Meat Substitutes: an interdisciplinary study to influence consumer behavior towards the more sustainable option

"How can consumer behavior be made more sustainable, concerning the consumption of meat and meat substitutes?"

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July 2017

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Acknowledgements

We would like to thank some people without whom this research would not have been possible. First of all, our interdisciplinary supervisor, Dr. Niels van Miltenburg, who supported us with the integration of our disciplines. Special thanks to disciplinary supervisors, MSc. Willem Vermaat, Dr. Maaike Jongenelen, and last but not least, Dr. Surya Gayet, who helped as form our disciplinary chapters.

Introduction

Sustainability, meat and meat substitutes

In Dutch society, sustainability is becoming a better-known concept. The problem however is that people are unaware of which day to day products are 'unsustainable' and therefore have a bad impact on, for example, the environment. Sustainability requires consideration of different aspects, such as environmental, social and economic. A definition of the term given by Asheim (1993) is that our generation should manage the available resources in a way that the average quality of life can be ensured for all future generations. The concept of 'unsustainability' has complex aspects, such as climate change. The enhanced greenhouse effect is a result of the increasing amounts of greenhouse gases in the atmosphere by anthropogenic sources, which causes the temperature on Earth to rise. An increased concentration of greenhouse gases in the atmosphere leads to various environmental problems (Crate & Nutall, 2016). For example, the sea level will rise, there will be an increase in extreme weather, the oceans will acidify, and diseases will spread faster (Koetse & Rietveld, 2009). All these consequences will make life on our planet more challenging.

During the 2015 United Nations Climate Change Conference in Paris, participating countries have agreed that the temperature on Earth should not rise more than two degrees Celsius (Harvey, 2015). A rise higher than two degrees Celsius results, among other things, in limited water resources, extreme heat and flooding. The greenhouse gas emissions have to be reduced in order to achieve the goals set in Paris. Acting on environmental sustainability is important to achieve the agreements made about not exceeding the goal of a maximum rise of two degrees Celsius. If regulations do not change unsustainable processes and we continue polluting and degrading the Earth as we are doing now, future generations will be limited in their resources. This could mean that future generations will have a hard time meeting their needs.

Amongst the vast majority of scientists, it is accepted that human activity is responsible for the climate change (Oreskes, 2004). One of the causes is the consumption of products that are not produced sustainably. A major contributor to the enhanced greenhouse effect is the meat industry (Troy & Kerry, 2010). However, there is a growing consumer demand for more sustainable products, instead of for example beef and poultry. The market of meat substitutes is thus growing rapidly. Meat consumers

worldwide are being diagnosed with higher risks of diabetes type 2, strokes and coronary heart diseases (Feskens, Sluik & Van Woudenbergh, 2013). However, meat products are still bought regularly (CBS, 2012). It is necessary to reduce the amount of meat consumed and opt for a more sustainable option, like soy based meat substitutes, as the environmental impact of meat substitutes is lower than that of meat. If consumer behavior could be influenced in order to provoke more sustainable behavior, fulfilling the Paris climate agreements would be one step closer to sustainability.

This study focuses on the Netherlands and its supermarkets. We ask: "How can consumer behavior be made more sustainable concerning the consumption of meat and meat alternatives?"

We will also use our insights for a policy advice to inform governments, producers, policy makers and supermarket chains how to influence consumer behavior towards more sustainable products, as immediate change is required for both the sake of the environment and public health. The issue of sustainable consumption regarding meat and its substitutes has not received much academic attention so far, but concerns citizens worldwide.

Integrative approach

The research question requires the involvement of different disciplinary insights, due to the complexity of the question. This means that the problem has multiple components which should be analyzed, and thus invites to be studied by different disciplines (Repko, 2012). One distinctive discipline is not able to give a satisfying answer. Therefore, three disciplines will be analyzing the research question in order to provide a fitting answer. The different insights will be provided by Environmental Sciences, Communication Sciences and Cognitive Neurobiological Psychology, respectively.

The involvement of different facets within the problem regarding meat production and consumption, such as sustainability, human behavior and cognition, and communication, can only be fully comprehended when the different disciplines combine and integrate their insights. For example, Environmental Sciences is capable of determining the definition of more environmentally sustainable options, but lacks the ability to communicate this information in an efficient way to consumers. Cognitive Neurobiological Psychology offers insight into human behavior and cognition, and why people make the choices they do. These insights could be combined with the expertise of Communication Sciences to make an effective proposal for the display of meat alternatives.

