology of the specific studies that are conducted for the consultancy advice.

Q1: *What is the relation between consumer motivations for food choice, perception of sustainability, and the choice for specific food products at the WUR restaurants?*

Q2: *What vega(n) alternatives for the current food offer at WUR restaurants are sustainable, feasible and healthy?*

Q3: *What strategies have been proven effective to increase the consumption of vega(n) foods?*

2. Activities

In order to be able to answer the (sub-)research questions, multiple activities were undertaken to gather the necessary information. In this part, the general structure of the activities related (sub)research questions were discussed. The methodology of the separate activities will be explained in the chapters of the three independent studies.

The first sub-research question: "*What is the relation between consumer motivations for food choice, perception of sustainability, and the choice for specific food products at the WUR restaurants?*" is answered by gathering information on the motivations of the consumers of the four WUR restaurants. The first step in this consumer study was making a survey that was spread among the study population (students and staff of the WUR). A research was done on consumer motivations to make sure that the questions of the survey had a scientific foundation. Furthermore, the dialogues with the caterers and contract manager were partly used in the process of making the survey. By including input from both scientific literature and the dialogues, the survey is scientific and relevant for the stakeholders involved. When the consumer study was finished, the data was analysed and Q1 was answered. From this analysis, information was selected that is suitable for the advice and for the specific caterers.

The second sub-research question: "*What vega(n) alternatives for the current food offer at WUR restaurants are sustainable, feasible and healthy?*" was answered through a literature study. In this literature study, multiple subjects linked to sustainable, feasible and healthy vega(n) alternatives were researched and discussed. This study provided scientific and feasible knowledge, by researching specific values of a vega(n) and omnivore diet that determine their sustainability. Moreover, cost efficiency of vega(n) foods are were investigated. Finally, the information gathered in this literature study was translated into practice-oriented advice on which vega(n) foods are most suitable for implementation in the WUR restaurants.

The third sub-research question: "*What strategies have been proven effective to increase the consumption of vega(n) foods?*" were also answered through a literature study on past interventions in other restaurants and universities. This study mainly focused on providing scientific and applicable knowledge about how to make the consumers of the WUR more inclined to buy the vega(n) foods that are offered by the four restaurants. The results of this study contributed to providing practice-oriented advice on how to best promote the consumption of vega(n) foods.

The information gathered from the three sub-research questions will be used to formulate an advice for the Green Office on how to increase the vega(n) consumption at the four WUR restaurants. This advice will consist of a general advice and tailored advice specified on the four WUR restaurants individually. The general advice will look at the three different studies, and also integrate their findings in order to provide the most feasible recommendations. The tailored advice is included because the consultancy team saw bigger differences between the four caterers during the orientation phase than initially thought. After these activities, the consultancy team will have answered the main research question: "*What scientific, applicable and feasible knowledge about consumer motivation and vega(n) alternatives can be used by the Green Office to increase the sustainable and healthy food offers at WUR restaurants in the long term?*".

3. Literature Study: Sustainable Nutrition

3.1 Methodology

The literature for this study was collected from search engines such as Pubmed, Google scholar, WUR library and Scopus. For the literature search, several search terms were used in order to obtain information. The search queries for the literature study can be found in Appendix 1. During the literature research, articles were firstly selected based on the relevance of their title and abstract. Consequently, selected articles were qualified as relevant based on their introduction and conclusion. If an article did not qualify as relevant to the literature study after the selection procedure, it was discarded. Otherwise, it was used to obtain information for the literature study.

3.2 Results

The Food and Agriculture Organization of United Nations (FAO, 2010) defines sustainable diets as “diets with low environmental impacts, which contribute to food and nutrition security and healthy life for present and future generations. Sustainable diets are protective and respectful to biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources” (FAO, 2010). Due to the broad meaning of sustainable diets, this literature research focused on low environmental impacts, nutritional health, nutritionally adequacy of plant-based alternatives and feasibility. This, in order to answer the second research question; ‘What vega(n) alternatives for the current food offer at WUR restaurants are sustainable, feasible and healthy’. Therefore, this chapter consists of four parts; environmental impact of agriculture, sustainable alternatives for animal-based products, health regarding a plant-based diet and feasibility of plant-based nutrition. The aim of this study on sustainable diets was to lay scientific groundwork for the output and advice regarding the sustainable food options at WUR restaurants.

3.2.1 Environmental impact of agriculture

Food production is responsible for 20-30% of the total environmental impact, caused by humans (Tukker & Jansen., 2006). The food system related environmental impact include global greenhouse gas emissions, reactive nitrogen (ammonia and dinitrogen monoxide) emissions, water shortage and land degradation.

Animal-based production is associated with the greatest environmental impact of all food production processes (Hedenus et al., 2014; Steinfeld et al., 2006; Djekic, 2015). Even the animal products with the lowest environmental impact, have a higher impact than vegetable substitutes (Poore & Nemecek, 2018). The upcoming chapter will elaborate on the different impacts on the environment.

3.2.1.1 Land use in livestock feed

At present, around 83% of world’s farmland is used for meat, aquaculture, eggs and dairy, despite the fact that it only provides 37% of our dietary protein and 18% of our total caloric intake (Poore et al., 2018). In order to feed people animal protein, more farmland is needed, compared to a diet consisting of plant proteins (Lappé et al.,2011).

A reduction in the production of animal-based products will result in reduced demand for feed and land use (Westhoek et al.,2014). By reducing the consumption of meat and dairy products in the European Union (EU) with 50%, the animal feed production will decrease from 520 million to 285 million tonnes in European Union. As a result, the land that is currently used for livestock feed will be available for other purposes. This corresponds to 9.2 million hectares in permanent grassland and 14.5 million hectares in arable land (Westhoek et al.,2014).

3.2.1.2 Water use

Fresh water is an increasingly scarce natural resource all over the world. It is estimated that 64% of the population will live in water-deficient areas by the year of 2025 (Steinfeld et al.,2006). The aquaculture industry has developed to a large extent, however, it has not considered the growing problem of water scarcity (McMurtry et al.,1997). Animal husbandry is the main cause of water shortage (Steinfeld et al.,2006). Animal-protein requires 100 times more water than production of an equal amount of plant-protein. Livestock related agricultural irrigation accounts for 85% of freshwater use. This water is mostly used for animal feed, which is an inefficient use of natural resources and not sustainable to provide food for future generations (Pimentel & Pimentel, 2003; Joyce, Dixon, Comfort & Hallet, 2012).

3.2.1.3 Nitrogen

An increased use of nitrogen fertilizers enables the food production to produce enough to support the rapidly growing population, and also to support the increasing total consumption of meat and milk per capita (Bouwman et al., 2013). However, a significant fraction of nitrogen is emitted to the environment and not used by the crops. For example, a study done in Norway found that agricultural nitrogen input is lost with 90% from cultivation to the consumers plate (Bleken & Bakken,1997). This has led to many negative effects on the environment, such as groundwater pollution, increased frequency and severity of harmful algal blooms, eutrophication and acidification of the land, and fish deaths (Bouwman et al., 2013). With a reduction of 50% of all meat and dairy consumption, the emissions of nitrates and ammonia in groundwater and surface water would decline by 40%, leading to an improvement of water pollution and a reduced risk of nitrogen enrichment in water (Westhoek et al., 2014).

3.2.1.4 Air pollution

The livestock sector contributes to GHG emissions by emitting dinitrogen monoxide (N_2O), methane (CH_4), carbon dioxide (CO_2) and ammonia, which leads to global warming (Friel et al., 2009). Animal-based production causes around one-fifth of global GHG emissions, which is higher than GHG emission caused by transport (Eshel et al.,2014; Steinfeld et al.,2006). Among these emissions, livestock sector account for 65% of N_2O, mostly from manure, 37% of CH_4, mostly from enteric fermentation and manure, 9% of CO_2, mostly from changes in land use like deforestation, and 64% of ammonia emissions, from livestock excreta (Joyce, Dixon, Comfort & Hallet, 2012; Steinfeld et al., 2006; Webb & Misselbrook, 2004). Net GHG emissions associated with agricultural production would be decreased by 42% when meat and dairy consumption decreases by 50% in EU (Westhoek et al.,2014).

3.2.1.5 Energy use

The food system accounts for a significant portion of the total energy use and GHG emission when producing, transporting, processing and marketing foods all over the world. (González et al.,2011) In the Netherlands, the food sector consumes about 17% of the total energy use (Reijnders & Soret, 2003). Research shows that energy use and GHG emissions for animal-based productions are higher than those for plant-based products. For example, in Sweden, beef production shows the highest energy usage (82MJ/kg) and more GHG emission (20 kg CO_2 eq./kg), while cereals production uses for energy only 2.6 MJ/kg and only produces 0.43 kg CO_2 eq./kg GHG emission. The protein delivery efficiency, which is the amount of protein production per energy use or per GHG emission, was for plant-based products higher than that for animal-based products. This means that vegetables use less energy and cause less GHG emissions than meat when producing the same amount of protein (González et al.,2011). Fossil fuels are important non-renewable natural resources (Reijnders & Soret,2003). Fossil fuel input for all animal protein production, is 25 kcal per 1 kcal of animal protein produced. This amount of fossil fuels used, is 11 times greater than the amount of fossil fuel used for plant-based protein production, like grains (Pimentel & Pimentel, 2003). Similar findings from another research show that animal-based production also requires 2.5 - 50 times more fossil fuel usage than soy production (Reijnders & Soret,2003).

3.2.1.6 Comparison of the environmental impact of different food groups

As elaborated on above, there is a big variation towards the impacts caused among different foods. The provision of a comparative overview on which food products are most adequate, concerning the environmental and health perspectives, enables to compose sustainable and healthy meal offers.
A recent study from Poore et al, (2018) compared different food groups and created an overview on their impact on the environment in the form of GHG emission, land use, acidification, eutrophication and water use. This overview can be found in the Appendix 5 figure 1.

Beef (beef herd), crustaceans (farmed), cheese and pork have a very high contribution to GHG emissions, land use, acidification, eutrophication and water scarcity (Poore et al, (2018). Ideally, less consumption of these food products would lead to a lower environmental impact. Restricting to only poultry and eggs as animal-based protein sources would result in an improvement in the environmental impact of meals (Nijdam, Rood & Westhoek, 2012; Poore et al, 2018). Although, this impact could be even more reduced by replacing animal-based products by plant-based products like tofu, pulses, peas and legumes, which are shown to have a low impact on the environment (Stagnari, Maggio, Galieni & Pisante, 2017; Davis, Sonesson, Baumgartner & Nemecek, 2010; Nijdam, Rood & Westhoek, 2012).
Cow's milk, compared to soy drink, has the highest impact on the environment on all five elaborated impacts above (Poore et al. 2018). The replacement of milk with plant-based options like soy drink could lead to a reduction in environmental impact, since these alternatives cause much lower GHG emissions, land use, acidification, eutrophication and scarcity of water. For the food group carbohydrates, like cassava, rice, oats, potatoes, maize, wheat and rye, GHG emission are much lower than GHG emissions caused by animal products (Poore et al. 2018).

Overall, it is possible to conclude that reducing the offer of animal products is going to provide the highest reduction in the environmental impact. Multiple studies found that the diet of meat-eaters causes a GHG emission that was twice as high as the GHG emission caused by vegan diets (Scarborough et al, 2014; Segovia-Siapco & Sabaté, 2018; Aleksandrowicz et al. 2016). The beneficial effect on reduced carbon footprint that a vegetarian and vegan diet bring about, makes a diet switch seem like a good way to address environmental sustainability and global food supply (Segovia-Siapco & Sabaté, 2018; Aleksandrowicz et al. 2016).

3.2.2 Sustainable alternatives for animal-based products

The previous chapter showed that plant-based food options have a lower impact on the environment compared to animal-based foods. This chapter examines the nutritional aspects of alternatives for meat, dairy and eggs to support a plant-based diet. During the literature study, no information was found on plant-based alternatives for fish, and will, therefore, not be discussed. The focus of this chapter lies on protein content, since consumed protein consists of around 70% of animal origin protein (FAO, n.d.).

3.2.2.1 Plant-based meat alternatives

Having meat included in the diet can be beneficial, since it is high in protein, and proteins are essential for the human body (Berg, Tymoczko & Stryer, 2002). Proteins function as catalysts, storing molecules, transport molecules, provide immune protection, provide mechanical support, transmit nerve impulses, control growth and differentiation, and they generate movement within the body (Berg, Tymoczko & Stryer, 2002).
When obtaining a plant-based diet, other protein sources should be considered in order to meet the recommended daily intake of protein. The recommended intake is 0.8 grams of protein per kilogram of body weight per day for healthy people, regardless of age (Voedingscentrum, n.d.). According to Neacsu, Mcbey & Johnstone (2017), plants high in protein are a good replacement for animal-products in the human diet. Legumes, pulses and cereals are plant-based protein sources that contain high amounts of proteins. Pulses and legumes are one of the most nutritious, accessible and conventional protein sources. Examples of plant sources high in protein are soybeans (30 g/100g protein), lupine (31.2 g/100g protein), lentils (24.2 g/100g protein) and cowpeas (23.4 g/100g protein). Meat products on the other hand, like beef or veal, chicken, and pork, have a protein content of 17.7 g/100 g, 20 g/100 g and 11.9 g/100g respectively (Neacsu, Mcbey & Johnstone, 2017). Fish also has a high protein content, however, the content depends on the type of fish. Tuna, mackerel, swordfish and skipjack are some examples of fish high in protein (27 g/100g).

The quality of plant-based proteins is lower than animal-based protein (Voedingscentrum, n.d.). Proteins in meat consist of a good balance of essential amino acids, whereas proteins obtained from one plant source consist of a lower variety of essential amino acids (Neacsu, Mcbey & Johnstone, 2017). However, the essential amino acids in cereal and legume proteins complement each other in the diet. A sustainable diet balanced in amino acids can be achieved by complementation and diversification of plant-based proteins. However, due to the lower quality of plant-based proteins, a 20% to 30% higher amount of protein respectively is recommended for vegetarians and vegans, in order to have a sufficient intake of protein (Voedingscentrum, n.d.).

Besides high protein content, meat has a good taste, is a large contributor in the food industry and is highly nutritious (Asgar et al. 2010). Properties of meat, like appearance, mouthfeel and texture, depend on the functionality of the protein. Meat analogues are products that resemble functional properties of meat like appearance, flavour, texture, and colour, without using animal-based proteins (Asgar et al. 2010). There is a widespread variety of sources of plant-based foods that are being used in meat analogues like textured soy protein, mushrooms, wheat gluten (e.g. seitan), nuts, cereal protein, vegetables, mycoproteins and pulses.
Using plant-based proteins in meat analogues is not only causing a lower intake of cholesterol and saturated fats, but it also adds more fibres, saponins, phytosterols, phytochemicals, protease inhibitors and isoflavones to the diet, which have beneficial effects on human health (Kumar et al. 2017).

3.2.2.2 Dairy and egg alternatives

Milk

Cow's milk is a widely consumed beverage, that is known for its provision of all the major nutrients like carbohydrates, proteins, and fats (Vanga & Raghavan, 2018). However, drinking cow's milk also has some downsides, like presence of pathogens like salmonella spp. and E. coli, which can cause wide spread disease outbreaks. Dairy products are also a source of short chain fatty acids (SFAs) and cholesterol, which can negatively affect human health (Siri-Tarino, Sun, Hu & Krauss, 2010; Piironen, Toivo & Lampi, 2002). In terms of sustainability, plant-based milk alternatives, such as almond drink and soy drink, have environmental advantages over dairy milk (Grant & Hicks, 2018). Furthermore, some people, such as infants, children, African people and Asian people, are prone to having cow's milk allergy or lactose intolerance, which affects human health (Vanga & Raghavan, 2018; Bahna, 2002). For milk, there are several plant-based alternatives, such as almond drink, soy drink, coconut drink, rice drink and oat drink (Vanga & Raghavan, 2018; Consumentenbond, n.d.). Table 3, shows the comparison of the nutrient profile of the different plant-based milk alternatives and cow's milk.

Table 3. Nutritional value of cow's milk and plant-based milk alternatives, with data from the Dutch website of 'Consumentenbond (n.d.)'.

Average (per 100 mL)	Low fat milk	Soy drink	Rice drink	Almond drink	Coconut drink	Oat drink
Energy	46.0 kcal	38.0 kcal	55.1 kcal	20.1 kcal	44.0 kcal	46.3 kcal
Saturated fats	1.0 g	0.3 g	0.2 g	0.1 g	1.4 g	0.2 g
Unsaturated Fats	0.5 g	1.6 g	1.0 g	1.2 g	0.2 g	0.9 g
Sugars	4.7 g	1.4 g	6.1 g	1.1 g	4.1 g	4.1 g
Fibres	0.0 g	0.5 g	0.2 g	0.3 g	0.3 g	0.7 g
Proteins	3.4 g	3.3 g	0.3 g	0.5 g	0.2 g	0.6 g
Salt	0.11 g	0.1 g	0.09 g	0.12 g	0.11 g	0.1 g

Calcium	123.0 mg	73.0 mg	45.0 mg	77.6 mg	0 mg	60.0 mg
Vitamin B2	0.45 mg	0.05 mg	0 mg	0.11 mg	0 mg	0.04 mg
Vitamin B12	0.45 ug	0.13 ug	0.14 ug	0.25 ug	0 ug	0.09 ug
Vitamin D	0 ug	0.19 ug	0.28 ug	0.44 ug	0 ug	0.19 ug

Values are highlighted in order to compare the plant-based milk alternatives with the nutritional values of cow's milk. Green highlighted means 'comparable or better value than cow's milk', orange highlighted means 'values are less adequate than cow's milk', and red highlighted means 'values are worse than cow's milk'.

Almond drink is lower in calories than cow's milk, but has a balanced nutrient profile. It is also high in polyunsaturated fatty acids (PUFAs) and monounsaturated fatty acids (MUFAs), and low in SFAs (Vanga & Raghavan, 2018). Soy drink is also high in PUFAs and MUFAs, and low in SFAs. It's nutrient profile, protein content, and calorie count is similar to that of cow's milk. Oat drink has a nutrient profile quite similar to soy drink, however, has a lower protein content and is higher in sugars, and thus in energy. Coconut drink is high in saturated fats and contains little carbohydrates and protein. Rice drink is high in sugar, and thus high in calories, and it contains very small amounts of fat and protein.

Based solely on nutrient profile, soy drink would be the best plant-based alternative for cow's milk, since it has a similar nutrient profile. Oat drink would also be a suitable choice, however, it is low in protein compared to soy drink or cow's milk. When choosing almond drink, the right amount of various essential nutrients should be obtained through other sources in the diet, since it is not as rich in calories as the cow's milk. Rice drink and coconut drink are not suitable to be consumed as cow's milk alternative, because of the limited nutrient content and diversity (Vanga & Raghavan, 2018).

Butter

Dairy butter is rich in saturated fats and cholesterol, which causes health concerns (Gorrepati, Balasubramanian & Chandra, 2014). Per 100 grams of dairy butter, an amount of 55 grams saturated fat and 222 milligrams of cholesterol can be found. Therefore, there is a preference for a healthier and plant-based alternative. A plant-based alternative for dairy butter is butter made from nuts or seeds. Some examples of nut or seeds butters are almond, cashew, hazelnut, sunflower, sesame, peanut and soy butter. The plant-based butters are lower in overall fat content, and saturated fat content (Gorrepati, Balasubramanian & Chandra, 2014, Thomas & Gebhardt, 2010). Additionally, plant-based butters contain more protein than the dairy butter. Calcium content on the other hand, is lower in hazelnut butter, sunflower butter, and the reduced fat version of peanut butter (Gorrepati, Balasubramanian & Chandra, 2014)

Cheese & eggs

Despite the fact that plant-based alternatives for cheese and eggs are rising on the market, literary studies on the nutritional value of plant-based alternatives for cheese and eggs are lacking (Nederlandse vereniging voor veganisme, n.d.). Replacements for products like cheese, cheese sauce and cream cheese are available on the Dutch market. For eggs, plant-based alternatives could be more beneficial for human health, since one large yolk of an egg contains around 275 mg of cholesterol, which is close to the recommended maximum intake of cholesterol of 300 mg per day (Spence et al, 2010; Alasfoor, Rajab & Al-Rassasi, 2007). On the website of the Dutch association of veganism, different options for egg replacement

are suggested. Replacers used for making an omelet for example, are tofu and silken tofu, or chickpea flour mixed with water (Nederlandse vereniging voor veganisme, n.d.). For substitution of egg in baking, several food products are suggested to be good replacement for eggs. For binding, products like bananas, applesauce, puree from tomatoes, pumpkin or potatoes, flour made from maize, potato or chickpeas and agar are mentioned. For rising, products like aquafaba, baking powder or flaxseed could be used.

3.2.3 Health regarding a plant-based diet

An omnivorous diet contains meat, dairy, fish and eggs, whereas these products are not a part of a vegan diet (Pills, Stec, Zych & Pilis, 2014). A vegetarian diet does contain dairy and eggs, but no fish, poultry or meat. A vegan diet is completely plant-based with no animal derived products at all. The intake of the amount of nutrients differs between a vegan, vegetarian and omnivorous diet (Clarys et al, 2014; Larsson & Johansson, 2002). The nutrients in both vegan and omnivorous diets, and effect on human health, are discussed in this chapter.

3.2.3.1 Omnivorous diet and plant-based diet

A partial plant-based diet, i.e. a vegetarian diet, has been shown to be an effective way to reduce body mass index, improve plasma lipid profile, protect against several types of cancers, and decrease arterial diseases like high blood pressure, stroke, metabolic syndrome, atherosclerosis and cardiovascular disease, compared to an omnivorous diet (Pills, Stec, Zych & Pilis, 2014; Le & Sabaté, 2014; Chen et al, 2018). A fully plant-based diet, compared with a vegetarian diet, seems to have additional protection for obesity, type 2 diabetes mellitus, hypertension, and cardiovascular mortality (Le & Sabaté, 2014).

Clarys et al (2014) and Larsson & Johansson (2002), found that the intake of nutrients differs between a vegan and omnivorous diet. The data on the nutrient intake across the dietary patterns has been collected and shown in table 4. In this chapter the data of the nutritional intake of the vegan diet and omnivorous diet are elaborated.

Table 4. Nutritional intake across the dietary patterns vegan, vegetarian, semi-vegetarian, pesco-vegetarian and omnivores (Clarys et al, 2004).