Secondly, the research question poses a problem which is an unresolved societal issue. Different insights could help to encounter the issue by integrating the results of the disciplinary components. This will result in a comprehensive advice to make consumer behavior more sustainable concerning the consumption of meat and meat alternatives.

As mentioned before, Environmental Sciences, Communication Sciences and Cognitive Neurobiological Psychology can give important insights while answering the research question. Thus, firstly, Environmental Sciences will compare the land use, water use and emissions of greenhouse gases of beef, poultry and soy based meat alternatives in order to state the more sustainable option. Secondly, Communication Sciences will make an analysis of communication regarding meat substituting products, considering nudging through product placement, the framing of meat alternatives, neophobia and providing factual information. Stimulating consumers to change their purchase-behavior through communicational techniques is a relatively easy, yet crucial step towards more sustainable consumption. Lastly, Cognitive Neuropsychology will approach the findability and appearances of meat and meat alternatives. The location of meat substitutes in supermarkets and the path towards them is discussed. Moreover, how we can encourage the consumption of meat substitutes, while discouraging the consumption of meat, by creating positive and negative associations with substitutes and meat, respectively. These insights taken together can result in the possibility of changing consumer behavior and will lay out the best possible way in doing so.

The insights of the mentioned disciplines will be integrated according Repko's Organization and Transformation techniques (2012). These integration techniques will help to create common ground. This is of great importance, considering the fact that some assumptions and concepts might differ for each discipline. From the common ground, a more comprehensive understanding will be constructed. The insight will be fully integrated to produce a new and more nuanced whole (Repko, 2012).

A Comparison of Meat and Meat Substitutes

Environmental Sciences – Ilfa van Duijvenbode

Introduction

Sustainability requires consideration of four aspects: environmental, social, cultural and economic. Amongst which, environmental sustainability is stated to be the most fundamental aspect (New Zealand Government, 2017.). Morelli (2013, p.23) defines environmental sustainability as:

"A condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity."

This definition highlights the width of the concept. Environmental sustainability is a broad concept and one of the subjects is climate change. Current emissions of greenhouse gases into the atmosphere are so high, that the supporting ecosystems cannot continue to regenerate the services necessary. One of the major contributors to the enhanced greenhouse effect is the meat industry (Troy & Kerry, 2010). The meat production is accountable for a high amount of greenhouse gases, like methane (CH_4) carbon dioxide (CO_2) and nitrous oxide (N_2O). Macdiarmid, Douglas and Campbell (2016) stressed that the meat industry can be held responsible for 14.5 per cent of the total emission of greenhouse gases.

In the course of time more meat alternatives have entered the market due to the increasing demand for such product. Plant-based products are becoming a more popular choice over animal products, as people hold the idea that meat alternatives are less polluting (Wild, Czerny, Janssen, Kole, Zunabovic & Domig, 2014). Yet, in order to achieve a society in which sustainable awareness is present, it is necessary to evaluate whether plant-based products are indeed more sustainable than their animal-based equivalents. Therefore, the disciplinary research question is stated as follows:

To what extent is the consumption of meat alternatives more sustainable than the consumption of meat when looking at the most significant environmental impacts in the Netherlands?

Beef and poultry, for animal-based products, and soy, for plant-based products, will be taken into consideration for answering the disciplinary research question, because these are commonly consumed (Wild et al., 2014). Additionally, there is an active academic debate about the environmental impacts of these products, providing the researcher with a lot data. These types of meat and meat alternatives will

be compared over different aspects of environmental sustainability. Since biological meat covers only a small percentage of the total meat consumption and production (Maarse, 2017), only regularly produced meat will be taken into account in this research.

Theories and method

To investigate to what extent meat alternatives are more sustainable than meat, it is necessary to know the factors on which environmental sustainability depends and what is considered sustainable. In this study, a comparison has been made based on three aspects of sustainability, namely: water use, emissions of greenhouse gases and land use. These aspects are selected because they are the most significant aspects when investigating environmental sustainability (Flemström, 2003) and because they are at the core of sustainable development (UN water, 2015; Foley, DeFries, Asner, Barford, Bonan, Carpenter & Helkowski, 2005). These three aspects will be applied to beef, poultry, and soy based meat alternatives. The chosen environmental impacts will be compared amongst each other in order to determine the most sustainable product.

Water use

Water is a finite and irreplaceable resource that is only renewable if well managed, and is fundamental in meat production (UN water, 2015; Tietenberg & Lewis, 2016). If not managed efficiently, water can pose a profound challenge to sustainable development. Thus, it is a necessity to use water efficiently and sustainably. According to Gleick (1998) sustainable water use requires "the maintenance of a desired flow of benefits to a particular group or place, undiminished over time." This means, meeting the water demands of current and future generations.

Water use is quantified by the water footprint (WF), a tool to calculate water use behind consumer products. The WF of a specific piece of meat is determined by the water consumption and pollution in each step within the supply chain of the final product (Gerbens-Leenes, Mekonnen & Hoekstra, 2013). This is measured in m^3 per tonne or per litre.

Land use

Land use refers to all the uses of land for multiple purposes measured in land surface. Human actions have changed the world's landscapes in drastic ways. As Foley et al. (2005, p.570) state, the ultimate

outcome of land use practices is generally the same, videlicet “the acquisition of natural resources for immediate human needs, often at the expense of degrading environmental conditions”. Exploiting of land can be held responsible for about 35 per cent of anthropogenic CO_2 emissions (Foley et al, 2005). The less land required, the more it contributes to environmental sustainability. Land is mainly used for the production of food and intensifying of farmland. The meat production in specific is also a large part of this (Lambin & Meyfrouidt, 2011).

To quantify land use, one needs to estimate the amount of farm land used, also known as on-farm land, and the amount of land required to produce all purchased inputs, such as fertilizer, pesticides, energy and feed, the so-called off-farm land. Off-farm land mainly is determined by land use for production of feed ingredients (de Vries & De Boer, 2010, p. 6). Land use is quantified as the area in m^2 used for the production of a product.

Greenhouse gases

Greenhouse gases are minor atmospheric constituents like water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and ozone (O_3). An increased amount of greenhouse gases results in an enhanced greenhouse effect causing the Earth’s surface temperature to rise (Goose, 2015; Lashof & Ahuya, 1990). The less greenhouse gases emitted into the atmosphere by anthropogenic sources, the more it accounts as sustainable. The emission of greenhouse gases is described as the carbon footprint, which is quantified as CO_2-equivalents (CO_2e) (Röös et al, 2013).

Data collection

Previously, this thesis clarified aspects of environmental sustainability. Yet, in order to answer the research question, a state-of-the-art review was executed to find to what extent the consumption of soy based meat alternatives is more sustainable than the consumption of beef and poultry when looking at the environmental impacts.

The current academic debate has been analysed using articles, journals, and websites found with search engines like Google, Google Scholar, Scopus and Web of Science, the results have been found. Appendix A table A1 lists the full range of search terms used to answer the research question. The data is exhibited in tables in order to give an overview of the differences of the environmental impacts of beef, poultry and soy based meat alternatives.

Results

This chapter lays out how beef, poultry and soy based meat alternatives perform on three different aspects of environmental sustainability; water use, land use and greenhouse gases. An overview will be given for each aspect of environmental sustainability.

Influence of beef, poultry and soy based meat alternatives on water use

In this section, the water use for beef, poultry and soy based meat alternatives will be compared with each other. In table 1 an overview is given for the total water footprint of the meat and meat alternatives. The bar chart in figure 1 shows the relative differences between meat and soy based meat alternatives.

Product	m^3 water per tonne
Beef	11,744
Poultry	1,787
Soy based meat alternatives	1,053

Table 1 - Overview of the water footprint of beef, poultry and soy based meat alternatives