Macro- and Micronutrients	Vegans		Vegetarians		Semi-Vegetarians		Pesco-Vegetarians		Omnivores		p_{anova}
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Absolute Intake											
Total energy (kcal)	2383 ^{a,b,c,d}	804	2722 ^{a,e}	875	2849 ^{b}	858	2744 ^{c}	797	2985 ^{d,e}	1029	<0.001
Total fat (g)	68 ^{a,b,c,d}	36	96 ^{a,e}	43	107 ^{b,e,f}	45	99 ^{c,g}	39	122 ^{d,f,g}	53	<0.001
Saturated fat (g)	21 ^{a,b,c,d}	11	41 ^{a,e,f}	21	47 ^{b,e,g}	22	43 ^{c,h}	19	54 ^{d,f,g,h}	25	<0.001
Mono-unsaturated fat (g)	19 ^{a,b,c,d}	12	31 ^{a,e,f}	15	36 ^{b,e}	17	32 ^{c,g}	14	46 ^{d,f,g}	21	<0.001
Poly-unsaturated fat (g)	28 ^{a}	17	24	14	24	12	24	13	22 ^{a}	11	<0.001
Cholesterol (mg)	149 ^{a,b,c,d}	92	275 ^{a,e,f}	125	321 ^{b,e,g}	132	296 ^{c,h}	111	376 ^{d,f,g,h}	169	<0.001
Carbohydrates (g)	336	106	343	105	334	96	331	96	322	108	ns
Sugar (g)	156	61	162	65	155	60	154	52	149	60	ns
Fibers (g)	41 ^{a,b,c,d}	14	34 ^{a,b}	14	34 ^{b,e}	12	33 ^{c,f}	13	27 ^{d,b,e,f}	10	<0.001
Proteins (g)	82 ^{a,b,c}	39	93 ^{d,e}	37	103 ^{a,d}	36	100 ^{b}	33	112 ^{c,e}	45	<0.001
Alcohol (g)	7 ^{a}	12	13 ^{b}	17	11 ^{c}	15	15 ^{d}	19	21 ^{a,b,c,d}	22	<0.001
Sodium (mg)	1316 ^{a,b,c,d}	666	2228 ^{a,e,f}	1013	2679 ^{b,e,g}	1156	2371 ^{c,h}	1047	3296 ^{d,f,g,h}	1525	<0.001
Calcium (mg)	738 ^{a,b,c,d}	456	1465 ^{a,e}	819	1470 ^{b,f}	712	1470 ^{c}	765	1199 ^{d,e,f}	682	<0.001
Iron (mg)	23 ^{a,b,c,d}	10	20 ^{a,e}	8	20 ^{b}	6	20 ^{c}	7	17 ^{d,e}	6	<0.001
Nutrient Density											
Total fat (E%)	25 ^{a,b,c,d}	8	31 ^{a,e,f}	7	33 ^{b,e,g}	6	32 ^{c,h}	7	36 ^{d,f,g,h}	7	<0.001
Saturated fat (E%)	8 ^{a,b,c,d}	3	13 ^{a,e,f}	4	14 ^{b,e,g}	4	14 ^{c,h}	4	16 ^{d,f,g,h}	3	<0.001
Carbohydrates (E%)	57 ^{a,b,c,d}	8	51 ^{a,e,f,g}	8	48 ^{b,e,h}	7	49 ^{c,f,i}	7	44 ^{d,g,h,i}	8	<0.001
Sugar (E%)	27 ^{a,b,c,d}	9	24 ^{a,e,f}	7	22 ^{b,e,g}	6	23 ^{c}	6	21 ^{d,f,g}	8	<0.001
Proteins (E%)	14 ^{a}	4	14 ^{b,c,d}	3	15 ^{b}	3	15 ^{c}	3	15 ^{a,d}	3	<0.001
Sodium (mg/1000 kcal)	546 ^{a,b,c,d}	202	815 ^{a,e,f}	261	934 ^{b,e,g}	272	859 ^{c,h}	244	1095 ^{d,f,g,h}	308	<0.001
Calcium (mg/1000 kcal)	306 ^{a,b,c,d}	136	530 ^{a,e}	212	512 ^{b,f}	173	531 ^{c}	204	406 ^{d,e,f}	185	<0.001
Iron (mg/1000 kcal)	10 ^{a,b,c,d}	2	8 ^{a,e,f}	2	7 ^{b,e,g}	2	7 ^{c,h}	1	6 ^{d,f,g,h}	1	<0.001

$^{a-h}$ Dietary patterns with the same superscripts differ significantly in the post hoc test ($p < 0.01$).

Compared to people with a plant-based diet, omnivorous diets result in higher intake of saturated fatty acids (SFAs), cholesterol, sodium, calcium, protein, vitamin B12, vitamin D, selenium and overall energy (calories) (Larsson & Johansson, 2002; Clarys et al. 2014). Calcium, vitamin B12, vitamin D and selenium are essential nutrients for the vitality of the body (FAO, 2001). The detailed functions in the human body, and their dietary sources, are further explained in Appendix 6.
In an omnivorous diet, high intake of sodium, cholesterol and SFAs might be of concern, since this could have negative effects on human health (Larsson & Johansson, 2002; Clarys et al. 2014; Ha, 2014; Ma, 2004; FAO, 2006) . For example, high sodium intake has negative effects on human health, since it increases blood pressure, and with that, it is related to cardiovascular mortalities (Ha, 2014). The maximum recommendation for salt intake of maximum of 5 grams per day was not exceeded in the study of Clarys et al. (2014) (Alasfoor, Rajab & Al-Rassasi, 2007). However, Larsson & Johansson (2002) found an exceedance of the maximum recommendation in both vegan and omnivorous diet.

Since Cholesterol can have a negative effect on human health, a standard recommended maximum intake is set at 300 mg of cholesterol per day (Ma, 2004); Alasfoor, Rajab & Al-Rassasi, 2007). However, the mean intake of cholesterol in omnivores is above 300 mg (Larsson & Johansson, 2002; Clarys et al. 2014). In the human body, cholesterol is needed for nerve insulation, production of certain hormones and as a component of the cell membranes (Ma, 2004). However, since the body itself is able to produce cholesterol, obtain this from the diet is not needed. Therefore, consumption of dietary cholesterol source, which is mostly of animal origin, like eggs, red meat, dairy products and shrimp, is adding unnecessary cholesterol to the diet and the body (Ma, 2004). Excessive amounts of cholesterol in the blood can lead to the formation of plaque in the arteries. Plaque is a thick and hard fatty deposit on the artery wall, that causes the arteries to become less flexible, thicker, harder, which eventually leads to slowing down or stopping of the blood flow through the artery.
Cholesterol and SFAs have been associated with increased risk of cardiovascular disease, since SFAs are adding to the low-density lipoprotein (LDL) cholesterol, and with that, increase serum total cholesterol (Kuipers et al. 2011; Siri-Tarino, Sun, Hu & Krauss, 2010; Alasfoor, Rajab & Al-Rassasi, 2007). However, in the case of SFAs, the effect on the body differs among the type of SFAs (FAO, 2006). SFAs accumulation in the body leads to chronic systemic low-grade inflammation (Kuipers et al. 2011). As a consequence of SFAs consumption, insulin resistance, atherogenic dyslipidemia and reallocation of energy-rich substrates can be promoted, which eventually leads to the increased risk of CVD. The SFA accumulation could eventually lead to atherogenic dyslipidemia, which is an independent risk factor for CVD (FAO, 2006; Manjunath et al. 2013).

As a part of the omnivorous diet, meat is a good source of nutrients like protein, (heme)iron, vitamin B12, other vitamin B complexes, selenium, phosphorus and zinc, which are all essential for the body (Pereira & Vicente, 2013; Godfray et al. 2018; FAO, 2001). On the other hand, meat, but also dairy and eggs, are high in SFAs and cholesterol (Siri-Tarino, Sun, Hu & Krauss, 2010; Ma, 2004; Piironen, Toivo & Lampi, 2002). Therefore, when taking into account the health effects of SFAs and cholesterol, an omnivorous diet could be considered as unhealthy.

With a plant-based diet on the other hand, intake of iron, folate, vitamin C, vitamin E, magnesium, PUFA, and dietary fibres were found to be higher compared to an omnivorous diet (Larsson & Johansson, 2002; Clarys et al, 2014). Iron, folate, vitamin C, vitamin E and magnesium are all essential for the human body processes (FAO, 2001). Also these nutrients' dietary sources and functions in the body are further discussed per nutrient in Appendix 6.

By switching diets towards a more plant-based diet, PUFA intake could become higher (Larsson & Johansson, 2002; Clarys et al. 2014). PUFAs can be subdivided into two groups, namely omega 3 and omega 6 fatty acids (Voedingscentrum, n.d.). These two nutrients are proven to protect against and decrease the risk on CVD, and are part of a healthy diet. Substitution of SFAs with PUFAs has been proven to be beneficial for the cardiovascular system, since it decreases the concentration of LDL cholesterol in the blood, and also the total/HDL cholesterol ratio (Siri-Tarino, Sun, Hu & Krauss, 2010; FAO, 2006). By replacing SFAs with MUFAs, a similar effect was found to be effective in reducing concentrations of LDL cholesterol and total/HDL cholesterol ratio. Furthermore, a diet high in fibres and low in saturated fat and cholesterol causes a decrease in LDL cholesterol (Jenkins et al. 1993)

The increased dietary fibre intake that comes with a plant-based diet, is beneficial for the human body, since it is proven to decrease the incidence of several diseases, like CVD, colon cancer and type 2 diabetes mellitus (Voedingscentrum, n.d.). Furthermore, it is beneficial for the digestion and causes satiation. Dietary fibre is part of a plant material that is resistant to enzymatic digestion (Dhingra, Michael, Rajput & Patil, 2012). Dietary fibre can be obtained from fruits, vegetables, potatoes, legumes, whole wheat bread, nuts and cereals (Dhingra, Michael, Rajput & Patil, 2012; Voedingscentrum, n.d.).

3.2.3.2 Nutrients of concern in a plant-based diet

Some nutrients that are of concern when following a plant-based diet, are vitamin D, selenium, omega 3, calcium, iron, vitamin B12 and zinc (Venderley & Campbell, 2006; Pills, Stec, Zych & Pilis, 2014; Joyce, Dixon, Comfort & Hallet, 2012; Craig, 2010). What is more, in the study of Larsson & Johansson (2002), actual inadequate intakes of vitamin B12, vitamin D, calcium and selenium were measured in people with a vegan diet. Although animal products are the main sources for these nutrients, they can also be obtained in other ways that are suitable for vegans (Venderley & Campbell, 2006, Craig, 2010). These alternative sources are shown in table 5. Their function in the human body is explained in Appendix 6.

Table 5. Plant-based sources for the nutrients, vitamin D, selenium, omega 3, calcium, iron, vitamin B12 and zinc.

Nutrient	Plant-based source
Vitamin D	Shiitake mushrooms, skin exposure to UV-B light radiation, vitamin D supplementation (Holick, 2007).
Selenium	Nuts (especially paranuts), whole grain cereals, vegetables (FAO, 2001).
Omega 3	Plant oils, seeds (Chia seeds, hemp seeds, walnuts, brazil nuts), algae (Saini & Keum, 2018; Voedingscentrum, n.d.)
Calcium	Nuts, légumes, green vegetables (Voedingscentrum, n.d.).
Iron	Bread, Whole wheat products, dark green vegetables, nuts, légumes (Voedingscentrum, n.d.).
Vitamin B12	Dried seaweed, algae, shiitake mushrooms, fortified foods, vitamin B12 supplements (Voedingscentrum, n.d.; Watanabe, 2007; Watanabe, Yabuta, Bito & Teng, 2014).
Zinc	Cereals, légumes, pulses, whole grains, tofu, tempeh, seeds, nuts (Voedingscentrum, n.d.; Saunders, Craig & Baines, 2013; FAO, 2001).

3.2.4 Feasibility of plant-based nutrition

Numerous studies have shown that the food demand will roughly double by 2050 (Ray et al., 2013; Tomlinson, 2013). Food prices are predicted to rise by 70-90 percent by 2030 (de Boer, and van Bergen, 2012) and this could promote violent conflicts and migration (Carrington & Vidal, 2011). Especially the lowest income households tend to be hit the hardest by changes in affordability of the food prices (Beddington, 2011). However, according to Oxford Martin School researchers (2016), a diet switch to a more plant-based diet could save up to 8 million lives by 2050, reduce GHG emissions by two thirds, lead to health-care related savings and avoided climate damages of 1,5 trillion US dollars (Springmann, Godfray, Rayner & Scarborough, 2016).

Protein prices

A promising solution for soaring food prices may be offered by partial substitution in the human diet of animal-based proteins with plant protein products (Smil, 2000). Plant obtained proteins are in general cheaper than proteins of animal origin (Kumar et al. 2017; Asgar et al. 2010). Due to animal metabolism, 1 kilogram of meat protein is produced out of an average of 6 kilograms plant protein (Smil, 2000; Pimentel and Pimentel, 2003). Even though the type of meat matters, the conversed inefficiency of transferring plant protein into animal protein makes meat responsible for a big share of environmental pressure and food prices (Aiking, 2011).
Moreover, plant-based proteins are comparatively stable and cheaper in price, since they are less affected by seasonal fluctuations in supply (Kumar et al. 2017; WRI, 2016). According to the World Resources Institute (WRI) (2016), all plant-based proteins fall under the lowest retail price, which is less than 2,5 cents per gram of protein, except for nuts. On the other hand all meat, fish and dairy fall under the middle or highest retail price, 2,5 - 4 cents or 4 - more cents per gram of protein, respectively. The cheaper retail price for plant-based protein is likely to

be in favour of the profitability for the buyer, e.g. caterers. Furthermore, plant-based proteins are stored easier and the shelflife is longer compared to animal-based proteins (Kumar et al. 2017).

Current trends

The amount of studies about the environmental impact of meat and dairy is rising. Also, awareness of plant-based diets is increasing, based on the fact that the search term 'vegan' has increased with 85% from january 2004 to january 2019 (Google Trends, n.d.).

Moreover, the amount of meat substitutes is rapidly increasing and very successful in the market. Meat substitute sales grew by 451% in the European market in the four years preceding February 2018 (Teixeira, 2018). One amongst many successful cases, is America's largest meat processor Tyson Foods, who invested in the vegan brand "Beyond Meat". They had a stock increase of 170% (CBS, 2019).

3.3 Discussion Sustainable Nutrition

Within the discussion, an interpretation will be given regarding the results. The description of the discussion will be divided in the major findings, importance of the findings, weaknesses and strengths.

3.3.1 Major findings

The impact of animal-based products on the environment appears to be larger than the impact of plant-based products. Therefore, a shift towards more plant-based diets like vegetarian and vegan diets have been found to cause a high reduction in environmental impact.

Animal-based protein in meat could be replaced by more sustainable plant-based protein sources like legumes, pulses and cereals. The protein content of such plant-based foods is higher than the protein content of meat. However, the quality of plant-based proteins is lower than animal-based proteins, since their amino acid content compensate each other. Therefore, a balanced consumption of cereals, legumes and pulses is recommended. Cow's milk could also be replaced by plant-based alternatives. Solely based on nutrient balance, soy drink is the best alternative, but almond drink and oat drink are also nutritious plant-based alternatives for cow's milk. Dairy butter can be replaced with plant-based butters, like soy butter or almond butter. Examples for plant-based alternatives used for eggs nowadays are tofu, silken tofu and chickpea flour, for mimicking an omelet. Bananas, applesauce, certain types of puree, certain types of flour, aquafaba, baking powder and flaxseed are used for egg replacement in baking.

A plant-based diet has beneficial effects on health by decreasing the risk of several metabolic diseases. Nutrient intake differs between an omnivorous diet a plant-based diet. Nutrients of concern in omnivorous diets are high intake of saturated fats, cholesterol, and sodium, since high intakes can deteriorate human health. On the other hand, nutrients of concern in plant-based diets are low intake of vitamin D, selenium, omega 3, calcium, iron, vitamin B12 and zinc, since intake of these nutrients are inadequate, however, essential. Remarkably, these nutrients can easily be obtained from plant-based sources, such as légumes, pulses, whole grain cereals, nuts, seeds, tofu and algae.

The prices of animal-based products are higher than plant-based products due to efficiency, price stability, longer shelf life and cheaper retail prices. Furthermore, a rise in the

amount of successful plant-based meat substitutes have been observed during the last few years.

3.3.2 Importance of the findings

The nutritional knowledge helps to substantiate the advice, regarding the importance, feasibility and safety of a vega(n) diet. This is important, because it can help to motivate different stakeholders to increase the vega(n) food offer.

3.3.3 Limitations

Due to a limited amount of time for the project, literature research on the sustainability was restricted to the environmental impact, nutritionally healthy, nutritionally adequacy and affordability. Some aspects that determine the sustainability of a product, like cultural acceptability, accessibility, economically fair and biodiversity, could not be taken into account. Another limitation of the literature study on sustainable nutrition is that there was no access to literary articles on plant-based alternatives for cheese, eggs and fish. Therefore, it is not possible to advice caterers on replacement alternatives on these food products, despite the fact that these products need to be replaced in order to become more sustainable. Furthermore, there were no studies found that actually discussed sustainable dishes or recipes. Therefore, the recipes that eventually are provided for the caterers, are based on the ingredients that were found to be more sustainable than animal-based products.

3.3.4 Strengths

The literature study on sustainable nutrition is based on many recent studies. Furthermore, when searching for plant-based alternatives, animal-based food products that are the most troubling for the environment were discussed. Also, when looking at the nutrient profile of an omnivorous diet and a plant-based diet, all nutrients were taken into account and elaborated extensively. The risk of a limited nutritional intake within a vega(n) diet, as well as the possible superfluous nutrition intake within an omnivorous diet was taken into account. This way, both options are explained as objective as possible, without judgement of the diets.

3.4 Conclusion

This literature study aimed to answer *Q*2: ‘What vega(n) alternatives for the current food offer at WUR restaurants are sustainable, feasible and healthy?’. A plant-based diet has been found to be the most beneficial when looking at the impact on environment, availability of sustainable ingredients, effect on human health and feasibility.

4. Literature Study: Review of interventions for sustainable diets

This literature study aims to answer research question three: “What strategies have been proven effective to increase the vega(n) food supply and consumption?”. To answer this research question, past interventions within the literature are used to gain insight in strategies to increase the vega(n) consumption at the WUR.

Everyday food behaviour of consumers is heavily influenced by habits (Klöckner & Blöbaum, 2010). However, in a study conducted by Klöckner and Zur (2014), it was found that it was possible to deviate from habits under certain conditions when someone wants to make an effort for dietary change. It was confirmed that a reduction of meat consumption can be motivated by moral and health aspects. Different tools are used in order to study the motivation and food choice of consumers. This part will focus solely on the food behaviour of consumers, whereas the consumer study will focus on the motivation of consumers.

Two types of tools are often used when studying behaviour and behaviour change. One of these tools is nudging: “Any aspect of the choice architecture that alters people’s behaviour in a predictable way, without forbidding any options or significantly changing their economic incentives” (Thaler & Sunstein, 2008, p. 6). In addition to that, nudging has a more empirical foundation in psychology and economics than other health promotion methods that are similar (Vallgarda, 2012). The other popular tool that is used to influence behaviour is by providing information. This way, it is possible for the consumer to make a well-balanced choice. These tools can be used in strategies to motivate consumers to increase their vega(n) food consumption and elaborated further below.

4.1 Methodology

This literature was gathered through search engines such as *Scopus*, *WUR library* and *Google Scholar.* Relevant search terms are used to look for literature and can be found in Appendix 1. The process of selecting relevant literature was done according to the following selection steps. The first step is reading the title, the second step the abstract and the last step the introduction and conclusion of the article. When an article did not seem relevant during one of these three steps, the article was discarded. When the literature was selected, relevant information was subsequently selected from the paper.

4.2 Results

4.2.1 Nudging

About 45% of everyday behaviours is non cognitive, which makes the nudging method more interesting, as it is steering people unconsciously without restricting them (Verplanken & Wood, 2006). According to Lehner, Mont and Heiskanen (2016), nudging can help reduce negative environmental impacts of food consumption to a certain extent.

A study that makes use of nudging as a food strategy is the study of Verena Kurz (2018) to motivate consumers in choosing vegetarian meals. Her study took place in two restaurants of the university of Gothenburg, Sweden. Three warm dishes were selected for the study and

presented to the consumers on a menu in both restaurants. One dish was vegetarian and the two other dishes contained either meat or fish. The only aspect that differed between the menus of the restaurants, were the placement of the dishes on the menus. In the first restaurant, the vegetarian meal was placed on top of the menu followed by the other non vegetarian dishes. In the second menu, the vegetarian dish was placed in between the two non vegetarian dishes. The percentage of vegetarian meals that were sold in the first university restaurant increased significantly when the dishes were made more visible. The impact of the study was also seen after the intervention ended as the amount of sold vegetarian meals kept increasing.

4.2.2 Providing information

Providing information about healthy choices is also a successful tool for health promotion. A report that included the provision of information on food was conducted by Visschers & Siegrist (2015). Two studies were conducted for this report at a university canteen in Switzerland over different time periods. The first study investigated whether or not there is a correlation between the amount of CO_2 emission (kg CO_2) and the taste of a meal. The goal of this study was to test the hypothesis whether or not meals with lower CO_2 emissions are less tasty than meals with high CO_2 emissions. This was done by investigating 32 meals of the canteen and handing out a survey to the consumers after they ate the meal. No correlation was found between the sustainability and taste of a meal. After the first study was complete, the second study was conducted in the same canteen as the first study. The aim of the second study was to increase the awareness of the consumers on the impact of the food production and consumption on the climate. The canteen offered four warm meals during the days, of which two were climate-friendlier (low kg CO_2, indicated by a label) and two were not climate-friendly (no label). Consumers could answer a survey after buying a meal. During the intervention, the share of the climate-friendlier meals increased with 20% in total. An increase was seen very quickly, because after 17 days shares had increased from 46.2% to 55.9%.

4.2.3 Combining Nudging and information provision

A study that is using a combination of nudges and information provision to influence consumers, is the study of Campbell-Arvai, Arvai & Kalof (2014). This study was conducted on a university campus in the United States of America and consisted of two phases. The first phase was an orientation phase, in which they used a survey to study the relative appeal of a selection of meat-free meals that were going to be displayed on the changed menu. In the second phase, the researchers randomly selected dining halls on campus to distribute the changed menus. Five different menus were created for this study. Which included either the five most popular meat-free meals from the survey or a combination with non vegetarian meals. The meals could be differentiated by a leaf symbol (stating that it was a meat-free meal) and an informational text giving the consumer information about the environmental impact of eating less meat. The participants that got the changed menu were told that they could also chose from another menu, with different meals, 3.5 meters away from their table. This menu only consisted of non vegetarian meals. It was found that participants chose the meat-free meal options significantly more when given the changed menu in comparison to participants that got the conventional menu. Even though the participants were not restricted in their choice for a non vegetarian meal. It did not matter whether or not the meat-free options were labeled with a leaf symbol and accompanying text.

A second study using the combination of nudging and providing information is from Mengwei Yue (2013). This study was conducted in a restaurant setting in Canada. Three different menus consisting of 10 meals were created for this study. Menu one consisted of 100% non vegetarian options, menu two consisted of 20% vegetarian items and 80% non vegetarian items, menu three consisted of 80% vegetarian items and 20% non vegetarian items. The menu included a variety of meals (salads, burgers, pasta, sandwiches) in order to not restrict the consumer in the food choice. The vegetarian items were labeled with a green “V” on menu two and three. A significant difference in attitude was found when the non-vegetarian menu, and the menu consisting for 80% out of vegetarian items, were compared. Another significant difference was found when the menu consisting for 20% out of vegetarian items was compared to the menu consisting for 80% out of vegetarian items. The difference between the attitude towards the menu consisting for 20% out of vegetarian menu, and the non-vegetarian menu was not significant. It was found that the consumers had a more favourable attitude when the menu consisted for 80% out of vegetarian meals.

4.3 Discussion: successful interventions

Within the discussion, an interpretation will be given regarding the results. The description of the discussion will be divided in the major findings, importance of the findings, weaknesses and strengths.

4.3.1 Major findings

The literature study on successful interventions found that the taste of a meal is not correlated to the impact it has on the climate. This means that climate-friendlier meals are not less tasty and appealing than meals that are less climate-friendly. Moreover, consumers are choosing more vegetarian meals when the first available menu presents more vegetarian options. This is also the case when consumers know that they can also choose from another menu just a couple of meters away. A study found that consumers were most positive about a menu when 8 meals (out of 10) are vegetarian. This means that visibility can increase the sales of vegetarian meals. In addition to that, it was found that labeling meals according to their impact on the climate can consciously help consumers make a more sustainable food choices.

4.3.2 Importance of the findings

The provision of effective strategies is valuable to use for the caterers, as they are dependent on their profit. Having strategies that are successful in motivating consumers to make a more sustainable and healthy choice, is important. This literature study provides practical advice for the different stakeholders, which could be useful with selling the sustainable and healthy vega(n) meals profitably.

4.3.3 Limitations

This study has potential limitations. A limited amount of relevant intervention studies is available. Therefore, not every aspect of influencing food behaviour could be discussed. Most studies about food behaviour change are focused on the theory of behaviour change instead of the practical aspects. As the project of the consultancy team is aimed to give the commissioner an advice on making changes in practice, it would be best to support the advice with examples out of practice. Therefore, having intervention studies as an example has a

bigger advantage in giving a successful advice for the commissioner to put in practice. Moreover, a limited amount of recent intervention studies were available. Therefore, the advice on successful strategies can be a little outdated, regarding some points. The last limitation is due to the amount of scientific literature found on “providing” information” as a tool for behaviour change. Most studies that include information as a tool focus on other tools or aspects within the study. This means that not much scientific based information can be found, that includes specific information on the tool “providing information”.

4.4.4 Strengths

This study has several strengths. One of the strengths of this literature study is that most of the studies used are set in the same setting as the study environment and study population of this project. This means that the interventions are already tested in similar environments with a similar study population. This makes it easier to translate the advice of this literature study to the setting and study population of this project, namely, the students and staff of the WUR. Another strength of this literature study is related to time efficiency. Namely, a lot of time is won as the consultancy team did not have to conduct an intervention themselves.

4.4 Conclusion

This literature study aimed to answer the sub-research question Q3: “What strategies have been proven effective to increase the consumption of vega(n) foods?”. Studies have shown that nudging and/or information provision can (un)consciously help consumers make a sustainable food choice without restricting them in their choice.

5. Consumer Study

The goal of the consumer study is to gain insight into the relation between the consumer motivations for food choice, their perception of sustainability and their eventual behaviour in choosing specific food products in the WUR restaurants. This chapter starts by providing a theoretical framework as basis for the study, which elaborates on theories that explain the consumer motivations for food choice, and their perception of sustainability. Secondly, the methods section provides an overview of the study sample and design, the method of data collection, the promotion plan, and the statistical plan. Finally, the results section will contain the data analysis, which will answer sub-research question Q1: "What is the relation between consumer motivations for food choice, perception of sustainability, and the choice for specific food products at the WUR restaurants?".

5.1 Theoretical Framework

This theoretical framework for the consumer study aims to create a scientific basis for the questionnaire. The first part of the questionnaire focuses on the individual motivations of students and staff of the WUR in relation to the choice of specific foods at the four restaurants. The final part integrates the sustainable aspects of food choice and the relation to the choice for certain foods. The final questionnaire used for the consumer study can be found in Appendix 7.

5.1.1 A consideration of theory

The aim of the project is to take a positive and holistic approach towards sustainable eating practices. Within the introduction of this report, the importance of biological, psychological, social and cultural influences on an individual's eating behaviour, as described by Shepherd & Raats (2006), was mentioned. However, food choices are also largely dependent on the context. The dietary behaviours are learned, supported, and expressed through expansive social environments in which food choice results from a dynamic interplay between physical, mental, social, and spiritual factors (Swan et al., 2015).

Approaches that solely include an individualistic model, like the Theory of Planned Behaviour, have had limited successes in interventions on promoting healthy and sustainable eating practices (Garnett, 2014). These approaches are often based on the perception that behaviour is the consequence of explicit motivations; motivations that people experience on a conscious level. However, human behaviour is not only based on explicit factors, but also on attitudes that are existing on an unconscious level. These implicit attitudes are shaped by the social and physical environmental factors that a person is exposed to throughout the life-course. These implicit attitudes cause the intention-behaviour gap that is apparent in many models that aim to predict behaviour (Friese, Hofmann, & Wänke, 2008).

This underlines the need for a holistic approach that focuses on all aspects related to eating behaviour; both within the individual and the social and physical environment. Antonovsky's salutogenic model of health connects to this viewpoint. First of all because it considers all aspects of health by looking how to create, enhance, and improve physical, mental, and social health (Swan, 2016). Secondly, the salutogenic model looks at how health arises from active participation in lifelong learning experiences (Swan et al., 2015).

5.1.2 The Personal Food System

A model that looks at how people construct their food choice is the Food Choice Process Model (Frust et al., 1996). A part of this model that looks specifically at the underlying motives for food choice is the 'personal food system' (Shepherd & Raats, 2006). Personal food systems include the construction of food choice values. These values are cornerstones for the classification of foods and situations, according to importance in constructing the food choice (Figure 3). The values differ per situation, depending on the context, and on the strategies a person has developed in dealing with food choices (Shepherd & Raats, 2006). Furthermore, the values represent a number of considerations that are influential in constructing food choices. They involve personally developed interpretations and meanings related to food and eating as well as involving emotional affect and attachment (Shepherd & Raats, 2006). There are five types of values that are continuously apparent in most people; taste, convenience, cost, health, and managing relationships.

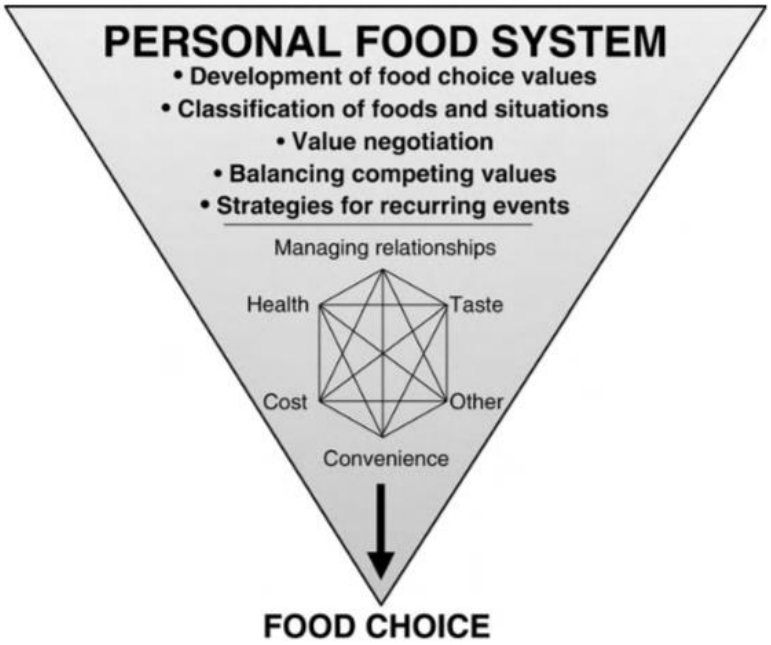


Figure 3. Details of the Personal Food System (Shepherd & Raats, 2006)

Taste often is the most important motivator for specific food choices and is used as a "minimum criteria" to decide if a food or drink will be consumed. Secondly, convenience also is a value with a strong influence. It refers to the time and effort considerations that people overthink when constructing food choices. For students, time-effort is frequently the primary meaning of convenience (Shepherd & Raats, 2006). Another value that is a strong determinant for the food choice of students is cost. Related to the 'value cost' is the concept of 'worth'; people have different perceptions on which food is worth a certain price. For example, people who are committed to animal welfare or climate degradation, might allocate more worth to biological foods. Health is another important value; when you ask people what they find most important in their life, many say "their own good health, and that of their loved ones". However, when making food choices, health as a value often is considered only after taste, convenience and costs. It is important to consider this when promoting healthy and sustainable foods. Furthermore, definitions to health in relation to food choice differ considerably between and

within different populations and over time. This includes the overall balance, nutrient balance, low fat, weight control, naturalness, disease management and disease prevention (Shepherd & Raats, 2006). The fifth main value is managing relationships, which represents the importance of social context. When making food choices, people consider the needs, preferences and feelings of the ones related to what, how, when and where food is eaten. Food choice can be compromised in order to build, maintain and repair relationships. This value also links to the 'Subjective Norm' which is described by Ajzen in his Theory of Planned behaviour. This subjective norm is shaped by the normative beliefs of the group or groups a person is part of and influences a person's intention and behaviour towards specific food choices (Ajzen, 1991). The previously described values all contribute to a consumer's motivation for making certain choices related to their food intake. However, there are more values that influence a person's food choice, only they are less frequently apparent in all people. These other values include quality, variety, symbolism, ethics, safety and waste (Shepherd & Raats, 2006). These values can occur frequently or only in specific circumstances.

Another consideration on factors that influence people's food choices was conducted by Steptoe, Pollard, and Wardle (1995) in support of their construction of the Multi-item Food Choice Questionnaire (FCQ). In their research, nine factors appeared to be related to food choice motivation, which were related to both health and non-health factors. The values they described and processed in the questionnaire are: health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity and ethical concern. On average, the factors sensory appeal, health, convenience and price appeared to be most important (Steptoe et al., 1995). This is mostly similar to the values as part of 'the personal food system', and strengthens the importance of uncovering the weight of these different values for individuals when aiming to promote sustainable food choices. Insight into consumer motives has proven to be valuable when developing interventions, policies, innovations and campaign related to food consumption (Steptoe et al., 1995).

5.1.3 The Salutogenic Perspective on eating behaviour and sustainability

The salutogenic perspective is based to the model of salutogenesis, as developed by Antonovsky (1979). Salutogenesis states that life experiences contribute to a person's Sense of Coherence (SOC); a strong SOC helps people to mobilise resources to cope with stressors and to manage tension successfully. Subsequently, the SOC helps determine a person's position on the health Ease-/Dis-ease continuum (Mittelmark et al., 2017). On this continuum people move between the "total absence of health" and "total health". The place on this continuum is partially determined by stressors; which are challenging situations that people are dealing with either more or less successfully. The SOC is a coping mechanism that supports people when they are dealing with challenging situations and in creating and preserving a healthy life (Swan, 2016). The SOC consists of three dimensions that interact with each others; meaningfulness, comprehensibility, and manageability. These dimensions are related to the food choice values of an individual's personal food system, because this depends on the strategies a person had developed for making health-related food choices (Shepherd & Raats, 2006). When people have a strong SOC for healthy and sustainable food values, they are more likely to execute behaviour related to these values (Swan, 2016).

Besides the SOC, the salutogenic framework includes a second important construct; General Resistance Resources (GRR). These GRR are resources a person possesses, both within people (e.g. self-efficacy) and in their social environment (Swan, 2016). The Sense of

Coherence of a person is positively related to the GRR; when someone has a strong sense of meaningfulness, comprehensibility and manageability, that person will be better able to identify and use the GRR. A structured overview and explanation the GRR can be found in figure 4.

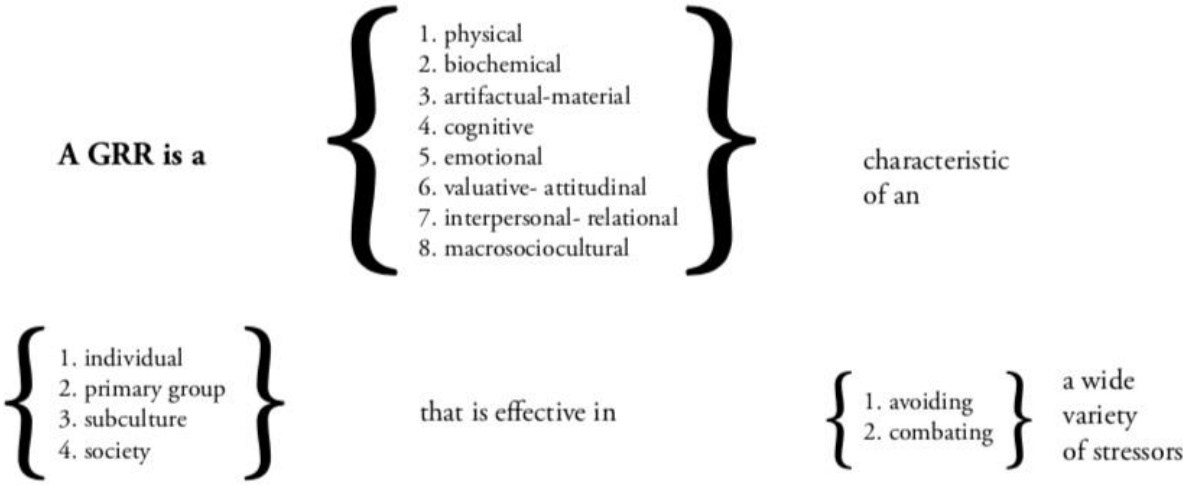


Figure 4. The Generalized resistance resource (Antonovsky, 1979)

The salutogenic perspective looks at a combination of individual and contextual factors that shape the way in which people experience eating in their daily lives. The consumption of animal-based foods is for many people an important part of their 'eating-experience'. This eating experience goes beyond only the nutritional needs, and is shaped by a lifetime of experiences in a specific social and cultural context (Swan, 2016). This context contributes to shaping a person's personal values, as explained before, that determine food choice. When looking specifically at environmental and health sustainability, as explained in the literature study, as a value that shapes eating experiences, the meaning people ascribe to sustainability plays an important role (Macdiarmid, Douglas, and Campbell, 2015). People's awareness of the environmental impact of food, and the impact of food on their health relates to their willingness to reduce the consumption of animal-based foods (Macdiarmid et al., 2015). Within the SOC, the dimension of meaningfulness can be explored in order to gain insight into the meaning people ascribe to sustainability and how this relates to their food choices. When relating this to behaviour, the motivation of people to choose for sustainable food (that is healthy and environmentally friendly) is strengthened by a high meaningfulness to, for example, the environmental impact of red meat. This strengthens the SOC, which will increase the chance that people make a sustainable food choice (Swan et al, 2015).

5.1.4 Linking the theory to questionnaires

This section aims to link the previously described theories to existing questionnaires that are used as basis for the construction of the questionnaire that is distributed for this consumer study. Figure 5 shows an overview of the interconnectedness between the theory and the related questionnaires.

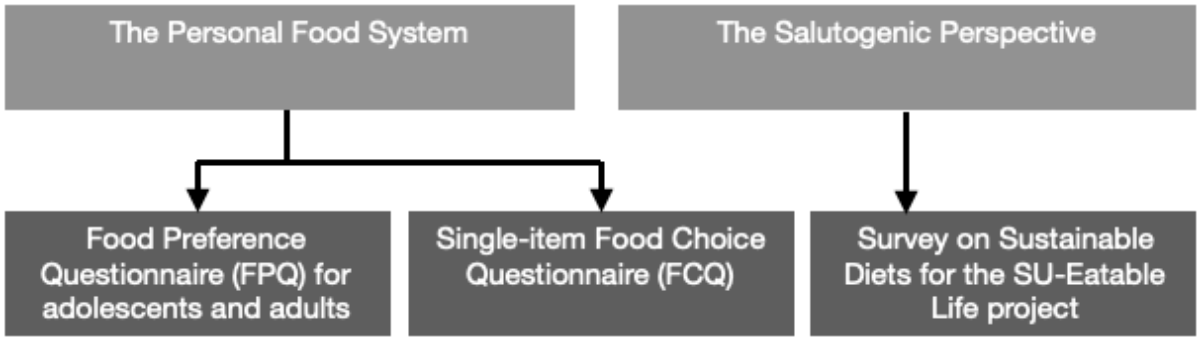


Figure 5. Structure on the relation between the theory and contiguous questionnaires

The theory related to The Personal Food System is translated into questions within the 'Food Preference Questionnaire (FPQ) for adolescents and adults' and the 'Single-item FCQ'. Both of these questionnaires aim to map the motivations of consumers food choices and ask the consumers to rate the different values, as described in sub-chapter 5.1.2, that determine their food choices. They are also both based on the FCQ that has been developed by Steptoe, Pollard, and Wardle (1995). The 'Survey on Sustainable Diets for the SU-Eatable Life project' is based on The Salutogenic Perspective, and focuses on the meaningfulness that people ascribe to sustainability.

5.1.4.1 FPQ for adolescents and adults

The FPQ for adolescents and adults includes questions on important dietary requirements which may influence the habitual intake and liking of certain foods (Smith, n.d.). These questions are relevant for this research, because the aim is to gather knowledge on the sustainability of the food offer, with a focus on more vega(n) meals. Whether people are vegan, vegetarian, flexitarian, pescatarian, or meat eaters, greatly influences their food choices. Furthermore, by including a question about the dietary regime, a distinction can be made between the opinions on the available food and the motivations between people with different regimes. For example, with vegetarianism, different values are prioritized; people who follow a more plant-based diet might prescribe more value to 'ethical concern' and 'health' (Shepherd & Raats, 2006).

5.1.4.2 Single-item FCQ

Where the original food choice questionnaire used multiple items for each of the 9 motives, a reduced food choice questionnaire is developed by Onwezen, Reinders, Verain en Snoek (2018). In this Single-item FCQ each motivation is surveyed with a single item; this served the aim to provide a balance between practical needs and psychometric concerns.

This questionnaire can, just as the multi-item FCQ be used to understand the motivations of consumers behind self-reported consumption (Onwezen et al., 2018). The single-item alternatives show the same pattern for the motivations underlying food intake, which makes this a suitable alternative for the multi-item FCQ, which was linked to the Personal Food System in chapter 5.1.2.

5.1.4.3 Survey on Sustainable Diets

The Survey on Sustainable Diets is developed for the SU-Eatable LIFE project. This is a three-year program that aims to: "reduce the environmental impact of food choices in the EU by reducing CO2 emissions and water usage through increasing citizens' awareness and

involvement in sustainable food ventures" (European Foundation Centre, 2019). Furthermore, the project is led by the Barilla Center for Food and Nutrition in partnership with GreenApes, Wageningen University and the Sustainable Restaurant Associations. The survey is partly based on the Salutogenic model of health. The questions that are applicable for this consumer study focus on the meaningfulness of sustainability in relation to food choices. This interdependence is explained in chapter 5.1.3.

5.2 Methodology

The methodology of the consumer study exists of four parts; the study sample and design, the method of data collection, the promotion plan and the statistical plan.

5.2.1 Study sample and design

To gain insight into the relation between the consumer motivations for food choice, their perception of sustainability and their eventual food choice in the WUR restaurants, a cross-sectional study was conducted. This study design suits the purpose of the overall aim, because the study was focused on one point in time and no follow-up was done (Levin, 2006). The study population of this cross-sectional study were the consumers of the WUR restaurant, which are the students and staff of the WUR. In order to answer the first sub-research question, a survey was made and spread among the students and staff of the WUR.

5.2.2 Method of data collection

The questions in the survey 'What's on your menu?' are based on the three existing questionnaires that are explained in the theoretical framework (chapter 5.1.4), and on the dialogue with the four caterers. The survey is divided into different sections that all contain one or more questions. An overview of the specific questions can be found in Appendix 6. Section one contains the introduction for the respondent, section 2 contains four questions on demographic characteristics of the respondents. Sections 3 and section 6 till 11 are all completely or partly based on the existing questionnaires; the link between these questionnaires and the sections is structured in figure 6.

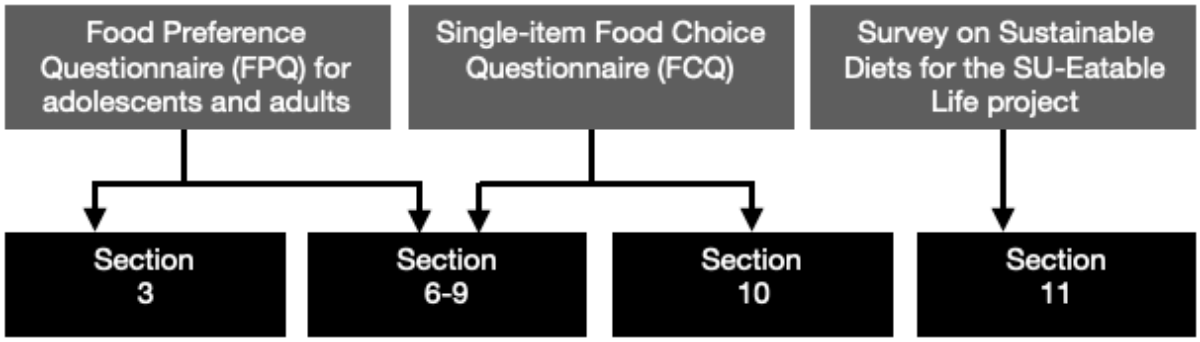


Figure 6. Structure on the relation between the existing questionnaires, and the sections of the 'What's on your menu?' questionnaire

In the theoretical framework the relevance of these existing questionnaires was made clear in relation to the theory (figure 5). In this chapter the pre-existing questionnaires are linked to specific questions in the survey.

Section 3 includes a question on what diet a person follows in relation to the consumption of animal- or plant-based protein, as described in chapter 5.1.4.1.

Section 4 and 5 are unrelated to the pre-existing questionnaires. Section 4 includes one question that asks about the frequency of food purchases at the restaurants. Section 5 includes one question that asks in which of the four restaurants (Impulse, Leeuwenborch, Orion, Forum) the consumer buys food most often. On the basis of this question the respondent will be directed towards either section 6, 7, 8, or 9.

Section 6 to 9 consists of the same questions, specified per restaurant. The first three questions in this section are on the product specifications; how much consumers spend and what foods and drinks do they buy at the specific restaurants. The questions on what specific foods and drinks they buy is based on a question of the FPQ for adolescents and adults. This question was redesigned to ask about the choice for specific products that are available in the restaurants (e.g. Sandwiches, snacks, soup, etc.), based on the dialogue with the caterers (table 1). The fourth, and last question, of these sections is based on the Single-item FCQ, but is revised to fit our specific target audience and context (the WUR restaurants). This question asks how the consumers rate the food offer at the restaurant, with as choice options the values discussed in chapter 5.1.2.

Section 10 includes one question that directly asks about the consumers motivations to buy food in WUR restaurants in general, based on the Single-item FCQ.

Section 11 includes four questions about 'Sustainability and Food Choice', of which the first, second and fourth questions are similar to three questions included in the 'Survey on Sustainable Diets for the SU-Eatable LIFE project. These questions ask about the meaningfulness consumers attribute to sustainability, this link is explained in chapter 5.1.3 and 5.1.4.3. The third question asks specifically about vegetarian and vegan foods; if people would prefer these if prices are the same as for animal-based foods.

5.2.3 Promotion plan

The online survey opened for respondents on the 11th of June 2019. The consultancy team used various ways to promote the online survey in order to get as many respondents as possible. The first promotion activity was posting a promotion post with a link to the survey in different Facebook groups, such as '*Wageningen student plaza'*. The post with the link and a digital flyer (Appendix 8) was posted daily in this group, to ensure that it was seen often by a lot of the members of the Facebook group.

The second promotion activity was recruiting our own network. The link to the survey was shared in multiple Whatsapp groups in which at least one of the consultancy team members was present (such as a study, friend, sport and sorority group chat). The members of the group chats were also asked to spread the survey in their own network to ensure that the respondents range stretched outside the personal network of the consultancy team members.

The third activity was posting a picture on the tv screens (Appendix 8) in all the campus buildings. The tv screens are called narrowcasts, they show a picture for 10 seconds and are placed throughout all the university buildings. The pictures shown, are usually used for promotion such as an event or a survey. The consultancy team emailed the receptions of all the university buildings with a request for posting a picture on the narrowcast from the 11th of June until the 20th of June.

The fourth activity was putting up posters (Appendix 8) around the four buildings (Forum, Orion, Leeuwenborch and Impulse) and in student flats. The consultancy team first

had to get approval of the four buildings' receptions for putting up posters in them. The team contacted the receptions and got designated spots to put up the posters. Some team members also live in student flats and were able to put up posters in common areas of those buildings. The aim of this activity was to broaden the range of the respondents.

The fifth and last activity was actively recruiting respondents on campus, this was done daily for one week. Areas were selected based on their relevance and their popularity among students and staff. The selected areas were: Forum, Orion, Leeuwenborch, Impulse, Campus plaza and the bus stops in front of campus plaza. These four buildings were chosen, because these are the included restaurants within the study. Campus plaza and the bus stops were selected, because a lot of students and staff are walking around in that area. For approaching consumers, the team printed out A6 flyers (appendix 8) with a QR-code and link to the survey and handed them out to consumers in the selected areas.

In order to increase the interest amongst the WUR students and staff to answer the survey, prizes were offered. The respondents could win one of the 10 "Tony Chocolonely" chocolate bars or a VVV giftcard worth 25 euros. These prizes were randomly awarded to the respondents, after closing the survey.