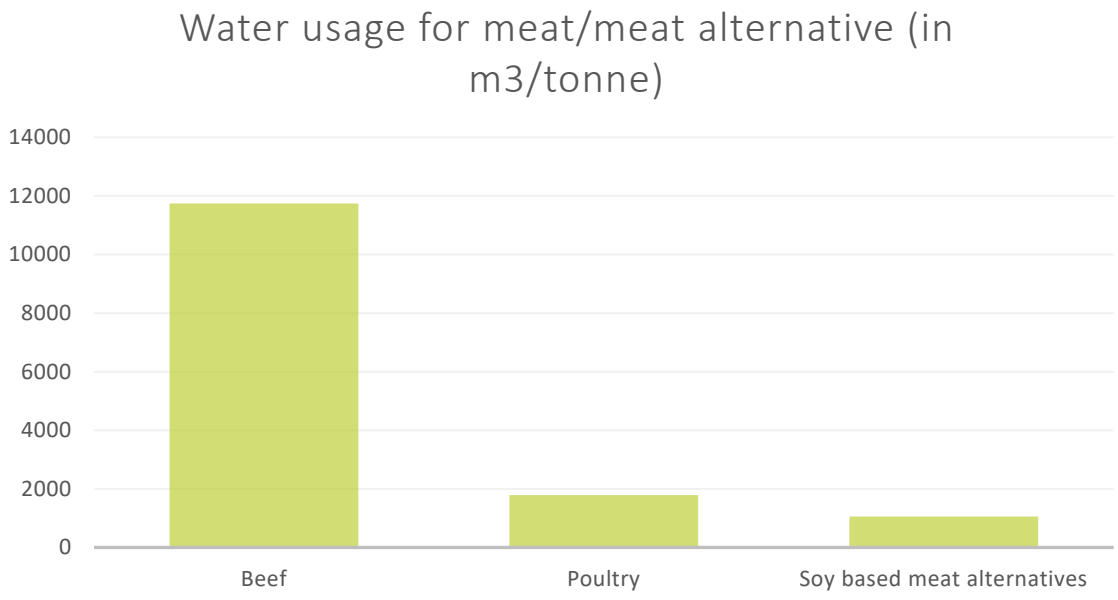

Figure 1 - Water usage for 1 tonne of beef, poultry and soy based meat alternatives in m^3

The water use for the production of meat depends on different factors like the country where it is produced and the feed they consume (Gerbens-Leenes, Mekonnen & Hoekstra, 2013). In the Netherlands cows mostly get fed with imported irrigated feed crops, which contain a mixture of roughages. The average water footprint of these roughages is 203 m^3 per tonne (Gerbens-Leenes, Mekonnen & Hoekstra, 2013). Thus, the largest share of the water footprint for the production of beef is due to the animal feed. The animal feed depends on the feed conversion efficiencies and the feed composition. Other factors like transport, cleaning the slaughterhouse, and water used on the livestock are responsible for the remaining share of water. The total water footprint of beef in the Netherlands for a mixture of animal feed is 11,744 m^3 per tonne (Hoekstra & Mekonnen, 2012).

The water used for the production of poultry depends, like beef production, on different factors; for example the country of production and the feed the animals consume. There is no clear statement made for the feed given to chickens in the Netherlands. Research varies from grazing, mixed and industrial. Therefore, when determining the water use, the average weight of these three types of feed is used. This gives a WF average of 1,787 m^3 per tonne for poultry (Hoekstra & Mekonnen, 2012).

The water footprint of crop products, like soy, is smaller than any animal product (Hoekstra & Mekonnen, 2012). The soybeans are imported to the Netherlands, as the country does not produce soybeans on a large scale. The water footprint of a soy burger of 150 grams is 157.90 litres. Converting this to m^3 per tonne, gives a water footprint of 1,052.70 (Ercin et al, 2012).

In table 1 and figure 1 the relative differences between beef, poultry and soy based meat alternatives are shown. With 11,788 m^3, the production of beef has a water footprint of over ten times higher than the water footprint of soy based meat alternatives. Therefore, considering the water use, the environmental effects of beef are much higher than of the soy based meat alternatives. The reason for this large deviation is that the animal feed used for meat production is liable for the water footprint; the crops have different water saturates and to produce beef there is a higher amount of feed necessary per kg.

Influence of beef, poultry and soy based meat alternatives on land use

In this section the land use for beef, poultry and soy based meat alternatives will be compared. In table 3 an overview is given for the land used by the production of meat and soy meat alternatives. To indicate the relative differences also a bar chart with the average amounts is given in figure 2.