5.2.4 Statistical plan

5.2.4.1 Preparation of the data

After gathering all the answers of the survey, the data was downloaded to a Microsoft Office Excel document and prepared for the data analysis. Multiple steps were taken for preparation. At first, the discrete variables were coded into numbers and the respondents that answered "other occupation (not at WUR)" were excluded from the data, because they were not part of the target population. In total, 17 (2.8%) respondents were excluded. Secondly, missing data issues did not apply, because most of the questions within the survey were mandatory to answer. Only the open questions (suggestions and motivations to buy or not buy food at the WUR restaurants) were optional. Subsequently, it was decided to not exclude outliers, because the survey was mainly focused on motivations and opinions. By removing outliers, different opinions and motivations would be removed, which could cause a bias in the final statistical results. At last, answers to the open questions were collected and summarized in categories. The most frequent answers are included in the results.

5.2.4.2 Software

Firstly, for the data preparation, Microsoft Office Excel was used. Afterwards, the data was transferred to IBM SPSS 21, to run the statistical tests.

5.2.4.3 Sample size calculation

For the sample size calculation, the total target population was calculated, which corresponds with the WUR students (n=11,477), PhD candidates (n=2,008) and staff (n=4,887) of the current year (Wageningen University and Research, n.d.). This consists of a total of 18,372 people. The desired confidence interval is 95%, with an alpha(α) of 5%. The finally required sample size was calculated and resulted in 377 people*.

5.2.4.4 Explanation of the variables included in the survey

The survey included questions that use the 5-point Likert scale. The decision was made to apply parametric tests to these ordinal variables, because scientific evidence shows that parametric tests are suitable for this analysis and more robust than nonparametric tests. Hence parametric tests allow the withdrawal of less biased conclusions when analysing responses that use Likert scales. Measures like 'mean' for central tendency and standard deviations for variability are recommended in this type of interval variable, even though it is not continuous (Sullivan, 2013; Boone & Boone, 2012). In order to answer this research question the variables included in the survey were subdivided in four dimensions; consumer, product, context and behaviour.

The first dimension was about the *consumer*, and includes the following:

- Demographic characteristics of the consumer (age, gender, nationality, type of diet and occupation).
- Food choice motivations (healthy, a way of monitoring my mood, convenient, provides me with pleasurable sensations, natural, affordable, helps me control my weight, familiar, environmentally friendly, animal friendly and fair trade).
- Perceptions of sustainability ("Do you think that, through their food choice, students and staff can reduce their personal impact on the environment?", "Would you be willing to pay more for food with a low impact on the environment?", "When you buy food at the WUR restaurants, would you like to know the environmental impact of the foods that you buy?, e.g. CO2 emissions, water consumption, land use, etc").

Table 6 shows an overview of the variables explained above, the classification of the type of variable, and the corresponding measurement scale.

Table 6. Variables included in the survey linked to the consumers

Demographics	Type of variable/ Measurement scale
gender	**discrete**/ male - female - I do not want to say
age	**continuous**/ years
nationality	**discrete**/ different nationalities
occupation	**discrete**/ WUR staff - WUR bachelor student - WUR master student - WUR PhD candidate - Other position at WUR - other position (not a WUR)
type of diet	**discrete**/ meat-eater - flexitarian - pescatarian - vegetarian - vegan other

*The tool used to calculate the sample size was a sample size calculator, retrieved from the following link: https://www.surveymonkey.com/mp/sample-size-calculator/

Motivations for food choice	Type of variable/ Measurement scale
healthy	**interval**/ scale from 1 to 5
way of monitoring my mood	**interval**/ scale from 1 to 5
convenient	**interval**/scale from 1 to 5
provides me with pleasurable sensations	**interval**/ scale from 1 to 5
natural	**interval**/scale from 1 to 5
environmentally friendly	**interval**/ scale from 1 to 5
animal friendly	**interval**/scale from 1 to 5
fair trade	**interval**/ scale from 1 to 5

Perception of sustainability	Type of variable/ Measurement scale
Willingness to pay for sustainability	**discrete**/ yes - no - I don't know - Only if the cost increase is below 10% - Only if the cost increase is below 30% - I don't know - I don't care
Opinion on impact on environment through food choices	**discrete**/ yes - no - I don't know
Desire to know about the environmental impact of the foods	**discrete** /yes - no - I don't know - I don't care

The second dimension was the *product*, and includes the following:

- Rating of the food offer at the WUR restaurants (healthy, a way of monitoring my mood, convenient, provides me with pleasurable sensations, natural, affordable, helps me control my weight, familiar, environmentally friendly, animal friendly and fair trade). In the rating of the food offer of the WUR restaurants, the respondents are asked to rate different characteristics of the food products that are offered at the WUR restaurant in which they buy food most frequently.

Table 7 shows an overview of the variables referred above, the classification of the type of variable they are and the corresponding measurement scale.

Table 7. Variables included in the survey linked to the products

Rating of the food offer	Type of variable/ Measurement scale
healthy	**interval**/scale from 1 to 5
way of monitoring my mood	**interval**/ scale from 1 to 5
convenient	**interval**/ scale from 1 to 5
provides me with pleasurable sensations	**interval**/scale from 1 to 5
natural	**interval**/ scale from 1 to 5
environmentally friendly	**interval**/ scale from 1 to 5
animal friendly	**interval**/ scale from 1 to 5
fair trade	**interval**/ scale from 1 to 5

The third section was the *context*, and includes the following:

- Restaurant that the respondent visits most often (Forum, Leeuwenborch, Orion or Impulse).

Table 8 shows an overview of the variables referred above, the classification of the type of variable and the corresponding measurement scale.

Table 8. Variables included in the survey linked to the context

Restaurants	Type of variable/ Measurement scale
Most frequented restaurant	**discrete**/ Forum - Orion - Leeuwenborch - Impulse

The fourth dimension was the *behaviour* and includes the following:

- More commonly bought foods and drinks (foods: sandwiches, wraps, soup, salads, fruit, puffed pastry, fried food, dinner, snacks, others; drinks; soft drinks, fresh fruit juices, dairy, dairy substitutes, others). The behaviour of the respondents is assessed by looking into the food and drink products they choose to buy more often.

Table 9 shows an overview of the variables referred above, the classification of the type of variable, and the corresponding measurement scale.

Table 9. Variables included in the survey linked to the behaviour.

Most purchased foods	Type of variable/ Measurement scale
Sandwiches	**discrete**/buy food - yes or no
Wraps	**discrete**/ buy food - yes or no
Soup	**discrete**/ buy food - yes or no
Salads	**discrete**/ buy food - yes or nod
Puff pastry	**discrete**/ buy food - yes or no
Fried food	**discrete**/ buy food - yes or no
Dinner	**discrete**/ buy food - yes or no
Snacks	**discrete**/ buy food - yes or no
Other	**discrete/** other foods purchased

Most purchased drinks	Type of variable/ Measurement scale
Soft drinks	**discrete/** buy drink - yes or no
Fresh fruit juices	**discrete**/ buy drink - yes or no
Dairy	**discrete**/buy drink - yes or no
Dairy substitutes	**discrete**/ buy drink - yes or no
Coffee	**discrete**/ buy drink - yes or no
Tea	**discrete**/ buy drink - yes or no
Beer/ Wine	**discrete**/buy drink - yes or no
Others	**discrete**/ other drinks purchased

There are other variables included in the survey that do not fit in any of the previously explained contexts. One of them is the frequency of food purchase. This variable functions as a possible moderator for the opinions on the food offer, because respondents that buy more often food at the WUR restaurants may have more specific perceptions about the

characteristics of the food offer and may buy different types of products. Another variable included as an extra variable was the money spent per week. This may explain some of the consumer and behaviour variables. At last, the 'preference for meat or vega(n) if both would have the same cost' is another variable that allows the understanding of the intention for behaviour. Since the main focus of the survey relays on understanding what leads to the consumption of sustainable food, it is very relevant to include it.

Table 10. Remaining variables included in the survey

Other variables	Type of variable/ Measurement scale
Frequency of food purchase	**continuous/** times per week
Money spent per week	**continuous/** euros
Preference of meat or vega(n) over cost	**discrete/** Yes - No - Only if vegetarian or vegan foods are cheaper - - I don't know - I don't care

5.2.4.5 Statistical methods and evaluation and justification of choices

In order to answer the research question "What is the relation between consumer motivations for food choice, perception of sustainability, and the choice for specific food products at the WUR restaurants?", different dimensions are considered. Under each dimension, variables are placed and these are answered by specific questions. Figure 7 explains how dimensions and variables relate to each other and to the actual behaviour.

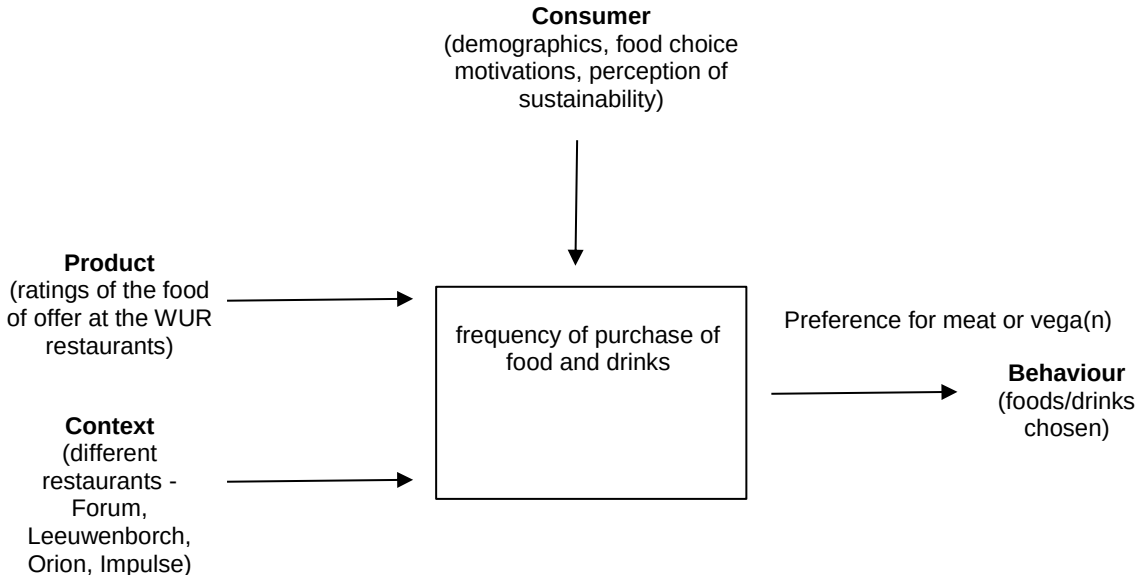


Figure 7. An overview of the relation between context, product, consumer and behaviour.

Firstly, a descriptive analysis of all the variables was performed, including a separation between the different restaurants (Forum, Leeuwenborch, Orion and Impulse). Afterwards, statistical tests were performed to assess if there was a relation between variables or not. Based on the research question and the scheme in Figure 7 the variables were related to each other. The performed statistical tests were based on the types of variables that are being compared and the relation that is meant to be understood. It is possible to find a further description of these relations in the Appendix 9.

5.3 Results - Data analysis

5.3.1 Descriptive data

A total of 611 participants filled out the online survey, however, 16 participants did not work or study at the WUR and therefore they are therefore not taken into account for this study. Table 10 shows the descriptive data of the 595 participants. Out of the 595 participants, 162 (27.23%) were male, 428 (71.93%) were female and 5 (0.84%) preferred not to say. The mean age of the participants was 24.06 years. The top three nationalities among the participants are Dutch (61.68%, n=367), Chinese (14.96%, n=89) and German (3.7%, n=22). This is similar to the top 3 most frequently appearing nationalities of the WUR population (Wageningen University and Research, 2018). The majority of the participants are WUR students (55.05% master's students and 34.01% bachelor's student), 4.88% is a PhD candidate at the WUR and 4.04% is a part of the staff. Moreover, most of the participants are flexitarian (44.11%), followed by meat eater (34.01%), vegetarian (11.78%), vegan (6.23%) and pescatarian (3.70%). The rest of the characteristics of the sample can be viewed in Table 11. Detailed tables with the average and standard deviation of the scores for food choice motivation and rating of the food offer can be found in appendix 10 (Tables 15 and 16). Appendix 10 also includes the percentages for the answers about food choice, and the perception of sustainability (Tables 17 to 21). The tables show both an overall result and the results per restaurant.

Table 11. Characteristics of the sample (n=595) according to the WUR restaurant that consumers frequent most often.

	Sample (N=595)	**Forum restaurant (n=308)**	**Leeuwenborch restaurant (n=46)**	**Orion restaurant (n=146)**	**Impulse restaurant (n=26)**
Male (n,%)	162(27.27%)	79(25.73%)	10(21.74%)	40(27.4%)	14(53.85%)
Female(n,%)	428(72.05%)	228(74.27%)	36(78.26%)	103(70.55%)	11(42.31%)
Age in years (mean±sd)	24.06 ± 5.88	23.64 ± 5.12	23.13 ± 3.32	23.86 ± 5.54	34.15 ± 10.03
Top 1 country	Dutch 367 (61.68%)	Dutch 183 (59.61%)	Dutch 40 (86.96%)	Dutch 83 (56.85%)	Dutch 15 (57.69%)
Top 2 country	Chinese 89 (14.96%)	Chinese 64 (20.85%)	- [1]	Chinese 19 (13.01%)	Chinese 2 (7.69%)
Top 3 country	German 22 (3.7%)	German 10 (3.26%)	- [1]	German 7 (4.79%)	- [1]
WUR staff (n,%)	29 (4.04%)	6 (1.95%)	4 (8.70%)	3 (2.05%)	14 (53.85%)
WUR bachelor's students (n,%)	202(34.01%)	105 (34.20%)	19 (41.30%)	51 (34.93%)	1 (3.85%)
WUR master's students (n,%)	327(55.05%)	179 (58.31%)	20(43.48%)	85 (58.22%)	4 (15.38%)
WUR PhD	24(4.88%)	12 (3.91%)	2 (4.35%)	4 (2.74%)	4 (15.38%)

candidates (n,%)					
Meat eater (n,%)	202(34.01%)	114(37.13%)	9(19.57%)	47(32.19%)	8(30.77%)
Flexitarian (n,%)	262(44.11%)	129(42.02%)	22(47.83%)	65(44.52%)	13(50.00%)
Pescatarian (n,%)	22(3.70%)	9(2.93%)	3(6.52%)	9(6.16%)	- [2]
Vegetarian (n,%)	70(11.78%)	35(11.40%)	7(15.22%)	18(12.33%)	4(15.38%)
Vegan (n,%)	37(6.23%)	35(11.40%)	5(10.87%)	7(4.79%)	1(3.85%)
Weekly spending on food in euros (mean±sd)	9.04 ± 4.37	7.98 ± 3.41	8.96 ± 4.50	11.31 ± 5.14	9.19 ± 4.88

-1 A shared second place with the rest of the nationalities as they all have n=1.

-2 No respondent is Pescatarian

The food choice motivations of the consumers are shown in Figure 8. The consumers where differentiated according to the restaurant that they visit most often. The consumers of all four restaurants believed that the affordability, health and convenience of the food are important motivators in their food choice. On the other and, the way that food controls one's weight, the familiarity of the food and how it influences your mood, were believed to be the least important to the consumers food choice motivations in all four restaurants.

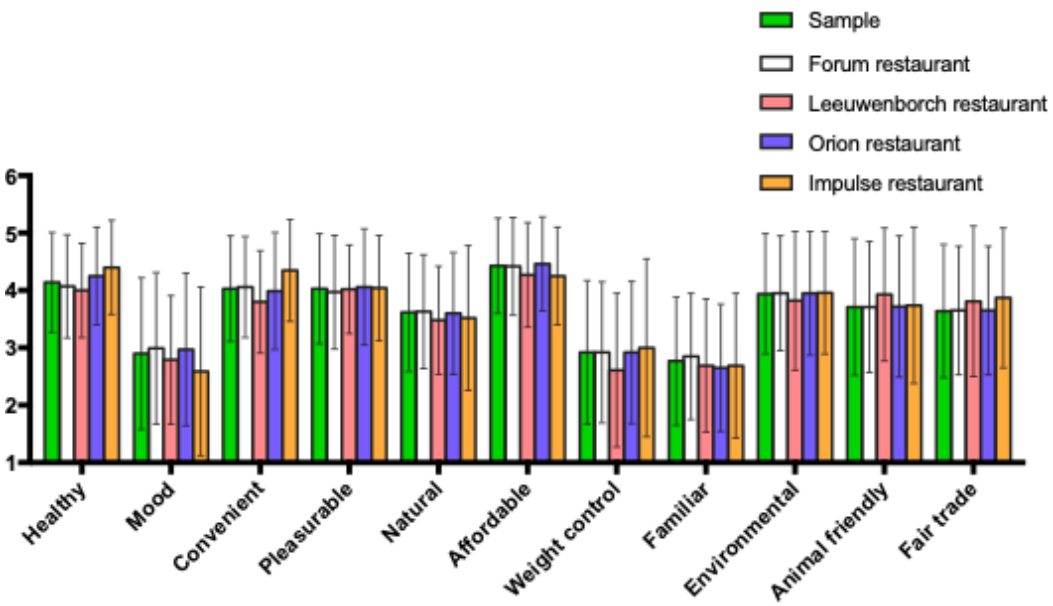


Figure 8. Food choice motivations of consumers at WUR restaurants. The results are expressed as mean ± SD.

The participants were asked to rate the food at the restaurant that they go to most often. The food choice motivators were linked to the restaurant that the consumer visits most often, and is depicted in Figure 9. The participants rated "convenient" the highest for both the restaurants

at Forum and Orion. The restaurant of the Leeuwenborch was rated the highest on affordability and the restaurant of Impulse was rated the highest on health.

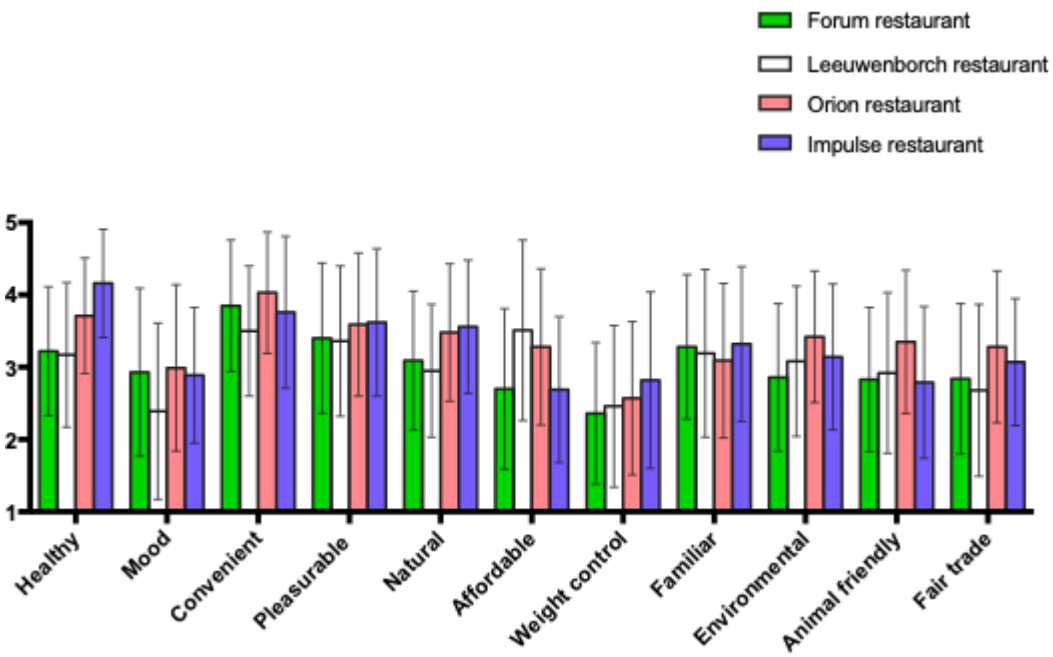


Figure 9. Rating of food offer at WUR restaurants. The results are expressed as mean ± SD.

The participants were also asked what products, in terms of foods and drinks, they bought at the restaurants where they go to the most. These answers are shown in Figure 10. It was noteworthy that sandwiches are the most popularly sold products. Leeuwenborch restaurant had a particularly high percentage of consumers that buy this product. The second most bought food product were soups.

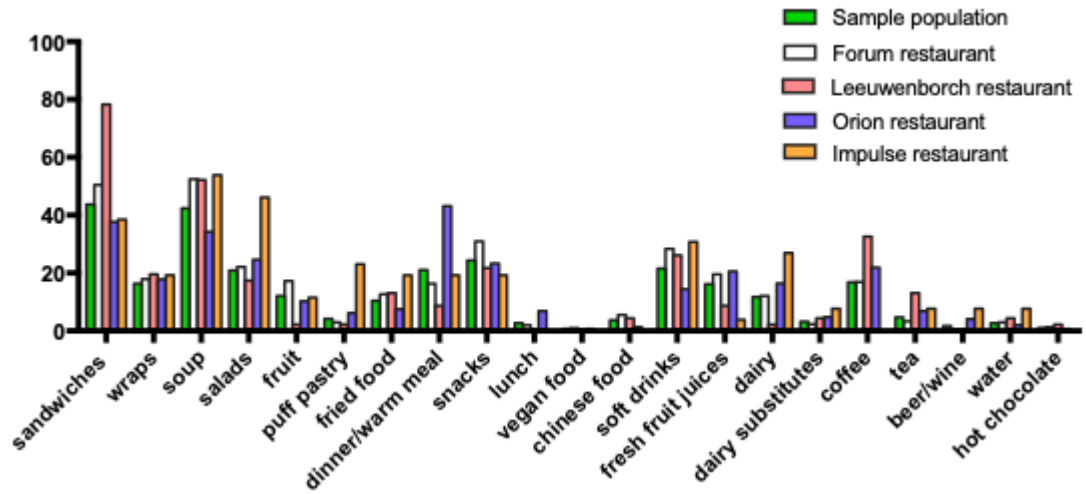


Figure 10. Food choice behaviour of consumers at WUR restaurants. The results are expressed as the percentage of respondents.

5.3.2 Inferential statistics

In this section the sample population (respondents of the survey) is going to be analysed in order to generate conclusions that can be generalized to the entire study population. The population resembles the WUR students and staff that are (potential) consumers of the WUR restaurants. This section of the results focuses on the correlation between the consumer demographics and the variables related to Q1: "*What is the relation between consumer*

motivations for food choice, perception of sustainability, and the choice for specific food products at the WUR restaurants?". Secondly, it includes statistical tests results that determine the correlations between:

- 'Consumer motivations for food choice' and the 'perception of sustainability' (5.3.2.2);
- 'Consumer motivations for food choice' and the 'choice for specific food products' (5.3.2.3);
- Perception of sustainability' and the 'choice for specific food products' (5.3.2.4).

All the graphs and figures included in this section include only the statistically significant results that were found.

5.3.2.1 Demographics

Table 12: Relations between demographics and motivations for food choice

Motivations for food choice	Demographics	df	F	p-value
Health	Among gender	2, 590	9.65	0.00
	Among type of diet	5, 587	6.13	0.00
	Among nationality	34, 558	1.79	0.00
Helps me control my mood	Among nationality	32, 497	2.38	0.00
Natural	Among gender	2, 579	8.65	0.00
	Among type of diet	5, 576	6.50	0.00
	Among nationality	34, 547	2.31	0.00
Helps control weight	Among gender	2, 567	8.65	0.00
	Among nationality	34, 535	1.93	0.00
Familiar	Among gender	2, 577	9.73	0.00
	Among nationality	32, 547	1.80	0.00
Environment friendly	Among gender	2, 569	9.67	0.00
	Among nationality	34, 537	2.62	0.00
Animal friendly	Among gender	2, 565	16.54	0.00
	Among nationality	32, 535	3.03	0.00
Fair trade	Among gender	2, 565	11.29	0.00

Affordable	Among age	1, 572	10.80	0.00
	Among nationality	34, 539	2.80	0.00
	Among type of diet	5, 568	1.96	0.02

A one-way ANOVA was performed to test the relation between the motivations for food choice and demographics. Afterwards a pairwise comparison was performed (Games-Howell).
The statistically significant pairwise comparisons showed that females have significantly higher scores than male, for health (mean difference: 0.31±0.08), natural (mean difference: 0.3±0.10), weight control (mean difference: 0.35±0.11), environmentally friendly (mean difference: 0.40±0.10), animal friendly (mean difference: 0.62±0.11), familiar (mean difference: 0.41±0.11) and fair-trade (mean difference:0.44±0.11). The flexitarian group has a higher score for healthy (mean difference: 0.33±0.83) and natural (mean difference: 0.40±0.93) than the meat-eater group. Lastly, the vegan group has a higher score for natural (mean difference: 0.68±0.17) than the meat-eater group.

Table 13. Relations between demographics and rating of the food offer at the WUR restaurants

Rating of the food offer at the WUR restaurants	**Demographics**	**df**	**F**	**p-value**
Weight control	Among gender	2, 459	3.59	0.03
Environment friendly	Among gender	2, 437	3.33	0.04
	Among nationality	30, 409	1.83	0.00
	Among type of diet	4, 435	4.92	0.00
Animal friendly	Among type of diet	4, 421	6.63	0.00
	Among nationality	29, 396	1.91	0.00
Fair-trade	Among type of diet	4, 361	3.99	0.00
	Among nationality	29, 336	1.92	0.00

A one-way ANOVA was performed to establish the relation between the rating of the food offer at the WUR restaurants. Afterwards a pairwise comparison was performed (Games-Howell). The results of the test show that the meat-eater group gave a higher rating on the WUR food offer for environment friendly (mean difference: 0.79±0.18) and fair-trade (mean difference: 0.74±0.23), compared to the vegan group. Furthermore, the meat-eater (mean difference: 0.94±0.17), pescatarian (mean-difference: 1.20±0.30), flexitarian (mean difference: 0.84±0.17) and vegetarian (mean difference: 0.76±0.21) groups gave a higher score to the WUR food offer on the factor animal friendly than the vegan group.

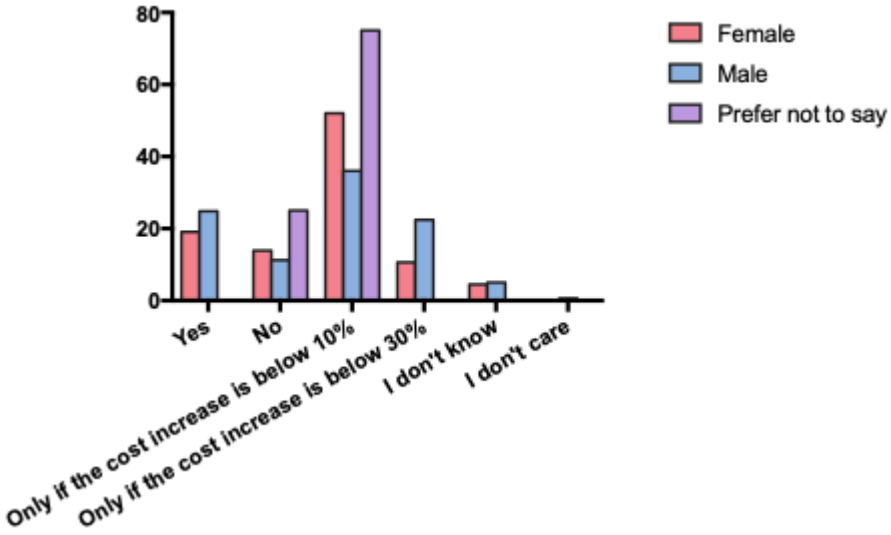


Figure 11. Relation between gender and willingness to pay for food with lower impact on the environment. The results are expressed as the percentage of respondents.

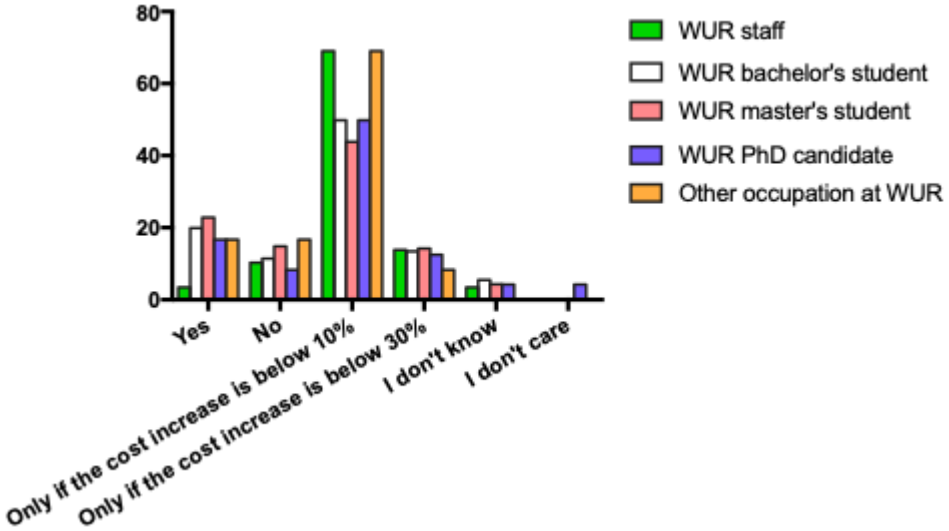


Figure 12. Relation between occupation and willingness to pay for food with lower impact on the environment. The results are expressed as the percentage of respondents.

Overall, only a minority of the people answered “no” to the question “Would you be willing to pay more for food with low impact on the environment?”. Although there was not a big difference between the percentage of consumers that answered “yes” or “no”, the majority of respondents were spread along the other possible answers: “only if the cost increases below 10%” and “only if the cost increases below 30%”. A Pearson chi-square test was conducted in order to discover the relationship between the question and the variables “gender”, “nationality” and “occupation”. The test between “gender” and the question had a p-value of 0.00, which means that this result is significant and that there is a relationship between the question and “gender” (Pearson chi-square (df:10)=25.10, p= 0.00). The test between the question and the variable “nationality” resulted in a p-value of 0.00. The test shows that there is a significant relationship between the question and nationality (The Pearson chi-square (df=170)=293.62,p=0.00). The test also showed that there was a significant relationship

between the question and the variable “occupation” with a p-value of 0.01 (Pearson chi-square (df=20)=21.84,p=0.01).

5.3.2.2 Consumer motivations for food choice related to perception of sustainability

When using the one-way ANOVA to test the relationship between the consumer motivations for food choice and their perception of sustainability there were no statistically significant results, all p-values were > 0.05.

5.3.2.3 Consumer motivations for food choice related to food choice

Table 14. Relations between consumer motivations for food choice and food choice

Motivations for food choice	Food choice	Regression coefficient	OR (e^(regression coefficient))	Standard error	df	p-value
Healthy	Salad	0.411	1.51	0.158	1	0.09
	Dinner/ warm meals	0.341	1.41	0.152	1	0.02

It can be concluded from table 14, that an increase in the score for health, increases the odds of choosing to buy a salad by 1.51 and to buy dinner/ warm meals by 14.1. In other words, participants that believe that health is an important food choice motivation have a 51% increase in the probability of buying salads and a 41% increase in the probability of buying dinner/ warm meals. These OR’s were obtained by making an exponential of the corresponding regression coefficient for each food.

Table 15. Relations between consumer motivations for food choice and frequency of food purchase at the WUR restaurants

Motivations for food choice	Frequency of food purchase at WUR restaurants	df	F	p-value
Mood control	-	1, 528	8.29	0.00
Pleasurable	-	1, 587	12.12	0.00

Table 15 shows that the scores given to ‘mood control’ and ‘pleasurable’ as motivators for food choice are predictors for the frequency of food purchases at the WUR restaurants. Furthermore, the relation of the score of ‘mood control’ with the frequency of food purchases at the WUR restaurants is positive, with a slope of 0.07 and the relation of the score of pleasurable with the frequency of food purchase at the WUR restaurants is negative with a slope of -0.09 (Table 15).

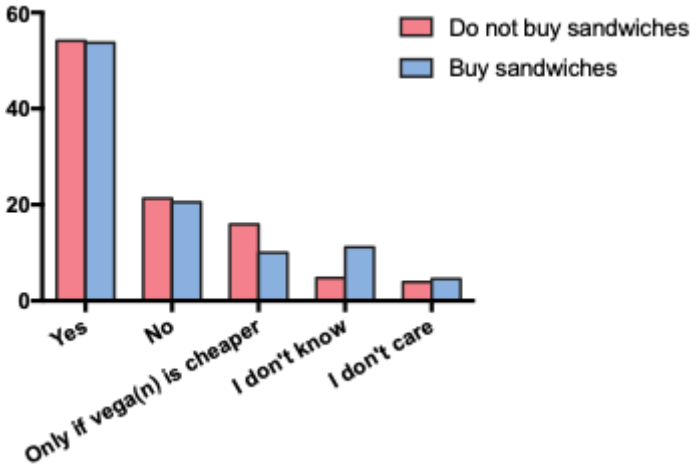


Figure 13. Relation between preference for vega(n) over meat if price is the same and buying sandwiches.The results are expressed as the percentage of respondents.

There is a relationship between the preference for vega(n) food over meat if the cost is the same within respondents that buy sandwiches or not (Pearson chi-square(df:4)=11.84, p=0.02). Overall, about 50% of the respondents state that they would prefer vega(n) food if the price would be the same. 15.8% of the respondents, that buy sandwiches, do not have an opinion on the topic (Figure 13).

5.3.2.4 Perception of sustainability vs food choice

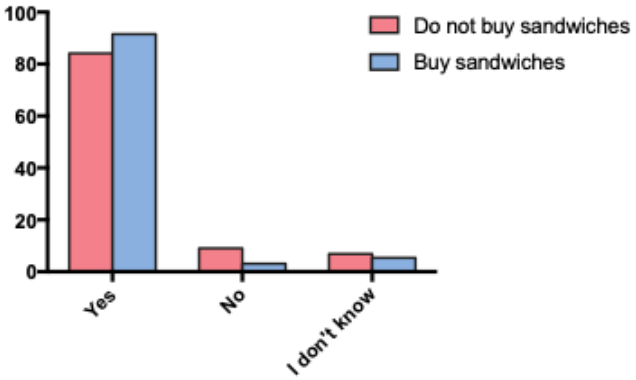


Figure 14. Relation between believing in personal impact through food choice and buying sandwiches. The results are expressed as the percentage of respondents.

There is a relationship between the fact that the respondents believe that through their food choice, students and staff can reduce their personal impact on the environment, and the respondents that buy sandwiches (Pearson chi-square(df:2)=9.33, p=0.01) (Figure 14).

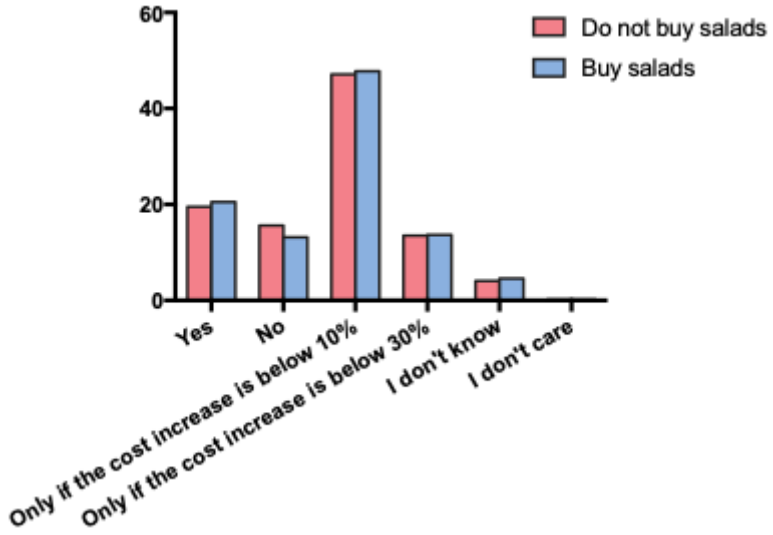


Figure 15. Relation between willingness to pay for low environmental impact and buying salads. The results are expressed as the percentage of respondents.

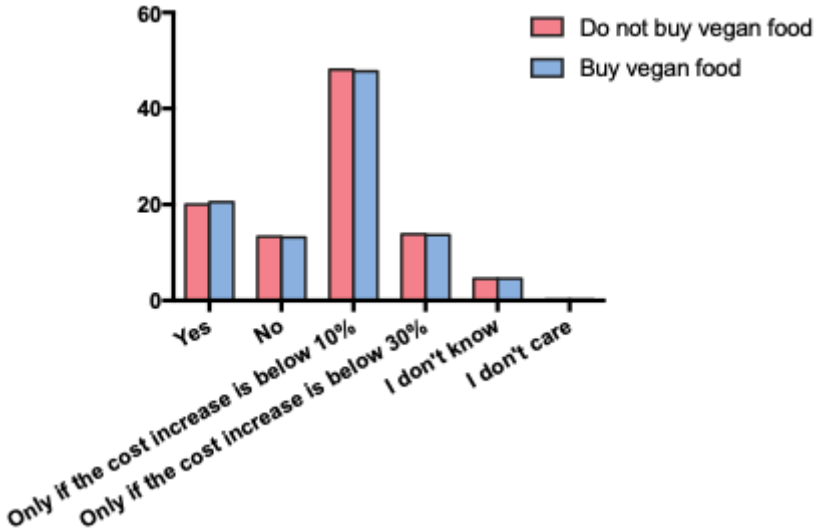


Figure 16. Relation between willingness to pay for low environmental impact and buying vegan food. The results are expressed as the percentage of respondents.

There is a relationship between the willingness to pay more for food with low environmental impact, and the respondents that buy salads (Figure 15) (Pearson chi-square(df:5)=12.83, p=0.03) and vegan food (Figure 16) (Pearson chi-square (df:5) =15.61,p=0.01).

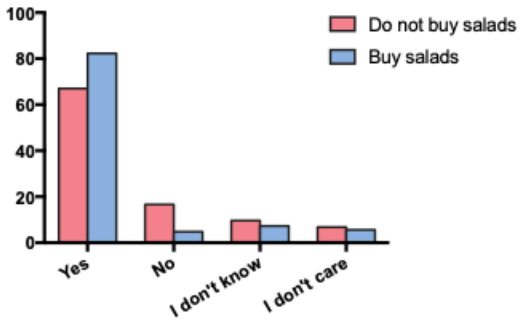


Figure 17. Relation between interest in knowing the environmental impact of foods bought and buying vegan food. The results are expressed as the percentage of respondents.

There is a relationship between the interest in knowing the environmental impacts of the foods bought and buying salads (Pearson chi-square (df:3) =13.70, p=0.00). (Figure 17)

5.3.2.4 Rating of the food offer at the WUR restaurants related to food choice

An increase in the score of the food offer for 'convenient', increases the odds of the consumers choosing to buy snacks by 1.63. This means that participants that consider the food offer of the WUR restaurants more convenient have a 63% increase in the probability of buying snacks (Table 16).

Table 16: Relations between ratting of the food offer at the WUR restaurants and food choice

Rating of food offer	Food choice	Regression coefficient	OR (e^(regression coefficient))	Standard error	df	p-value
Convenient	Snacks	0.489	1.63	0.210	1	0.02

5.3.3 Open answer questions (Motivations and Suggestions)

On one hand, most consumers think eating at WUR restaurants is too expensive, so they prefer to prepare their own lunch as it is much more affordable unless they forget to bring it or they do not have enough time, such as preparing for the exam. While on the other hand, some consumers think it is very convenient to have lunch or dinner at WUR restaurants, especially when they need to stay at campus until late. Some vegetarian or vegan consumers consider that the variety of vegetarian or vegan food offered at WUR restaurants is very limited, which is an important reason that they do not want to buy food there. And some gluten-intolerant consumers were disappointed that WUR restaurants rarely provide gluten-free food or foods in accordance with the Mediterranean diet, which is the most suggested diet by dieticians (according to the consumer).

Suggestions are designed for the vegetarian and/or vegan food offer at the WUR, where most consumers want more diverse, more appealing, more delicious and more affordable vegetarian or vegan foods. And some consumers even think that vegetarian food should be provided every day, not just on Monday, and they also think WUR restaurants should limit meat options and only offer vegetarian or vegan food. Furthermore, part of the consumers think that giving a label to vegetarian or vegan food would make the options more clear. Only a few consumers are reluctant to eat vegetarian food; they only like meat.

5.4 Discussion on consumer study

Within the discussion, an interpretation will be given regarding the results. The description of the discussion will be divided in the major findings, the importance of the findings, weaknesses and strengths.

5.4.1 Major findings

The need to have a holistic approach towards the consumer behaviour when buying food products at the WUR restaurants led to the inclusion of questions related to the Personal Food System and to the Salutogenic Perspective, as explained in the theoretical framework. Furthermore the behaviour that emerges from considering these theories is included by asking for the specific food choices. In both the Personal Food System and the Salutogenic Perspective the importance of individual characteristics (e.g. gender, nationality, diet) and of contextual factors (e.g. differentiation between the four restaurants) is made clear. Therefore, first the demographics of the consumers are discussed in relation to their motivations towards food choices, the perceptions on sustainability and the relation of these with the characteristics of the food offer of the WUR restaurants.

5.4.1.1 Demographics on the consumers

Overall, women give more importance to factors like health, naturalness and familiarity of food. Furthermore, women give higher scores to the importance of the food they eat being environment friendly, animal friendly and fair-trade. Nationality was another demographic factor that showed significant relations with almost all the motivations for food choice and opinions on the food offer. It is likely that this fact is highly related with the culture associated with different nationalities. The two nationalities that are most frequently represented in the consumer study are Dutch and Chinese. These results are in accordance with previous studies, where it was found that gender and culture play a role in the importance given to different food choice motivations and perceptions of sustainability. In Western societies, women have a tendency to perform healthier food choices and are more concerned about food choices and behaviour than men (Arganini, 2012). Cultural ideals that eating meat is associated with masculinity or wealth can also play a role in these findings (Holm, 2000). Within the results of the survey, it was visible that in the student's subgroup affordability tends to take primary importance, even though other motivations and concerns about environmental impact of the meals are valued. These results are in agreement with the findings from Steptoe A. & Pollard T. (1995) that report that price is one of the most valued factors by people, together with health and convenience. The diet that consumers adhere to (e.g. vegan, flexitarian) also plays a role in different motivations for food choice. The consumers that eat meat, ascribed less importance to factors like healthy, natural and animal friendly compared to the remaining diets (pescatarian, flexitarian, vegetarian and vegan).It is important to consider a gender and cultural specific approach when focusing on healthy and sustainable food choices (Schösler, 2015). This approach should include, as well, the different concerns of the students and staff and of the groups with different diet types. It is necessary to find a balance between preserving the ideals of the consumers and finding an acceptable food offer that is healthy and sustainable.

5.4.1.2 Relation between consumer motivations for food choice, rating of the food offer and food choice

The survey included questions about the factors that motivate consumer's food choice, this relates to the Personal Food System. The results showed that consumers that value health are the ones that buy more often salads and warm dinner. When referring to convenience, there was a significant relation with the preference for snacks. The respondents that report to buy snacks might be motivated by the value of convenience. This supports the increase of healthy and sustainable snack offer. Generally, the respondents that find the food offer more pleasurable are the ones that most frequently purchase food at the WUR restaurants. This information can be used to improve the consumer's acceptance of sustainable food at the WUR restaurants. Interventions should focus on improving and enlightening the healthiness of the salads and warm dinner meals. It is also important to consider the 'convenience' aspect and offer more sustainable snacks, this way consumers who value this factor are likely to consume more sustainable products. Furthermore, it is important for healthy and sustainable foods to be equally pleasurable to the consumer. Creating a more sustainable and healthy food offer should happen together with eating a highly pleasurable eating experience. The characteristics of pleasurable foods that should be considered are the smell, taste, texture and looks (Steptoe, 1995). The fact that healthy and sustainable foods are pleasurable may improve the acceptance of consumers that are less interested in health and sustainability issues, but interested in the pleasurability of the food.

5.4.1.3 Relation between perception of sustainability and food choice

Various questions related to the consumer's perception of sustainability were included in the survey. When asking the respondents if they would be willing to pay more for food with a lower environmental impact, the respondents that most often buy salads and vegan foods significantly gave a positive answer, especially if the costs do not increase more than 10%. The consumers that buy salads most often were also more interested in knowing the environmental impact of food products. It is possible to conclude that consumers that buy salads often are more interested in factors like health and the environment. These findings may give a hint towards the advantages of improving not only the health characteristics but also the sustainability of the salads and vegan food. Communicating this to the consumers may trigger their interest in the product. Another question included in the survey, related to a sustainable and healthy behaviour was the following: "Would you prefer vegan or vegetarian foods over meat if the price were the same?". When faced with this question about half of the respondents answered "yes" and only about 20% had a straight negative answer. It is possible to conclude that there is a general open mind towards a shift to more plant-based foods at the WUR restaurants.

5.4.1.4 Findings per restaurant

When analysing the descriptive results of each restaurant separately, there is a similarity in the most valued factors even though there are some variations. Healthy is one of the motivations that seems to have a primacy importance for the consumers in all restaurants, this might be explained by the population of the WUR being more aware of the relevance of this factor (Geurts, 2016). However, as expected, the factors that tend to be more valued in all the four restaurants are affordable, pleasurable and convenient. In fact, affordability is the factor with the highest score in all restaurants except for Impulse, in which health has the highest

score. This result may be related to different characteristics of the respondents from Impulse, for example ‘an older age’ and more percentage of respondents that are staff than in the other restaurants. However, further analysis would be necessary to draw conclusions about this.

5.4.3 Importance of the findings

The outcomes of the consumer study are important for providing information on what the consumer wants. Speculations about this could already be made, but scientifically based conclusions could not be drawn without this consumer study. These scientifically based results provide a stronger argument to present to the caterers. These findings also give insight on how to improve the health and sustainable characteristics of the food offer of the WUR restaurants in a way that suits the specific characteristics, interests and opinions of the consumers. This gives a higher probability of success to the approach, because it is tailored to this specific population.

5.4.4 Unexpected findings

The results of the consumer study led to various findings that agree with previous literature, however, there were some unexpected results. As previously explained, people have different perceptions of “worth” of food depending on the factors to which they are more committed (Shepherd & Raats, 2006). Therefore, it was expected that respondents that attribute different importance to different characteristics of the food would have a different answer to the question “Would you be willing to pay more for food with less impact on the environment”, however, there were no statistically significant relations between the consumer motivations for food choice and their perception of sustainability.

5.4.5 Limitations

The consumer study has a few limitations. One was that the consultancy team had planned to promote the survey in more ways than described in chapter 5.2.3, however not all the promotion activities could be realised. For example, the team wanted to promote the survey by having tables set up in the four buildings and let students and staff fill out the survey on the spot. However, this was not allowed by the receptions of the buildings, so the team could not do it. Another limitation is that the respondents within this study gave rational answers, as they have to think about which option they are choosing when they fill in the survey. However, food decisions are mostly irrational. This fact was taken into account as much as possible, but it is still a limitation towards the internal validity of this study. Furthermore, it is possible that the respondents within this study are more interested in sustainable food. Due to their interest, they are more likely to fill in the survey, which may lead to biased results. The sample population consisted of mostly master students and females. The average age of the respondents is 24 years old, which may not be representative of the age of WUR’s staff and students. This can cause a biased study population and limits the external validity. When analysing the four restaurants separately, it is not possible to find statistically significant results. This probably happened because the number of respondents of each restaurant separately is too low. However, it is possible to analyse the descriptive statistics results, even though it is not possible to withdraw as strong conclusions.

5.4.6 Strengths

This consumer study has several strengths. Firstly, the assumptions of the Green Office were checked to see what is already present and what is still needed within the restaurants. This made it possible to increasingly specify our consumer study in what is useful according to the caterers. This made our study stronger, as the caterers are the ones who will make use of the advice. Secondly, the study had 611 respondents and a minimum of 377 were needed in order to have a significant sample. This made it possible to make stronger correlations and to strengthen the internal validity. Furthermore, the high amount of respondents made it possible to look at differentiated descriptive results among the four restaurants. This is very important, as it became clear through observations and dialogues that all four caterers have different approaches and needs related to the topic of this project. The conclusions of this study contribute to the development of a general and a tailored advice, differentiated among caterers. Finally, the consumer study is in line with the vision of the WUR and builds on the sustainable ventures that are already being undertaken by the four caterers on the campus.