Product	m^2 of land per kg
Beef	27-49
Poultry	5-9.2
Soy based meat alternatives	2-3

Table 3 - Overview of the land used for the production of beef, poultry and soy based meat alternatives

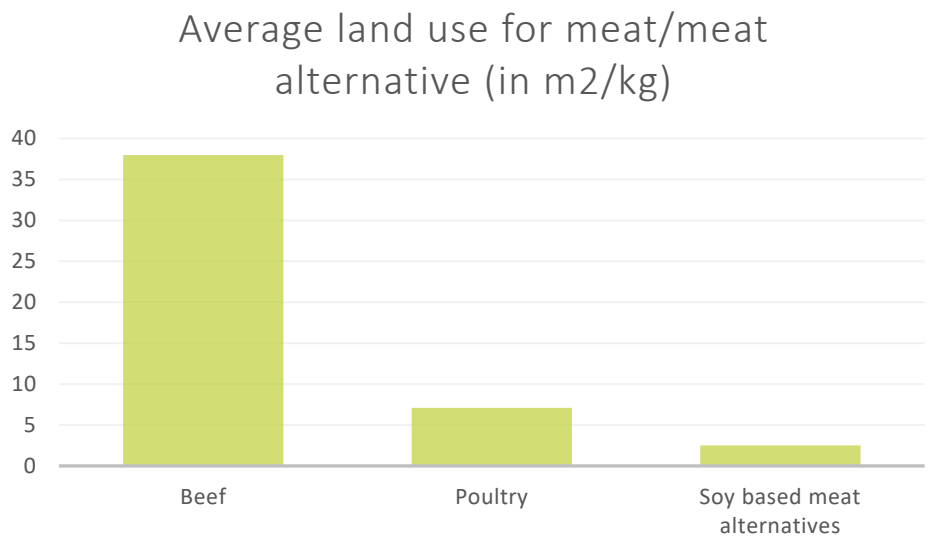

Figure 2 - Land used for 1 kg of beef, poultry and soy based meat alternatives in m^2

Land use, just like water use, is dominated by feed production (Röös, 2013). De Vries and de Boer (2010) state that to produce 1 kg of beef 27-49 m^2 of land is required. The exact amounts differ due to the very wide variety in beef production systems, ranging from very intensive to very extensive agriculture (Nijdam, Rood & Westhoek, 2012, p.763). With extensive beef production more land is used, which can vary between 286–420 m^2 per kg. In the Netherlands, these numbers are smaller because intensive beef production systems are more common (Preston & Willis, 2013).

For the production of poultry, the land required for 1 kg of product is between 5 and 9.2 m^2 (de Vries& de Boer, 2010; Mogensen et al, 2009; Nijdam, Rood & Westhoek, 2012). These differences can be explained by the different periods in which the studies were executed. Additionally, caused by the

intensive and extensive production systems, the amounts do not differ as much as with beef, because there are less production systems.

Not much research is done for the land used for the production of soy based meat alternatives. However, Weiske et al (2006) and Nijdam et al. (2012) show that 2 to 3 m^2 of land is used per kg of soy based meat alternative.

The animal feed not only dominates the water use, but also the land use. Cows are less efficient in conversion of ingested energy and nutrients into edible meat than chicken (Schroeder and Titgemeyer, 2008; de Vries & de Boer, 2010). This results in the need for more land area.

Influence of beef, poultry and soy based meat alternatives on the emissions of greenhouse gases

In this section the emission of greenhouse gases by the production of beef, poultry and soy based meat alternatives will be compared. In table 4 an overview is given for the land used by the production of meat and soy meat alternatives. To indicate the relative differences also a bar chart with the average amounts is given in figure 3.

Product	Kg CO_2-e per kg
Beef	9-42
Poultry	2-6.9
Soy based meat alternatives	2

Table 4 - Greenhouse gas emissions per kg of beef, poultry and soy based meat alternatives