5.5 Conclusion

The consumer study answered Q1: "*What is the relation between consumer motivations for food choice, perception of sustainability, and the choice for specific food products at the WUR restaurants?".* In order to answer this subquestion, two questions where constructed and answered based on the significance of the results and the interrelatedness of the variables.

Q1.1 *What is the relation between motivations for food choice,rating of the food offer and food choice?*

- Consumers who ascribe more importance to 'health' are more likely buy salads and warm dishes (OR=1.51).
- Consumers who ascribe more importance to the value 'convenience' are more likely to buy snacks (OR=1.63). Furthermore, convenience is a motivator that scores high in general (average of 4.03±0.92 out of 5).
- Respondents that rate the food offer at the WUR restaurants more 'pleasurable' are the ones that most frequently purchase food at the WUR restaurants (F(df:1, 587)=12.12, p=0.00).

Q1.2 *What is the relation between perception of sustainability and food choice?*

- Most of the consumers indicated that they are willing to pay more for foods with a low impact on the environment, as long as the increase in cost is below the 10% (67,84%). There is a significant difference in answering this question between the respondents that often buy salads or not (pearson chi-square(df:5)=12.83, p=0.02). The consumers that buy salads were more positive.
- More than half of the consumers (53.7%) indicated that they would choose vegan or vegetarian foods when the prices are the same. If the vega(n) foods would be cheaper, this percentage would increase with 13.3% (total of 74%). These consumers most often buy sandwiches.
- On average, consumers showed an interest in being informed about the environmental impact of their food choices; About 70% answered 'yes' when asked if they would like to be informed about the environmental impact of the food they buy at the WUR restaurants.

6. General Discussion

This project aims to answer the following main research question: *What scientific, applicable and feasible knowledge about consumer motivation and vega(n) alternatives can be used by the Green Office to increase the sustainable and healthy food offers at WUR restaurants in the long term?*

Within this project, health, pleasure and convenience are the most important motivators to choose for a certain type of food. In general, the consumers of the WUR express willingness to adhere to a more sustainable and plant-based diet and would like to be informed about the impact on the climate. This information could be provided on different vega(n) alternatives, such as tofu, tempeh, legumes, pulses, whole grain cereals, mushrooms, nuts, vegetables or mycoprotein. Providing information about these alternatives and making use of nudging on the vega(n) food is suggested to stimulate the consumers food choice.

This knowledge provides possibilities and evidence to successfully increase the vega(n) food offer. Therefore, these findings are important for the Green Office to help the caterers to increase their vega(n) food offers at WUR restaurants.

This project has several weaknesses. Firstly, the future purpose of this project has a practical end goal, as it will be used to help the caterers increase their vega(n) food offer. However, the aim of this project does not focus on the practical end goal, but is focussed on providing scientific knowledge to the Green Office, and only afterwards, relating it with a practical advice. Therefore, the aim of this project and the future end goal are interrelated. In the end, the outcomes and advice of this report are made solely for the Green Office. It is important to keep in mind that, if the knowledge does not fit the practical end goal, it will not help the Green Office to make a shift towards more vega(n) food. Therefore, the caterers are key players that need to be taken into account within this report as well. As a result, the report has to focus less on one specific purpose and take more factors into account. A second limitation that is related to the first one is the lack of trust from the caterers to increase their vega(n) food offer, which they expressed during the dialogues. The caterers are the target group for this study, and noticing their scepticism made the team question what the purpose of this project should be. In order to meet the needs of the caterers and the Green Office, a broader focus was needed. Instead of only focussing on the caterers, a broader perspective was taken into account by including many different stakeholders, such as the consumer, other caterers at the WUR campus and the Executive board. This broader perspective made it possible to provide new suggestions for further research and make an impact towards change. A limitation towards this adoption is, again, a broader focus and lack of specificness. This broad focus within the report had limited space to answer specific questions. For example, it was not possible to study one very specific part of behaviour motivations, or nutrients within one type of food. At last, our ambitions as an ACT team are high. Therefore we wanted to achieve the highest quality according to the background knowledge, but also in the practical advice. However, due to time limitations, this was only possible to a certain extent.

This project has several strengths. At first, the team focused on health behaviour and nutrition. These are two topics that suit the team's expertise and made it possible to provide the highest quality contents. Moreover, this study uses multiple studies. This provides stronger insights,

because through the different study designs, our research question is answered from different points of view. Furthermore, this project used many scientific sources to substantiate the provided knowledge and convincing evidence towards the need, possibilities and strategies to change. Moreover, all the used methods are supported and justified by different theories and literature. These are all extensively elaborated within the text and appendices. For example, the survey is based on two different theories and three related questionnaires. Next to this, different stakeholders are taken into consideration. Not only the aim of the commissioner, which was providing scientific knowledge, but also the field, was analysed, with the aim of developing a more practical orientation. This was a crucial investigation, as the research team learned about many new things that the WUR restaurants are already doing. Insight towards their perspective made the team shift towards a broader focus. In the end, a practical advice for the caterers and a scientific report for the Green Office has been made. This is an outcome that shows that our focus is not on one single issue, but also on matching the theory with practice.

Throughout the development of this study, the need for future research emerged. At first, this study focuses on the consumer at the four restaurants of the WUR. However, many consumers go to Campus Plaza, which is located at the campus as well. In order to get a better idea of the consumer behaviour, it might be interesting to include the customers at Campus Plaza. The reasons consumers have to buy food at Campus Plaza could give interesting outcomes. Moreover, when Campus Plaza is excluded, it is hard for the caterers to make their food supply vega(n). The caterers mentioned that they experience profit loss during meatless Monday, because the consumers go to Campus Plaza. Therefore, possibilities to make Campus Plaza more sustainable simultaneously with the caterers at WUR, should be considered. Possibilities could first be investigated through dialogues with the owners at Campus Plaza. Through these dialogues, it might be possible to gain insight in what they are selling, what strategies they already use, if the food they sell is sustainable and if they are willing to change towards a more vega(n) food offer.

Secondly, through the dialogue with the caterers and contract manager, it became clear that a top-down approach towards more sustainable food is lacking. To effectively change the food supply at the WUR campus, it can be useful to get in touch with- and to influence the executive board of the WUR. Shortly, a new and more specific vision will be created for the WUR caterers by the contract manager. Lobbying to influence their outdated vision towards a more vega(n) oriented vision could stimulate the caterers to increase their vega(n) food offer. Within this project, different possibilities were taken into account. Through networking with employers from the WUR facility management, some options were suggested by them. The board could be reached through the student council and once in a while, students can have a breakfast with the board. Furthermore, in October 2019, an event is organized to search for projects and ideas towards sustainable protein where funds will be provided. This event is called “Protein Transition Investment Theme” and could lead to a broader opening to discuss the vision on sustainability on the WUR itself (Pyett, S. (2019).

Finally, a future study could investigate the irrational behaviour of the consumer. This study made a survey, which is filled in rationally whereas the food behaviour is mostly irrational. There are multiple suggestions to investigate the irrational behaviour. For example through observations. Look at what students are buying and ask them afterwards how they made this decision. Or observe how consumers behave when certain forms of nudging are performed on the food within the restaurant. Through this observations, it is interesting to test if the amount of sold vega(n) food increases. As the four restaurants are different in their

supply, their needs, consumer characteristics and work style, it is suggested to observe nudging strategies at all four restaurants separately. This could be done by the caterers or in cooperation with approval of the caterers.

7. Advice

In the creation of the advice, considerations were made related to the inclusion criteria. During the orientation phase of the project (chapter 1.3), it became clear that there are considerable differences between the four caterers. This advice takes these differences into consideration by including a tailored advice for the caterers, that considers their specific restraints and motivations. Furthermore, it became clear that all four caterers are already willing to include more sustainable, and vega(n), foods, and are already undertaking multiple steps to achieve this. During the dialogue with the caterers and the contract manager, the need for more guidance and specific guidelines from the Executive Board towards a more sustainable food supply became clear. Therefore, we want to recommend the Green Office to use the knowledge that is gathered and presented in this advice to approach the Executive Board of the WUR.

The advice consists of two main parts. The first part is a general advice based on the three studies. The second part consists of a tailored advice and is differentiated by the four restaurants of Impulse, Leeuwenborch, Forum, and Orion. The points included in the tailored advice are based on the wishes indicated by the caterers during the stakeholders dialogues, and the significant results from the consumer study. Within this report the advice is supported by the results from the studies. The concrete points of recommendations from the general part of the advice and the tailored advice are combined into a poster format. The advice is visualized in four posters, in which the general part includes the same information, but the tailored advice is separated per caterer. Subsequently, there are four posters including the useful information and recommendation for each caterer (Appendix 11). A poster format is used to create an overview of the main recommendations that is attractive and practical oriented for the caterers.

7.1 General advice on Sustainable Nutrition

In the literature study, several food ingredients were described that could replace parts of an animal-based dish or completely replace animal-based dishes.

Plant-based meat alternatives can be made using tofu, tempeh, legumes, pulses, whole grain cereals, mushrooms, nuts, vegetables or mycoproteins.

- Ingredients like cereals and legumes or pulses are recommended to be combined in a meal, in order to get an optimal amino acid content, and with this, a nutritious meal.
- In order to create more complete nutrient profiles for plant-based meals, ingredients like seeds, algae, dark green vegetables, dried seaweed and shiitake mushrooms can be used.
- Based on the nutrient content, soy, almond and oat drink are the most suitable plant-based alternatives.

There are also specific foods that are suitable to replace dairy and egg products:

- For making omelets, tofu, silken tofu or chickpea flour can be used, combined with the right herbs and spices to make it taste like egg as much as possible.
- Dairy butter could be replaced with plant-alternatives, like soy butter or almond butter, or margarine.

7.1.1 Linking the literature to specific foods and recipes

Based on the consumer study 'What's on your menu?', it can be concluded that the most popular dishes at the WUR university are sandwiches and soups. Together with taking into account the ingredients found in the literature study, recipes for sandwiches and soups were obtained from the website of 'the vegan challenge'.

- Lunch dishes like mushroom ragout on bread, tofu scramble, tofu omelet, eggplant salad on bread, broccoli-zucchini-coconut soup, white bean burgers with roasted bell pepper and tomato on bread, bean soup and lentil soup are examples of plant-based recipes that can be found on this website (Veganchallenge, n.d.).
- More websites on plant-based recipes, can be found on the recipes website of veganwiki.nl, which is an initiative of the Dutch association of veganism.
- Lastly, a mobile application could be used, called Eaternity app (Eaternity, n.d.). It is a paid app where health, costs, sustainability and other ratings of different foods are indicated. It is meant for professional use, e.g. catering businesses, and the data is scientifically based.

7.2 General Advice on Successful Interventions

There are useful strategies for making more sustainable food choices by changing parts of the environment, without restricting the consumer in choice:

Make vega(n) options more visible for the consumer, since it increases the sales of those meals. This can be done by placing vega(n) meals near the cash register, in the middle of the room or at the entrance of the restaurant. In addition to this, non-vega(n) meals can be placed further away from the registers and the entrance of the restaurant.

Provide the consumer with more vega(n) meals on the menu. It is proven that a menu that consists for 80% out of vegetarian meals, increases the sales of these meals without decreasing the attitude of the consumers towards the food and the restaurant. This can be combined with making the vega(n) options more visible on the menu.

Provide consumers with information about the meal itself, this will help the consumer make a more conscious decision about their food. Labeling meals "climate-friendly" increases the sales of those meals.

7.3 General advice on Consumer Motivations

When implementing more vega(n) food options in a restaurant at WUR campus, take three demographic factors of the consumers into consideration:

Gender; Women ascribe more value to health, the environment, animal welfare, and fair trade related to their food choices. This correlates with their willingness to pay more for foods with a low environmental impact. Therefore, promotion campaigns could focus on being especially attractive for men, so they will also be interested in vega(n) foods.

Nationality; Chinese people ascribe less value to the environment and animal welfare related to their food choice, than Dutch people. They are also less willing to pay more

for products with a lower environmental impact. Therefore, it is advised to make vega(n) dishes that connect to multiple cultures.

Diet: People who follow a vega(n), vegetarian, or flexitarian diet ascribe more importance to health, the environment, animal welfare, and organic foods, related to their food choices. They are also more demanding for these values when rating the food offer in the four restaurants. Therefore, it is advisable to focus on these values when promoting the vega(n) foods, for example by providing labels.

Secondly, there are correlations between food choice motivators and the choice for specific foods, that can be used in the composition of vega(n) products:

- Consumers who ascribe more importance to 'health' buy more salads and warm dishes. To increase the interest for these products, the promotion can focus on the health benefits, while also making the foods more vega(n).
- Consumers who ascribe a lot of importance to the value 'convenience' buy more snacks. Since convenience is a motivator that scores high in general (4.03 out of 5), including more vega(n) snacks can attract more consumers while increasing the sustainability of the food offer.

Thirdly, there is a correlation between the choice for vega(n) and sustainable foods and the willingness to pay, related to specific target products:

- More than half of the consumers (53.7%) indicated that they would choose vegan or vegetarian foods when the prices are the same. When vega(n) foods are cheaper, this percentage increases with 13.3% (total of 74%). Consumers who gave these indications, also buy sandwiches most often. Therefore, sandwiches can be a target product for increasing the vega(n) food offer, with a specific focus in the promotion on "equal prices" or "cheaper" related to the animal-based equivalent.
- Most of the consumers (67,84%) indicated that they are willing to pay more for foods with a low impact on the environment, as long as the increase in cost is below the 10%. These consumers bought salads most often. Therefore, salads can also be a target product for increasing the vega(n) and sustainable food offer, with a specific focus in the promotion on the benefits for the environment.

Finally, consumers, on average, showed an interest in being informed about the environmental impact of their food choices. This strengthens the utility of using nudging and the provision of information, as described in chapter 7.2.

7.4 Tailored advice

The points included in the tailored advice are based on the dialogue with the four caterers and on the three studies conducted within this project. For all four restaurants a comparison is made between what the consumers find important when considering food choice and how the consumers rate the food that is offered by the restaurant. Based on the results of the consumer study, a top 3 was constructed on the motivations for food choice. A differentiation was made among the four restaurants, by using and sorting the results of the consumers visiting one restaurant most frequently. This means that, per restaurant, the consumers visiting this restaurant most frequently, their general motivation for food choice is provided. Next to this, a

top 3 of how these consumers rate the restaurant is provided, using the same values as for food choice. Recommendations are provided on what values are missing based on a comparison of the 'top 3 on the ratings of the food offer at the restaurant' and "the most important motivations". These recommendations advice the caterers on which values they should integrate and promote more when selling their vega(n) foods. Secondly, pie charts are included and show for each restaurants specifically (1) Willingness of the consumers to pay more for food with a lower impact on the environment, (2) Preference for vega(n) foods over meat related to the price, and (3) Diets followed by the people visiting the restaurant. These diagrams show an overall willingness of the consumers to consider sustainability in their food choice, when differences in price are not too high. Other facts and quotes from the respondents are included in the posters (Appendix 11), to further strengthen the benefits of including more vega(n) foods in the food offer of the restaurants. Per caterer, recommendations are presented and combined through visuals in this tailored advice. Table 17 includes the written advice for the caterers as it is represented in the poster.

Table 17: Tailored advice for the four caterers at WUR, as represented in the poster (Appendix 11)

Sodexo (Impulse)	**Good Food (Leeuwenborch)**	**Cormet (Forum)**	**OSP (Orion)**
Top 3 motivations for buying food: 1) Healthy 2) Convenient 3) Affordable Top 3 ratings on the food offer: 1) Healthy 2) Convenient 3) Pleasurable	Top 3 motivations for buying food: 1) Affordable 2) Pleasurable 3) Healthy Top 3 ratings on the food offer: 1) Affordable 2) Convenient 3) Pleasurable	Top 3 motivations for buying food: 1) Affordable 2) Healthy 3) Convenient Top 3 ratings on the food offer: 1) Convenient 2) Pleasurable 3) Healthy	Top 3 motivations for buying food: 1) Affordable 2) Healthy 3) Pleasurable Top 3 ratings on the food offer: 1) Convenient 2) Healthy 3) Pleasurable
*Pie chart	*Pie chart	* Pie chart	*Pie chart
Recommendations: Focus on **affordability** when introducing or promoting more vega(n) foods. When introducing sustainable/vega(n) foods, keep the price difference within a 10% margin of the animal-based products. **Provide knowledge** about the environmental impact of the foods, e.g. by colour labeling.	Recommendations: Focus on the **health** benefits when promoting vega(n) foods. When introducing sustainable/vega(n) foods, keep the price difference within a 10% margin of the animal-based products. Introduce an indication for vega(n) foods that are recognizable for vega(n)'s but not necessarily for meat-eaters, so meat-eaters won't refrain from choosing it. E.g. V for Vegetarian, and VV vor Vegan.	Recommendations: Focus on the **affordability**, and on **health** benefits when promoting vega(n) foods. When introducing sustainable/vega(n) foods, keep the price difference within a 10% margin of the animal-based products. **Provide knowledge** about the environmental impact of the foods, e.g. by colour labeling.	Recommendations: Focus on the **affordability** when promoting vega(n) foods. When introducing sustainable/vega(n) foods, keep the price difference within a 10% margin of the animal-based products. More than ⅔ of your consumers are vega(n)'s, flexitarians, or pescatarians → The promotion can focus on the **"being vega(n)**"
Quote: *"I think they are already doing a great job. I am very happy with the meatless mondays and hope they will introduce*	Quote: *"Introduce a voucher, when you eat 5 or 10 times vegan/vega, you get 1 free vegan meal the next time. The food itself is super"*	Quote: *"I would prefer vegetarian/vegan foods over meat when it is tastier than meat foods. I don't care whether or not I eat meat,*	Quote: *"In my country, vegetable cooked dishes are way more cheaper than meat, but here almost the same price. Somehow, it*

more meatless days in the week."		*but I do care about the nutrients the food has."*	*made me choose meat over vegetables."*

8. Literature

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9. Appendix

Appendix 1: Search terms of the literature studies and consumer studies

Sustainable nutrition

Table 1. Search queries for the literature study 'sustainable nutrition'

Chapter	Research terms
Environmental impact of agriculture	(Vegetarian OR vegan OR plant-based) AND (environment OR environmental impact vegetarian OR environmental impact vegan OR environmental impact plant-based OR meat production OR greenhouse gas emission OR water use OR energy use)
Sustainable alternatives for animal-based products	(Vegetarian OR vegan OR plant-based) AND ((milk OR meat OR cheese OR egg AND alternative* OR analogue* OR replace* OR protein source* OR protein* OR protein content OR nutrient* OR nutrition* value OR nutrition* quality OR sustainable protein option?)
Health regarding a plant-based diet	(Vegetarian OR vegan OR plant-based) AND (health* OR human health OR disease* OR cardiovascular disease OR beneficial for human health OR negative effect on human health OR safe OR deficiencies OR nutrients of concern OR health implication* OR saturated fats OR cholesterol OR vitamin D OR vitamin B12 OR selenium OR omega 3 OR omega 6 OR calcium OR iron OR zinc OR calcium OR folate OR magnesium OR vitamin C OR vitamin E OR polyunsaturated fat OR monounsaturated fat)
Feasibility of plant-based diet	(Vegetarian OR vegan OR plant-based) AND (price OR cost* OR feasib* OR affordable OR cheap OR expensive OR expenses OR market)

Literature study: Review of interventions of sustainable diets

Table 2. Search queries for the literature study 'review of interventions of sustainable diets'

Chapter	Research terms
Nudging	(vegetarian OR vegan AND intervention AND food), (nudg* OR information AND vegetarian OR vegan AND intervention AND university) and (sustainable diet AND nudg* OR information AND campus OR canteen)
Providing information	(sustainable AND food AND intervention OR strateg*), (vegetarian OR vegan AND information AND intervention), (Intervention AND vegetarian OR vegan AND university OR canteen), (strateg* OR intervention AND campus OR university OR canteen AND information AND provision AND menu)

Combining nudging and information provision	(strateg* OR intervention AND menu AND campus AND nudg* AND information AND provision), (combin* AND nudg* AND intervention OR strateg* AND university OR campus), (Information AND provision AND university AND campus AND nudg* AND menu).

Appendix 2: Observational study on the current WUR restaurant food offer

Table 3. The amounts of food offers counted at the WUR restaurants

		Forum- Grand café	Impulse- Futurum	Orion- the Spot	Leeuwenborch
Lunch					
Sandwitch, wrap	Vegan	1	2	4	1
	Vegetarian	16	4	0	5
	Meat/ fish	4	5	0	1
Soup	Vegan	0	0	2	2
	Vegetarian	2	2	0	0
	Meat/ fish	0	0	0	0
Salat units	Vegan	10	5	6	1
	Vegetarian	6	2	2	0
	Meat/ fish	1	0	0	0
Snacks					
Savoury snack, puff pastry	Vegan	4	0	10	4
	Vegetarian	10	3	6	6
	Meat/ fish	4	0	1	3
Sweet snacks	Vegan	5	2	10	2
	Vegan fresh	2	3	6	2
	Vegetarian	33	7	24	9
	Meat/ fish	0	0	0	0
Dinner					
	Vegan	-	-	-	-
	Vegetarian	-	-	-	-
	Meat/ fish	-	-	-	-
Drinks					
Dairy	Dairy-substitute	3	0	2	4
	Substiture warm drinks	Yes	Yes	yes	no
	Dairy	16	5	6	6
Sugar	Low (<- 5gram) per 100 ml	30	12	8	8
	High (5 gram- <) per 100 ml	20	11	15	13
Side notes					

		Forum- Grand café	Impulse- Futurum	Orion- the Spot	Leeuwenborch
Lunch					
Sandwitch, wrap	Vegan	3	3	3	2
	Vegetarian	16	3	2	4
	Meat/ fish	19	5	2	1
Spreads	Vegan	2	0	2	0
	Vegetarian	5	9	8	3
	Meat/ fish	0	8	5	0
Soup	Vegan	0	0	2	0
	Vegetarian	2	1	0	1
	Meat/ fish	0	1	0	0
Salat units	Vegan	9	4	6	1
	Vegetarian	4	4	2	1
	Meat/ fish	3		0	
Snacks					
Savoury snack, puff pastry	Vegan	5	0	7	4
	Vegetarian	11	2	2	2
	Meat/ fish	6	1	2	1
Sweet snacks	Vegan	8	2	8	2
	Vegan fresh	10	3	3	2
	Vegetarian	39	9	22	15
	Meat/ fish	0	0	0	0
Dinner					
	Vegan	-	-	-	-
	Vegetarian	-	-	-	-
	Meat/ fish	-	-	-	-
Drinks					
Dairy	Dairy-substitute	2	0	0	3
	Substiture warm drinks	yes	yes	yes	no
	Dairy	17	5	5	6
	Yogurt	8	8	0	3
Sugar	Low (<- 5gram) per 100 ml	31	11	11	8
	High (5 gram- <) per 100 ml	18	8	12	12
Side notes					

Appendix 3: Structure of the caterers' dialogue

Introduction including 'who are we' (Yentl & Sophie) and the aim of the Green Office and the purpose of the consultancy team:

- Aim Green Office: Create a shift towards more sustainable, healthy and affordable protein options at Wageningen University and Research (WUR) campus.
- Purpose: Provide convincing, applicable, feasible and scientific knowledge about consumer motivations in relation to sustainable foods, and about vega(n) alternatives to support the aim of the Green Office

Orienting questions that seek to answer: '*Who are the stakeholders?*', '*What do they want?*', and '*How are they trying to get it*?'

- Where does your focus lie with regard to the specific food offer?
- Are you trying to induce changes? And what changes have you induced recently?
- What are important parties that are involved in your restaurant? (supply-chain)

Specific questions related to vega(n) food offer

- What is your perspective towards the aim of the Green Office?

"Explain our goal (Purpose) and that we want to help them by gaining insight in the consumer motivations (consumer study) and by providing vega(n) alternatives for the animal-based protein foods they now offer (Based on scientific literature)"

- What information do you find valuable/important in order to further support the transition towards a more vega(n) food offer?

"Explain that we understand their constraints; on meatless Monday consumers go to Campus Plaza, only a small percentage of the students want vega(n) food options (??), sales, restricted freedom because of being part of larger catering companies"

- Do you have any additional constraints you worry about?
- Do you have ideas on how to overcome these constraints?
- Why are there still so many unhealthy snacks available?

Wrap up

- How would you like our collaboration to look like? Do we keep you up to date during to project process?
- Would you like to be present at our presentation at the 2nd of July?

"Explain what our output will look like: written output (focus on Practice oriented advice for the caterers on the implementation of vega(n) foods) and visual outputs (final presentation, poster on consumer motivations and on vegan alternatives)"

Appendix 4: Stakeholder long-list

Green Office of the WUR

The Green Office is the sustainability office from WUR, its vision is that sustainability is the future and so the university needs to act on it (Green Office Wageningen, 2016a). The "Green Office Movement" is a project, created in the Netherlands, that aims to establish offices that inform, connect and support the communities of the Universities to act on sustainability (Green Office Movement, 2019). The six principles of the Green Office model are: "exists of students and staff; has the official mandate to encourage sustainability in the higher education institution; receives funding to achieve the above; is integrated in the organizational structure of the institution; collaborates with internal and external parties and demonstrates how this change can be achieved through training." (Green Offices, n.d.).

- Given the purpose of the Green Office, this project definitely falls in its interests, therefore this is a high interest stakeholder. Although the Green Office is highly interested in the project and it serves as facilitator and instigator on sustainability issues, its power to apply changes is limited.

(Potential) consumers of the WUR restaurants

The (potential) consumers of the WUR restaurants are the students and staff of the University. This is a very diverse group constituted by over 18,500 people with different cultures and beliefs and very different characteristics.

In the end, the demand of the consumer is the determinant for the food offer in the restaurants, therefore its input is decisive to this project, which means that although the (potential) consumers do not make direct decisions, they have an indirect source of power. This group is the one that is affected by the restaurants' food offer in the end line, therefore it is an high interest stakeholder.

Caterers of the WUR restaurants

The WUR restaurants are managed by four different caterers, OSP (in the Orion building), Cormet (in the Forum building), Good Food (in the Leeuwenborch building) and Sodexo (in the Impulse building).

The caterers are under a contract agreement with the WUR, therefore, there are regulations that they need to follow but in the end point, they still possess some freedom to make their own decisions on which food to offer and how to organize "their" restaurants, therefore, they have high power. The caterers show some concerns on sustainability and healthiness but one of their main worries is the profit. If a shift in the restaurants leads to lower profit that is not in their interest.

Food suppliers

The food suppliers are in a more distant position in the supply chain, the functioning of the whole chain depends on them and they depend on the final product demand, it is a two-way relationship. This high dependence on the product demand causes this stakeholder to have a low power in this context.
Specifically the suppliers of animal products will be affected by a shift in the food offer in the restaurants towards more vega(n) alternatives, because the products they offer will have a lower demand, therefore they have a low interest in the shift.

Contract manager of the caterers of the WUR restaurants

The contract manager is a relatively high interest stakeholder since she represents the interests of the WUR that are in line with the interests of this project. Her power is relatively high, but there are still limitations on what she can execute and not, according to the contract obligations.

CaterPillars

The "Caterpillars" are a group participating in the WUR student challenge: "ReThink Protein". This challenge consists on producing a "breakthrough idea to feed 9 billion people with healthy, sustainable and affordable protein". (WUR Student Challenge: ReThink Protein, 2019a)

The group is working in a platform to "accelerate a sustainable protein transition by connecting people in the food sector" (WUR Student Challenge: ReThink Protein, 2019b).

The project definitely falls in the vision of this group, therefore they are a high interest stakeholder. The "CaterPillars" are working in the subject of sustainability and health, including the involvement of the caterers. They may have some power to assist with the aims of this project, although this power is limited when comparing with institutions and companies.

Executive Board of the WUR

The Executive Board of the WUR is responsible by the management and administration of the entire institution and is constituted by three members, the president, the rector magnificus who is also t he vice president, and a third member. The executive board is appointed for a period of four years (Wageningen University and Research, n.d.b). This stakeholder has a very high power since it is the final decision maker of the WUR, regarding to interest it can be considered relatively low when comparing to other stakeholders that are more closely related to the project.

Student Council of the WUR

The student council, is constituted by 12 students, that represent the interests of all students at WUR. This board is provided of four major rights: disapprove the plans of the Executive Board, advise the Executive Board, present initiatives to the Executive Board and obtain all the necessary information about the WUR. In light of these four major rights, it is possible to conclude that the Student Council is a high power stakeholder that is able to influence the decisions of the Executive Board. The Student Council is a high interest stakeholder as well, since it represents the students that are one of the main groups of (potential) consumers that are going to be affected by a possible change in the WUR restaurants (Wageningen University and Research, n.d.a).

Appendix 5: Global impact of food production

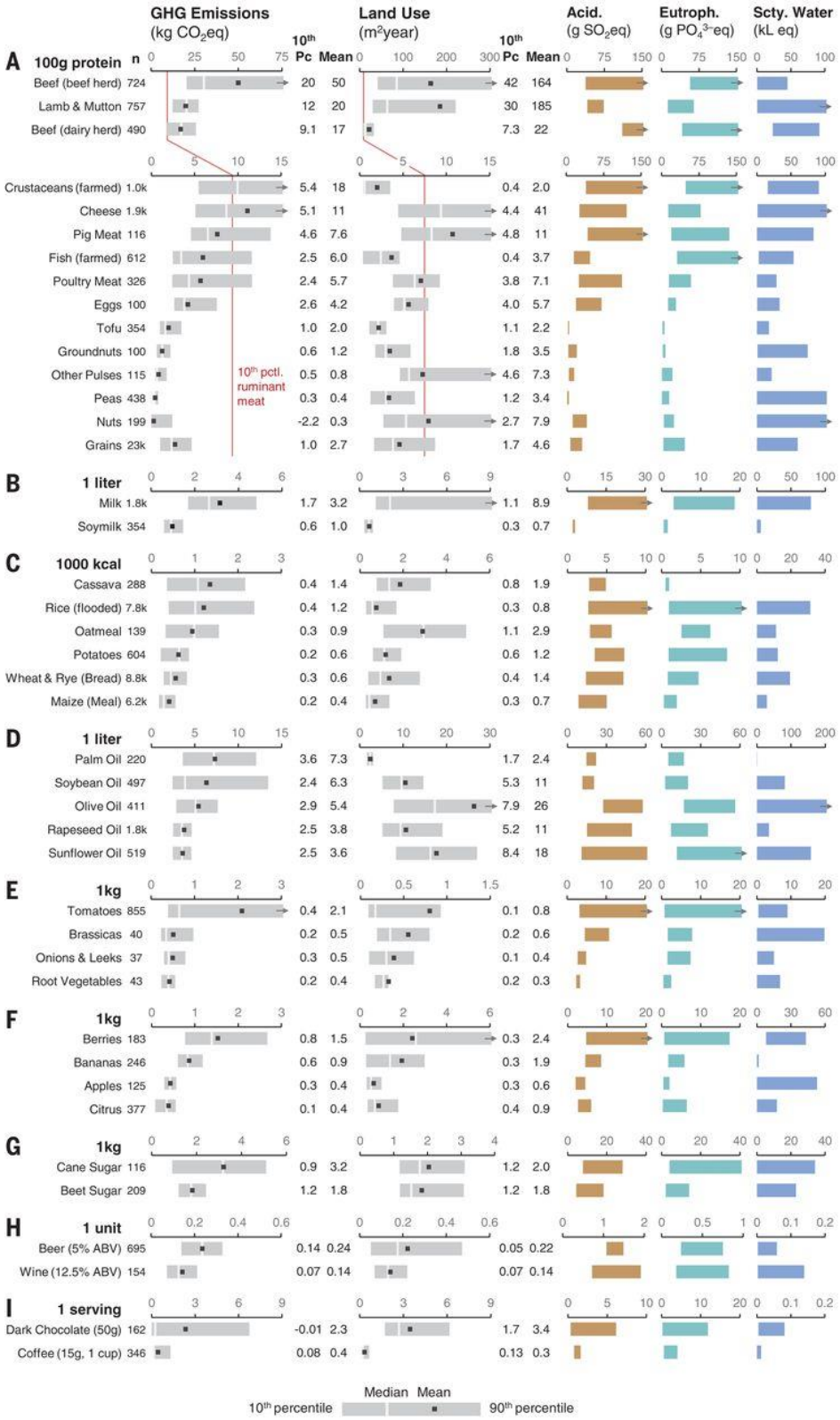


Figure 1. Estimated global variation in GHG emissions, land use, terrestrial acidification, eutrophication, and scarcity-weighted freshwater withdrawals, within and between 40 major food groups (Poore et al, 2018)

Appendix 6: Description of nutrients

A list of descriptions of nutrients and their dietary sources and functions in the body.

Calcium

Calcium is of importance for the build and upkeep of bones and teeth (FAO, 2001). Also, calcium ions play part in a lot of metabolic processes in the body. Calcium is mainly found in dairy products, nuts, legumes and green vegetables (Voedingscentrum, n.d.).

Folate

Folate, also known as vitamin B11, is of importance for the development of an unborn foetus, for the growth and functioning of the human body, for functioning as a co-factor and for the production of red blood cells (Voedingscentrum, n.d.; FAO 2001). An adequate amount of fresh green vegetables in the diet makes a good source of folate. Folate can also be obtained from bread, whole grain products, dairy and meat (FAO 2001).

Iron

Iron is essential for the body, where it is incorporated in red blood cells, which are responsible for the transport of oxygen through the
body (Anderson & Mclaren, 2012; Voedingscentrum, n.d.). Two forms of iron can be obtained from the diet, namely heme iron and non-heme iron (Voedingscentrum, n.d.). Heme iron can only be obtained from animal products, and is absorbed by the gut more efficiently compared to non-heme iron. Non-heme iron can be obtained from both animal and plant sources, like bread, whole wheat products, dark green vegetables, nuts and legumes (Voedingscentrum, n.d.). .

Magnesium

Magnesium is of importance in the conduction of nerve signals, muscle functioning, and formation of bone and muscles (Voedingscentrum, n.d.). In the diet, it can be obtained from cereals, bread, nuts, vegetables, meat and dairy.

Omega 3

Omega 3 is beneficial for human health, since it protects against CVD (Voedingscentrum, n.d.). It is a PUFA that can be found in several plant-based oils and in seeds, like chia seeds, hemp seeds, walnuts and brazil nuts (Saini & Keum, 2018). There are three kinds of omega 3, namely alfa-linoleenzuur (ALA), eicosapentaeenzuur (EPA) and docosahexaeenzuur (DHA). ALA is the main kind of omega 3 that a plant-based diet can deliver (Voedingscentrum, n.d.). However, EPA and DHA can be synthesized from ALA (Lenihan-Geels, Bishop & Ferguson, 2013). EPA and DHA are mainly obtained from fish and shellfish, who get their omega-3 fatty acids EPA and DHA from the algae in their diet (Voedingscentrum, n.d.; Lenihan-Geels, Bishop & Ferguson, 2013). These algae-derived lipids are also suitable for vegetarians (Lenihan-Geels, Bishop & Ferguson, 2013).

Selenium

Selenium is a trace element that protects red blood cells and other cells against damage, and is important for a well functioning thyroid (Voedingscentrum, n.d.). It can be found in nuts, especially paranuts, whole grain cereals, and vegetables. However, the selenium content depends on the amount of selenium

present in the soil the product grows on. This depends on environmental conditions, agricultural practices, and geographic location (FAO, 2001).

Vitamin B12

Vitamin B12 can mainly be obtained from animal products, like dairy, meat, fish and eggs (Voedingscentrum, n.d.). It also occurs in dried seaweed and algae, however, a big part of this vitamin B12 is not active and is not absorbed into the body (Voedingscentrum, n.d.; Watanabe, 2007). Some other plant-based sources of vitamin B12 are shiitake mushrooms, dried green and purple lavers (nori) (Watanabe, 2007; Watanabe, Yabuta, Bito & Teng, 2014). Vitamin B12 is needed to make red blood cells, and essential for a good functioning nervous system (Voedingscentrum, n.d.). Since mainly animal products are a good source of vitamin B12, it is important for people following a plant-based diet, to obtain enough vitamin B12 via the diet, to take vitamin B12 supplementation or to consume products fortified with vitamin B12, in order to prevent vitamin B12 deficiencies (Voedingscentrum, n.d.; Pawlak et al, 2013).

Vitamin C

Vitamin C functions as an antioxidant in the body (Voedingscentrum, n.d.). It is also needed for absorption of iron in the gastrointestinal tract, the formation of new connective tissue and for the upkeep of the immune function. Foods like fruits and vegetables as kiwi's, berries, citrus fruits, strawberries and cabbage, and potatoes are dietary sources of vitamin C.

Vitamin D

Vitamin D is needed for calcium uptake in the gastrointestinal tract, and with that, maintenance of strong bones and teeth (Voedingscentrum, n.d.). It also plays a part in the functioning of the immune system and muscles. Shiitake mushrooms are a source of vitamin D (Holick, 2007). The skin can also produce vitamin D, during exposure to UV-B light radiation. However, this process happens less in people with a darker skin tone (Voedingscentrum, n.d.). In case vitamin D requirements are not met via diet, vitamin D is obtained via sun exposure, or via consumption of vitamin D supplementation (Holick, 2007).

Vitamin E

Vitamin E is also an antioxidant, protecting the cells, organs, eyes, blood vessels and tissue. Furthermore, vitamin E is important for the metabolism (Voedingscentrum, n.d.). Vitamin E is naturally present in a plant-based diet, like nuts, seeds, cereals, fruits, vegetables, bread, sunflower seed oil and margarine, but also in animal products (Voedingscentrum, n.d.; FAO 2001).

Zinc

Zinc is a trace element that is part of several big enzymes that are involved in the body's metabolism (Voedingscentrum, n.d.; FAO, 2001). Zinc is also needed for growth and development of tissue, making proteins, genetic expression and essential for a functioning immune system. Plant-based sources of small amounts of zinc are cereals, legumes, pulses, whole grains, tofu, tempeh, seeds and nuts (Voedingscentrum, n.d.; Saunders, Craig & Baines, 2013; FAO, 2001).

Appendix 7: Survey ‘What’s on your menu?’

Section 1: Introduction

Dear participant,
Together with the Green Office we are exploring the possibilities to increase the availability of sustainable and healthy food options at the WUR restaurants (Forum, Leeuwenborch, Orion and Impulse).

By completing this survey you get a chance to win a 25 euros gift voucher (VVV-bon) or one of the 10 “Tony Chocolonely” chocolate bars!

You are asked to answer 12 questions about the WUR restaurants (excluding the vending machines), which in total takes less than 5 minutes of your time. Please, take your time and answer honestly. Your personal opinion matters, there are no right or wrong answers.Your data will be completely anonymous, no private data will be shared with others.

If you have any further questions you can contact us through planticorn@gmail.com. Thank you for participating!

Best,
Planticorn

* This survey closes at the 20th of June

*Vereist

Section 2: Personal information

1. **What is your age? (years)** *
2. **What is your gender?** **Markeer slechts één ovaal.*
    a. Female
    b. Male
    c. Prefer not to say
    d. Anders:
3. **What is your nationality?** *
    Markeer slechts één ovaal.
    - Choice option between the 113 countries -
4. **What is your occupation?** **Markeer slechts één ovaal.*
    a. WUR staff *Ga naar vraag 5.*
    b. WUR bachelor's student *Ga naar vraag 5.*
    c. WUR master's student *Ga naar vraag 5.*
    d. WUR PhD candidate *Ga naar vraag 5.*
    e. Other position at WUR *Ga naar vraag 5.*
    f. Other occupation (not at WUR) *Ga naar "The end ."*

Section 3: Diet

1. **Do you identify as any of the following?** * *Markeer slechts één ovaal.*
    a. Meat-eater (I eat meat at least 5 days per week)
    b. Flexitarian (My primary type of diet is vegetarian but I occasionally eat meat or fish)
    c. Pescatarian (I do not eat meat but I do eat fish) Vegetarian (I do not eat meat or fish)
    d. Vegetarian (I do not eat meat or fish)
    e. Vegan (I only eat plant-based)

f. Anders:

Section 4: Frequency of food purchases at WUR restaurants

1. How many times per week (on average) do you buy food at the WUR restaurants (Leeuwenborch, Forum, Orion and Impulse), including coffee bars and chinese stands? *
2. Can you motivate your answer if necessary? (optional)

Section 5: Food offer at WUR

1. **In which WUR restaurant do you buy food the most? ***Markeer slechts één ovaal.*
    a. Forum *Ga naar vraag 13.*
    b. Impulse *Ga naar vraag 21.*
    c. Leeuwenborch *Ga naar vraag 17.*
    d. Orion *Ga naar vraag 9.*
    e. I don't buy food in any WUR restaurant *Ga naar vraag 25.*

Section 6: Food choice at the Orion Restaurant

1. **On average, how many euros do you spend at the Orion restaurant per week? ***
2. **When you buy food at the Orion restaurant, what products do you buy? (more than 1 answer possible)**
   Vink alle toepasselijke opties aan.
    a. Sandwiches
    b. Wraps
    c. Soup
    d. Salads
    e. Fruit
    f. Puff pastry
    g. Fried food
    h. Dinner Snacks
    i. Anders
3. **When you buy drinks at the Orion restaurant, what products do you buy? (more than 1 answer possible)**
   Vink alle toepasselijke opties aan.
    a. Soft drinks
    b. Fresh fruit
    c. Juices
    d. Dairy
    e. Dairy substitute
    f. Other:
4. **How would you rate the food offer at the Orion restaurant?**1 = not at all, 5 = very much (If you are on a phone, the screen will not show every option at once. You can swipe to see all the answer options) *Markeer slechts één ovaal per rij.*
    a. Healthy
    b. A way of monitoring my mood (e.g. a good feeling, coping with stress)
    c. Convenient
    d. Provides me with pleasurable
    e. Sensations (e.g. texture, appearance, smell and taste)
    f. Natural
    g. Affordable
    h. Helps me control my weight

i. Familiar
j. Environmental friendly
k. Animal friendly
l. Fair-trade (*Ga naar vraag sectie 10)*

Section 7: Food choice at the Forum Restaurant

1. **On average, how many euros do you spend at the Forum restaurant per week? ***
2. **When you buy food at the Forum restaurant, what products do you buy? (more than 1 answer possible)** *Vink alle toepasselijke opties aan.*
    a. Sandwiches
    b. Wraps
    c. Soup
    d. Salads
    e. Fruit
    f. Puff pastry
    g. Fried food
    h. Dinner Snacks
    i. Anders:
3. **When you buy drinks at the Forum restaurant, what products do you buy? (more than 1 answer possible)** *Vink alle toepasselijke opties aan.*
    a. Soft drinks
    b. Fresh fruit
    c. Juices
    d. Dairy
    e. Dairy substitute
    f. Other:
4. **How would you rate the food offer at the Forum restaurant?**1 = not at all, 5 = very much (If you are on a phone, the screen will not show every option at once. You can swipe to see all the answer options) *Markeer slechts één ovaal per rij.*
    a. Healthy
    b. A way of monitoring my mood (e.g. a good feeling, coping with stress)
    c. Convenient
    d. Provides me with pleasurable
    e. Sensations (e.g. texture, appearance, smell and taste)
    f. Natural
    g. Affordable
    h. Helps me control my weight
    i. Familiar
    j. Environmental friendly
    k. Animal friendly
    l. Fair-trade (*Ga naar vraag sectie 10)*

Section 8: Food choice at the Leeuwenborch Restaurant

1. **On average, how many euros do you spend at the Leeuwenborch restaurant per week? ***
2. **When you buy food at the Leeuwenborch restaurant, what products do you buy? (more than 1 answer possible)** *Vink alle toepasselijke opties aan.*
    a. Sandwiches
    b. Wraps
    c. Soup

d. Salads
e. Fruit
f. Puff pastry
g. Fried food
h. Dinner Snacks
i. Anders:

3. **When you buy drinks at the Leeuwenborch restaurant, what products do you buy? (more than 1 answer possible)** *Vink alle toepasselijke opties aan.*
    a. Soft drinks
    b. Fresh fruit
    c. Juices
    d. Dairy
    e. Dairy substitute
    f. Other:
4. **How would you rate the food offer at the Leeuwenborch restaurant?** 1 = not at all, 5 = very much (If you are on a phone, the screen will not show every option at once. You can swipe to see all the answer options) *Markeer slechts één ovaal per rij.*
    a. Healthy
    b. A way of monitoring my mood (e.g. a good feeling, coping with stress)
    c. Convenient
    d. Provides me with pleasurable
    e. Sensations (e.g. texture, appearance, smell and taste)
    f. Natural
    g. Affordable
    h. Helps me control my weight
    i. Familiar
    j. Environmental friendly
    k. Animal friendly
    l. Fair-trade (*Ga naar vraag sectie 10)*

Section 9: Food choice at the Impulse Restaurant

5. **On average, how many euros do you spend at the Impulse restaurant per week? ***
6. **When you buy food at the Impulse restaurant, what products do you buy? (more than 1 answer possible)** *Vink alle toepasselijke opties aan.*
    a. Sandwiches
    b. Wraps
    c. Soup
    d. Salads
    e. Fruit
    f. Puff pastry
    g. Fried food
    h. Dinner Snacks
    i. Anders:
7. **When you buy drinks at the Impulse restaurant, what products do you buy? (more than 1 answer possible)** *Vink alle toepasselijke opties aan.*
    a. Soft drinks
    b. Fresh fruit
    c. Juices
    d. Dairy
    e. Dairy substitute
    f. Other:

8. **How would you rate the food offer at the Impulse restaurant?** 1 = not at all, 5 = very much (If you are on a phone, the screen will not show every option at once. You can swipe to see all the answer options) *Markeer slechts één ovaal per rij.*
    a. Healthy
    b. A way of monitoring my mood (e.g. a good feeling, coping with stress)
    c. Convenient
    d. Provides me with pleasurable
    e. Sensations (e.g. texture, appearance, smell and taste)
    f. Natural
    g. Affordable
    h. Helps me control my weight
    i. Familiar
    j. Environmental friendly
    k. Animal friendly
    l. Fair-trade *(Ga naar vraag sectie 10)*

Section 10: Values as motivators for food choice

1. **It is important to me that the food at the WUR restaurants is…** 1 = not important at all, 5 = very important (If you are on a phone, the screen will not show every option at once. You can swipe to see all the answer options) * *Markeer slechts één ovaal per rij.*
    a. Healthy
    b. A way of monitoring my mood (e.g. a good feeling, coping with stress)
    c. Convenient
    d. Provides me with pleasurable
    e. Sensations (e.g. texture, appearance, smell and taste)
    f. Natural
    g. Affordable
    h. Helps me control my weight
    i. Familiar
    j. Environmental friendly
    k. Animal friendly
    l. Fair-trade

Section 11: Sustainability and food choice

1. **Do you think that, through their food choice, students and staff can reduce their personal impact on the environment?** **Markeer slechts één ovaal.*
    a. Yes
    b. No
    c. I don't know
2. **Would you be willing to pay more for food with a low impact on the environment?** **Markeer slechts één ovaal.*
    a. Yes
    b. No
    c. Only if the cost increase is below 10% Only if the cost increase is below 30%
    d. I don't know
    e. I don't care
3. **Would you prefer vegetarian and/or vegan foods over meat when the prices are the same?** *
    Markeer slechts één ovaal.
    a. Yes
    b. No

c. Only if vegetarian or vegan foods are cheaper
d. I don't know
e. I don't care

4. **When you buy food at the WUR restaurants, would you like to know the environmental impact of the foods that you buy? (e.g. CO2 emission, water consumption, land use etc)***
   Markeer slechts één ovaal.
   a. Yes
   b. No
   c. I don't know
   d. I don't care

Section 12: Suggestions

1. **Do you have any suggestions related to the vegetarian and/or vegan food offer at the WUR?**

Section 13: The end

Thank you for participating, have a nice day!
For a chance to win the 25 euros gift voucher (VVV-bon) or one of the 10 “Tony Chocolonely” chocolate bars, we would like to have your email address so we can contact you in case you win! Your email address will not be shared with others and will be deleted from our data after the winners are contacted.