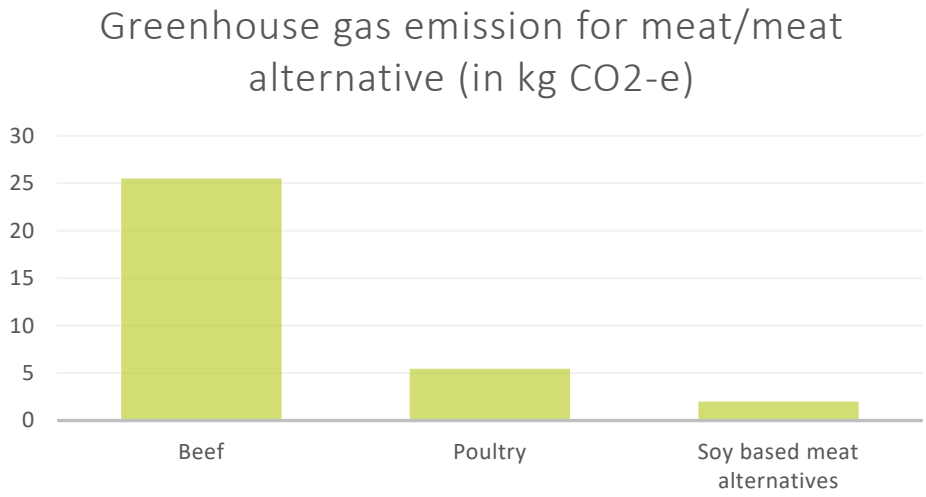

Figure 3 - Greenhouse gas emission per kg of beef, poultry and soy based meat alternatives in kg CO2-e

The results for the amount of greenhouse gases emissions for the production of meat are relatively high. Beef has the largest impact of all animal products. The production of 1 kg of beef results in 9-42 kg CO_2-e (de Vries& de Boer, 2010; Mogensen et al, 2009; Nijdam, Rood & Westhoek, 2012).

The production of poultry has a carbon footprint of 2- 6.9 kg CO_2-e per kg of poultry (de Vries & de Boer, 2010; Nijdam et al, 2012). Scarborough et al. (2014) closely aligns with 5.4 kg CO_2-e per kg of poultry.

The carbon footprint for the production of soy based meat alternatives is 1-2 kg CO_2-e per kg of meat alternative (Nijdam et al., 2012; Weiske et al., 2006). Research done by Scarborough et al. (2014) state the same results of 2 kg CO_2-e per kg of meat alternative.

For the greenhouse gases emitted into the atmosphere, the emissions of CH_4 per kg of beef are higher than for poultry. Methane emissions have a big impact on the enhanced greenhouse effect. These emissions originated from manure and from enteric fermentation processes in the rumen (de Vries & de Boer, 2010). This accounts for about 75 per cent. De Vries en de Boer (2010, p.8) state: 'During the cultivation and transport of feed emission of greenhouse gases occur, especially CO_2 and N_2O. Therefore, emission of CO_2 and N_2O per kg product is higher for ruminants than for monogastrics".

Discussion

The results indicate that for the three aspects of environmental sustainability – land use, water use and greenhouse gas emission – beef has, by far, the highest impact on the environment. Poultry has a lower impact, but the soy based meat alternatives have the least impact on the environment. However, there are some deficiencies in the investigation.

Firstly, the production of beef, poultry and soy based meat alternatives have solely been 'tested' for three aspects of environmental sustainability. Thus, including more factors could extend, and therefore benefit, the research. For example, the packaging of the product is an important environmental factor (Marsh& Bugusu, 2007). Especially as both meat and soy based meat alternatives are packaged in plastic, which is known for its huge environmental impact. Besides the packaging, the energy usage could be analysed and compared.

Secondly, the production from soybean to soy based meat alternative has not completely been taken into account considering the land use and the emission of greenhouse gases. This could add a bias to the research in favour of soy, therefore the research would have benefited from taking the whole life cycle of soy based meat alternatives into account.

Lastly, it must also be noted that there are more meat alternatives than soy based, but those contain dairy products. When buying meat alternatives, no difference is made between soy and dairy based meat alternatives. They are located at the same place and not all consumers know the differences. The research could be extended by including other animal products like milk and eggs to make a more complete analysis of to what extent products have a less impact on the environment.

Yet, it can be stated that beef indeed has a high impact on the environment. Meat alternatives are an efficient and useful product to present to people. In order to live in a society where environmental sustainable awareness is present, it is most of all needed for people to reduce the amount of beef they are eating. To enhance this process, efficient presentation of information is necessary.

Furthermore, increasing the productivity could have a positive influence on the water and land use, and on the greenhouse gases emitted into the atmosphere. The amount of greenhouse gases emitted could be decreased. This means less land is required for feed productivity. This could result in a more sustainable use of land and water (Röös et al, 2013).

Conclusion

In order to answer the disciplinary research question: “To what extent is the consumption of meat alternatives more sustainable than the consumption of meat when looking at the most significant environmental impacts in the Netherlands?” a literature review has been executed. To determine to what extent meat alternatives have a lower impact on the environment than meat, a comparison has been made between three environmental aspects videlicet, land use, water use and emission of greenhouse gases. Although the research could be extended, the results indicate that beef has the highest water footprint, uses the most land and has the highest carbon footprint in comparison with poultry and soy based meat alternatives. Meat alternatives have a water footprint of approximately ten

times less than beef, use around ten times less land and have a carbon footprint of ten times less than beef.