1. **E-mail:** -e-mail address can be filled in-

Stop met het invullen van dit formulier.

Section 14: The end

Unfortunately, you are not among our target audience for this study. Therefore, this is the end of the questionnaire. We want to thank you for your time and have a nice day!

Best, Planticorn

Appendix 8: Promotion material consumer study

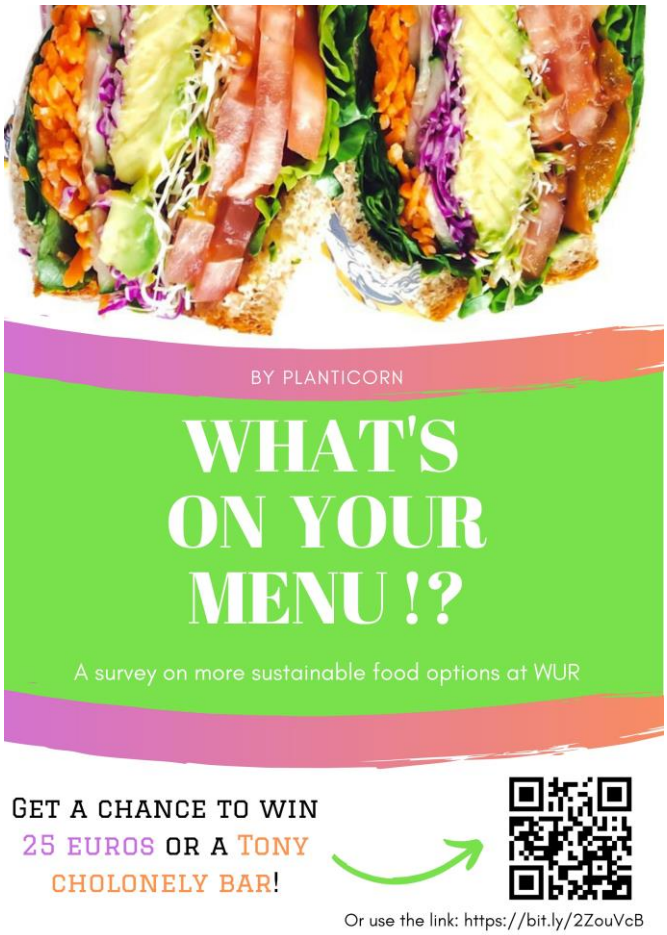


Figure 2. Poster and flyer design for survey promotion

Figure 3. TV-banner design for survey promotion

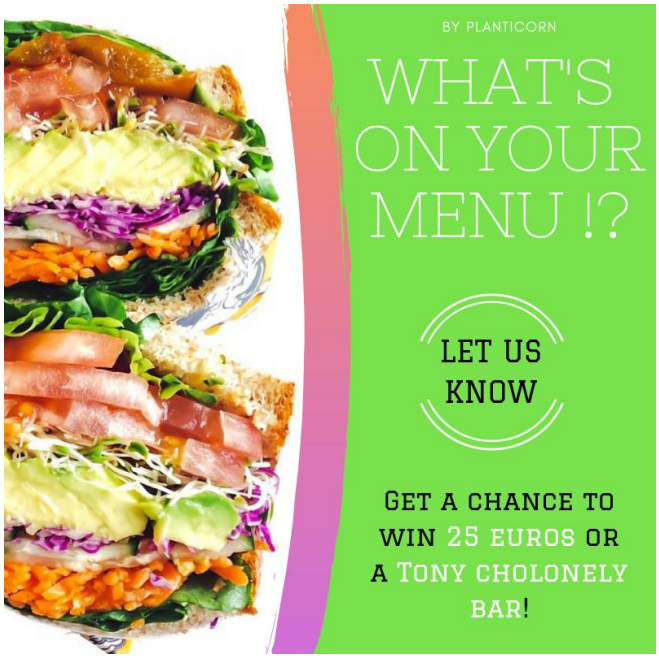


Figure 4. Social media flyer design for survey promotion

Appendix 9: Relation between variables and used statistical tests

Below it is possible to find a description of all the variables that were related and the corresponding used statistical tests.

1. The relation between the different demographic variables (age, gender, nationality, occupation and type of diet) and the different motivations for food choice (healthy, a way of monitoring my mood, convenient, provides me with pleasurable sensations, natural, affordable, helps me control my weight, familiar, environmentally friendly, animal friendly and fair trade).

Table 4. The statistical test for the relation between the different demographic variables and the different motivations for food choice.

Independent variable (x)	Dependent variable (y)	Statistical test
Demographics (consumer)	Motivations for food choice (consumer)	one-way ANOVA (Games-Howell)/ simple linear regression (for variable age)

2. The relation between the different demographic variables (age, gender, nationality, occupation and type of diet) and the rating of the different characteristics of the food offer in the WUR restaurants (healthy, a way of monitoring my mood, convenient, provides me with pleasurable sensations, natural, affordable, helps me control my weight, familiar, environmentally friendly, animal friendly and fair trade).

Table 5. The statistical test for the relation between the different demographic variables and the rating of the different characteristics of the food offer in the WUR restaurants.

Independent variable (x)	Dependent variable (y)	Statistical test
Demographics (consumer)	Rating of the food offer (product)	one-way ANOVA (Games-Howell)/ simple linear regression (for variable age)

3. The relation between the different demographic characteristics (age, gender, nationality, occupation, type of diet) and the different questions about perception of sustainability (Do you think that, through their food choice, students and staff can reduce their personal impact on the environment?, Would you be willing to pay more for food with a low impact on the environment?, When you buy food at the WUR restaurants, would you like to know the environmental impact of the foods that you buy? (e.g. CO2 emission, water consumption, land use etc)).

Table 6. The statistical test for the relation between the different demographic variables and the different questions about perception of sustainability.

Independent variable (x)	Dependent variable (y)	Statistical test
Demographics (consumer)	Perception of sustainability (consumer)	Chi square test for independence

4. The relation between the motivations for food choice (healthy, a way of monitoring my mood, convenient, provides me with pleasurable sensations, natural, affordable, helps me control my weight, familiar, environmental friendly, animal friendly and fair trade) and the actual food choice (foods: sandwiches, wraps, soup, salads, fruit, puffed pastry, fried food, dinner, snacks, others; drinks; soft drinks, fresh fruit juices, dairy, dairy substitutes, others).

Table 7. The statistical test for the relation between the motivations for food choice and the actual food choice.

Independent variable (x)	Dependent variable (y)	Statistical test
Motivations for food choice (consumer)	Food choice (behaviour)	Logistic linear regression

5. The relation between the different questions about perception of sustainability (Do you think that, through their food choice, students and staff can reduce their personal impact on the environment?, Would you be willing to pay more for food with a low impact on the environment?, When you buy food at the WUR restaurants, would you like to know the environmental impact of the foods that you buy? (e.g. CO2 emission, water consumption, land use etc)) and the actual food choice (foods: sandwiches, wraps, soup, salads, fruit, puffed pastry, fried food, dinner, snacks, others; drinks; soft drinks, fresh fruit juices, dairy, dairy substitutes, others).

Table 8. The statistical test for the relation between the different questions about perception of sustainability and the actual food choice.

Independent variable (x)	Dependent variable (y)	Statistical test
Perception of sustainability (consumer)	Food choice (behaviour)	Chi square test for independence

6. The relation between the different motivations for food choice (healthy, a way of monitoring my mood, convenient, provides me with pleasurable sensations, natural, affordable, helps me control my weight, familiar, environmental friendly, animal friendly and fair trade) and the questions about the perception of sustainability (Do you think that, through their food choice, students and staff can reduce their personal impact on the environment?, Would you be willing to pay more for food with a low impact on the environment?, When you buy food at the WUR restaurants, would you like to know the environmental impact of the foods that you buy? (e.g. CO2 emission, water consumption, land use etc)).

Table 9. The statistical test for the relation between the motivations for food choice and the questions about the perception of sustainability.

Independent variable (x)	Dependent variable (y)	Statistical test
Perception of sustainability (consumer)	Motivations for food choice (consumer)	One-way ANOVA (Games-Howell)

7. Relation between motivations for food choice (healthy, a way of monitoring my mood, convenient, provides me with pleasurable sensations, natural, affordable, helps

me control my weight, familiar, environmental friendly, animal friendly and fair trade) and weekly frequency of food purchase at the WUR restaurants.

Table 10. The statistical test for the relation between the motivations for food choice and weekly frequency of food purchase at the WUR restaurant

Independent variable (x)	Dependent variable (y)	Statistical test
Motivations for food choice (consumer)	Frequency of food purchase (consumer)	Simple linear regression

8. Relation between the rating of the different characteristics of the food offer at the different WUR restaurants (healthy, a way of monitoring my mood, convenient, provides me with pleasurable sensations, natural, affordable, helps me control my weight, familiar, environmental friendly, animal friendly and fair trade) and the weekly frequency of food purchase at the WUR restaurants.

Table 11. The statistical test for the relation between the rating of the different characteristics of the food offer at the different WUR restaurants and the weekly frequency of food purchase at the WUR restaurant.

Independent variable (x)	Dependent variable (y)	Statistical test
Rating of the food offer (product)	Frequency of food purchase (consumer)	Simple linear regression

9. Relation between the rating of the different characteristics of the offer of the WUR restaurants (healthy, a way of monitoring my mood, convenient, provides me with pleasurable sensations, natural, affordable, helps me control my weight, familiar, environmental friendly, animal friendly and fair trade) and actual food choice at the WUR restaurants (foods: sandwiches, wraps, soup, salads, fruit, puffed pastry, fried food, dinner, snacks, others; drinks; soft drinks, fresh fruit juices, dairy, dairy substitutes, others).

Table 12. The statistical test for the relation between the rating of the different characteristics of the offer at the WUR restaurants and actual food choice at the WUR restaurants.

Independent variable (x)	Dependent variable (y)	Statistical test
Rating of the food offer (product)	Food choice (behaviour)	Logistic linear regression

10. Relation between the preference of meat or vega(n) over costs and actual food choice at the restaurants (foods: sandwiches, wraps, soup, salads, fruit, puffed pastry, fried food, dinner, snacks, others; drinks; soft drinks, fresh fruit juices, dairy, dairy substitutes, others).

Table 13. The statistical test for the relation between the preference of meat or vega(n) over costs and actual food choice at the restaurants.

Independent variable (x)	Dependent variable (y)	Statistical test
Preference of meat or vega(n) over costs	Food choice (behaviour)	Chi square test for independence

Appendix 10. Descriptive tables

Table 15. Food choice motivation of consumers at WUR restaurants. The results are expressed as n, mean±SD.

	Sample	**Forum restaurant**	**Leeuwenborch restaurant**	**Orion restaurant**	**Impulse restaurant**
Healthy importance rating	593 (4.14 ± 0.87)	307 (4.07±0.90)	46 (4.00±0.82)	146 (4.25±0.85)	25 (4.40±0.82)
Way of monitoring my mood importance rating	530 (2.90±1.32)	279 (2.99±1.32)	38 (2.79±1.12)	130 (2.97±1.33)	22 (2.59±1.47)
Convenient importance rating	586 (4.03±0.92)	302 (4.06±0.88)	45 (3.80±0.89)	144 (3.99±1.02)	26 (4.35±0.89)
Pleasurable sensations importance rating	589 (4.03±0.96)	305 (3.97±0.99)	46 (4.02±0.77)	146 (4.06±1.01)	26 (4.04±0.92)
Natural importance rating	582 (3.62±1.03)	302 (3.63±0.99)	42 (3.48±0.94)	146 (3.60±1.06)	25 (3.52±1.26)
Affordable importance rating	574 (4.43±0.83)	297 (4.42±0.85)	45 (4.27±0.91)	143 (4.46±0.82)	24 (4.25±0.85)
Weight importance rating	570 (2.92±1.25)	296 (2.92±1.23)	41 (2.61±1.34)	140 (2.92±1.24)	26 (3.00±1.55)
Familiar importance rating	580 (2.77±1.12)	297 (2.85±1.10)	45 (2.69±1.16)	144 (2.65±1.11)	26 (2.69±1.26)
Environment friendly importance rating	572 (3.94±1.05)	295 (3.95±1.00)	44 (3.82±1.21)	144 (3.95±1.08)	23 (3.96±1.07)
Animal friendly importance rating	568 (3.71±1.19)	294 (3.71±1.14)	40 (3.93±1.16)	144 (3.72±1.23)	23 (3.74±1.36)
Fair-trade importance rating	568 (3.64±1.16)	298 (3.65±1.12)	42 (3.81±1.31)	139 (3.65±1.12)	23 (3.87±1.22)

Table 16. Rating on food offer at WUR restaurants. The results are expressed as n, mean±SD.

	Forum restaurant	**Leeuwenborch restaurant**	**Orion restaurant**	**Impulse restaurant**
Health rating on food offer	305 (3.22±0.89)	46 (3.17±1.00)	143 (3.71±0.80)	25 (4.16±0.75)
Way of monitoring my mood rating on food offer	252 (2.93±1.16)	33 (2.39±1.22)	115 (2.99±1.15)	19 (2.89±0.94)
Convenient rating on food offer	302 (3.85±0.91)	44 (3.50±0.90)	140 (4.03±0.84)	25 (3.76±1.05)
Pleasurable sensations rating on food offer	304 (3.40±1.04)	44 (3.36±1.04)	143 (3.59±0.99)	26 (3.62±1.02)
Natural rating on food offer	296 (3.09±0.96)	41 (2.95±0.92)	135 (3.48±0.95)	25 (3.56±0.92)
Affordable rating on food offer	303 (2.70±1.11)	45 (3.51±1.25)	145 (3.28±1.08)	26 (2.69±1.01)
Weight control rating on food offer	274 (2.36±0.98)	41 (2.46±1.12)	122 (2.57±1.06)	22 (2.82±1.22)
Familiar rating on food offer	297 (3.28±1.00)	43 (3.19±1.16)	137 (3.09±1.07)	25 (3.32±1.07)
Environmental friendly rating on food offer	265 (2.86±1.02)	37 (3.08±1.04)	116 (3.42±0.91)	21 (3.14±1.01)
Animal friendly rating on food offer	259 (2.83±1.00)	39 (2.92±1.11)	113 (3.35±0.99)	14 (2.79±1.05)
Fair trade rating on food offer	225 (2.84±1.04)	31 (2.68±1.19)	94 (3.28±1.05)	15 (3.07±0.88)

Table 17. Food choice behaviour of consumers at WUR restaurants

	Sample (N=594)	**Forum restaurant (n=307)**	**Leeuwenborch restaurant (n=46)**	**Orion restaurant (n=146)**	**Impulse restaurant (n=26)**
Sandwiches (%)	43.77%	50.49%	78.26%	37.67%	38.46%
Wraps (%)	16.33%	17.92%	19.57%	17.81%	19.23%
Soup (%)	42.42%	52.44%	52.17%	34.25%	53.85%
Salads (%)	20.88%	22.15%	17.39%	24.66%	46.15%

Fruit (%)	12.12%	17.26%	2.17%	10.27%	11.54%
Puff pastry (%)	4.21%	2.93%	2.17%	6.16%	23.08%
Fried food (%)	10.44%	12.70%	13.04%	7.53%	19.23%
Dinner/ warm meal (%)	21.04%	16.29%	8.70%	43.15%	19.23%
Snacks (%)	24.41%	30.94%	21.74%	23.29%	19.23%
Lunch (%)	2.69%	1.95%	0.00%	6.85%	0.00%
Vegan food (%)	0.67%	0.98%	0.00%	0.68%	0.00%
Chinese food (%)	3.70%	5.54%	4.35%	1.37%	0.00%
Soft drinks (%)	21.55%	28.34%	26.09%	14.38%	30.77%
Fresh fruit juices (%)	16.16%	19.54%	8.70%	20.55%	3.85%
Dairy (%)	11.78%	12.05%	2.17%	16.44%	26.92%
Dairy substitutes (%)	3.20%	2.28%	4.35%	4.79%	7.69%
Coffee(%)	16.84%	16.94%	32.61%	21.92%	0.00%
Tea (%)	4.71%	3.26%	13.04%	6.85%	7.69%
Beer/ wine (%)	1.68%	0.65%	0.00%	4.11%	7.69%
Water (%)	2.69%	2.93%	4.35%	2.05%	7.69%
Hot chocolate (%)	1.01%	1.30%	2.17%	0.68%	0.00%

Table 18. The answers of question 'Do you think that,through their food choice, students and staff can reduce their personal impact on the environment?'

	Sample (N=594)	**Forum restaurant (n=307)**	**Leeuwenborch restaurant (n=46)**	**Orion restaurant (n=146)**	**Impulse restaurant (n=26)**
Yes (%)	87.21%	84.36%	95.65%	88.36%	88.46%
No (%)	6.40%	7.71%	0.00%	8.22%	7.69%
I don't know (%)	6.23%	8.47%	2.17%	3.42%	3.85%

Table 19. The answers of question 'Would you be willing to pay more for food with a low impact on the environment?'

	Sample (N=594)	**Forum restaurant (n=307)**	**Leeuwenborch restaurant (n=46)**	**Orion restaurant (n=146)**	**Impulse restaurant (n=26)**
Yes (%)	20.37%	20.20%	30.43%	18.49%	23.08%
No (%)	13.13%	14.33%	19.57%	9.59%	3.85%
Only if the cost increase is below 10% (%)	47.47%	46.58%	30.43%	52.74%	57.69%
Only if the cost increase is below 30% (%)	13.64%	13.36%	17.39%	14.38%	11.54%
I don't know (%)	4.55%	5.21%	0.00%	3.42%	3.85%
I don't care (%)	0.17%	0.00%	0.00%	0.68%	0.00%

Table 20. The answers of question 'Would you prefer vegetarian and/or vegan foods over meat when the prices are the same?'

	Sample (N=594)	**Forum restaurant (n=307)**	**Leeuwenborch restaurant (n=46)**	**Orion restaurant (n=146)**	**Impulse restaurant (n=26)**
Yes (%)	53.70%	50.81%	69.57%	51.37%	50.00%
No (%)	20.88%	22.15%	13.04%	21.92%	23.08%
Only if vegetarian or vegan food are cheaper (%)	13.30%	14.66%	2.17%	13.70%	15.38%
I don't know (%)	7.58%	8.79%	8.70%	8.22%	0.00%
I don't care (%)	4.21%	3.58%	4.35%	4.11%	11.54%

Table 21. The answers of question 'When you buy food at the WUR restaurants, would you like to know the environmental impact of the foods that you buy? (e.g. CO2 emission, water consumption, land use etc)'

	Sample (N=594)	**Forum restaurant (n=307)**	**Leeuwenborch restaurant (n=46)**	**Orion restaurant (n=146)**	**Impulse restaurant (n=26)**
Yes (%)	70.03%	72.31%	69.57%	69.86%	69.23%
No (%)	14.14%	13.03%	15.22%	11.64%	23.08%
I don't know (%)	9.09%	9.12%	4.35%	10.96%	3.85%
I don't care (%)	6.57%	5.54%	8.70%	7.53%	3.85%

Appendix 11: Posters on the tailored advice

Figure 5. Tailored advice poster for Sodexo (Impulse)

General Advise

Sustainable Nutrition

No Meat? No problem!

Sustainable & nutritious plant-based alternatives for meat can be: tofu, tempeh, légumes, whole grain cereals, mushrooms, nuts, vegetables and mycoproteins

No Dairy? No problem!

Sustainable & nutritious plant-based alternatives for dairy can be soy drink, almond drink or oat drink. Dairy based butter can easily be replaced with plant-based alternatives like margarine, soy butter, almond butter, olive oil or sunflower oil.

No-Meat recipes

Lunch ideas for lunch could be mushroom ragout on bread, tofu scramble, tofu omelet, eggplant salad on bread, white bean burgers with roasted bell pepper and tomato on bread, broccoli-zucchini-coconut soup, bean soup and lentil soup

No Eggs? No problem!

Sustainable & nutritious plant-based alternatives for omelettes are tofu or chickpea flower. For baking applesauce, bananas and pumpkin puree or baking powder, flaxseed, and aquafaba

Sustainability app

The Eaternity app is a paid app, where health costs, sustainability and other ratings of different foods are indicated. This could be a great tool to make use of in the catering business, since it is meant for professional use, and the data is scientifically based.

Succesfull Promotion

Strategies to make more sustainable food choices by changing several things in the environment, without restricting the consumer in choice:

1. **Provide more vega(n) meals on the menu**
   A menu consisting of vegetarian meals (for 80%) increases the sales without decreasing the consumers attitude towards the restaurant and food.
2. **Make vega(n) options more visible for the consumer**
   Place them near the cash register, in the middle of the room or at the entrance of the restaurant.
3. **Provide information about the meal 's sustainability & health**
   This helps the consumer with making conscious decisions about their food. Labelling meals as climate-friendly increases the sales of those meals. The majority of WUR consumers shows interest towards this information

Consumer Motivations on Food Choice and Sustainability

The following three demographic factors of the consumers have the biggest influence on food choice:

- Gender
- Nationality
- Diet

Conumers with ...

High value for health	High value for convenience
Buy more salads and warm dishes	Buy more snacks
Advice: Promote for health benefits of these dishes in order to increase interest in the dish	Advice: Vegan snacks can attract more consumers while increasing the sustainable food offer

Consumers motivations for buying sustainable & vega(n) foods:

- 53.7% Would choose vegan or vegetarian foods when the prices are the same as the animal-based equivalent
- 74% Would choose vegan or vegetarian foods when the prices are lower than the animal-based equivalent
- 65.8% Would be willing to pay a maximum of 10% more for more sustainable meals

These consumers also buy sandwiches most often... → Focus on making this product more sustainable, with keeping in mind the effect of the price on the consumers behaviour

These consumers also buy salads most often... → Focus on promotion of the environmental impact benefits of the meal

Tailored Advise

What did the consumer find most important per restaurant?

1. Focus on health benefits when promoting vega(n) foods, keep the price difference within a 10% margin of the animal-based products
2. Introduce an indication for vega(n) foods that are recognizable for vega(n)'s but not necessarily for meat-eaters, so meat-eaters won't refrain form choosing it, e.g. V for vegetarian and VV for vegan

Good food (Leeuwenborch)

Top 3 highest scores towards the restaurant, rated by consumers at Leeuwenborch:

1) Affordable
2) Convenient
3) Pleasurable

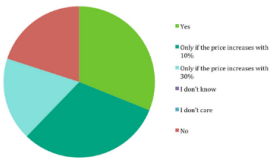
Top 3 motivations for consumers at Leeuwenborch when buying food:

1) Affordable
2) Pleasurable
3) Healthy

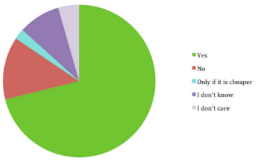
Survey respondent quote:

"They could introduce a voucher: when you eat 5 or 10 times vegan/vega, you get 1 free vegan meal the next time. The food itself is super"

Willingness to pay more for food with a lower impact on the environment



Preference for vega(n) foods over meat when the prices are the same



Diets followed by the people visiting Leeuwenborch

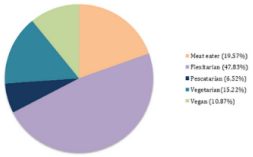


Figure 6. Tailored advice poster for Good food (Leeuwenborch)

Figure 7. Tailored advice poster for Cormet (Forum)

Figure 8. Tailored advice poster for OSP (Orion)