This research is relevant in order to understand the need to eat less meat and for which products the meat can be replaced. An investigation in how to influence the human behaviour towards more sustainable products, contributes to answering a complex issue. Therefore, the researcher recommends further investigation in this field.

Turning Carnivores into Herbivores

Communication Sciences – Marie-Claire van Olphen

Introduction

Whenever entering a Dutch supermarket, even when I have never visited it before, I can find the meat department right away. However, as a vegetarian myself, I often experience difficulty finding the meat substitutes. Unlike the meat department, which is usually also a lot bigger, there are no signs that point customers in the direction of these products. Now, could this be a partial explanation for the lower consumption of meat substitutes compared to meat? Apart from other decisive factors like personal preferences and beliefs, the communication towards the customer regarding these products allows for optimization.

The production and the high demand for meat have devastating effects on our planet and public health. Worldwide, meat consumers have been diagnosed with elevated risks of diabetes type 2, strokes and coronary heart diseases (Feskens, Sluik & Van Woudenbergh, 2013). Furthermore, due to for example the enormous amount of food required for livestock, meat production has a high negative environmental impact (Elferink, Nonhebel & Moll, 2008). In fact, the livestock sector is one of the main contributors to the most severe environmental problems, as it causes land degradation, air and water pollution, and climate change (Steinfeld, Gerber, Wassenaar, Castel & De Haan 2006). Moreover, the production, processing, transport, storage, cooking and wastage of food –particularly meat– contribute to the disproportionately high emissions of greenhouse gases (Scarborough et al., 2014). Research about the environmental impacts of meat, vegetables and meat substitutes suggests that the environmental impact of vegetarian foods compared to meat is consistently relatively low when considering production and processing (Reijnders & Soret, 2003).

Despite the meat industry's tremendous impact on public health and Planet Earth, global per capita meat consumption is increasing and is very likely to continue to grow in the future (Henchion, McCarthy, Resconi & Troy, 2014). Nonetheless, it appears difficult to convince consumers of the inherent hazards of meat consumption. A 2001 study in the U.K. showed that meat-eaters, meat-avoiders, vegetarians and vegans each turned out to be most positive towards their own nutrition choices (Povey, Wellens & Conner, 2001). On top of that, the respondents appeared to have the most negative opinion about the eating customs of the diets that differed most from their own (Povey, Wellens & Conner, 2001). As this

research will point out, communicational strategies have the ability to adjust these less positive attitudes of meat-eaters.

This is a study of shifting consumer behavior towards more sustainable choices regarding the consumption of meat and meat substitutes. It is part of a larger interdisciplinary study that ultimately offers a policy advice for supermarket chains, politicians and the Dutch government. The combined disciplines of Environmental Sciences, Cognitive Neuropsychology and Communication Sciences are complementary in their insights regarding this topic, yet need each other in order to be able to stimulate effective changes in consumer behavior. In this study, the subject has been researched from a Communication Sciences' point of view. The research was carried out on the basis of the question: "How can communication contribute to the stimulation of the consumption of meat substitutes as more sustainable products compared to meat?"

The research question will be answered on the basis of three researched aspects. First of all, the importance of creating awareness, as a lot of people are uninformed about the disadvantages of meat and benefits of meat alternatives. Secondly, understanding consumer preferences regarding meat substitutes. And third, the availability of meat substitutes, as it is important that these products are easy to detect in supermarkets.

Results

Creating awareness

An attempt to directly modify customer behavior is not always effective; a reason to opt for a rather indirect way of influencing behavior is preventing a phenomenon called *psychological reactance*. When individuals experience the feeling of others trying to control their behavior, and therefore restrict their behavioral freedom, they will resist and do anything to regain the authority over their willpower (Brehm, 1996). This means that telling someone how to live their life often has the opposite effect; it is likely to result in an even greater tendency towards to the undesirable practices. Adopting a more indirect means of modifying consumer behavior is thus recommended.

At the bottom of shifting consumer behavior is creating awareness about meat (substitutes). This is essential, because the uncertainty regarding new and unknown foods currently plays a key role in the

low sales of meat alternatives: “Key barriers for non-users and light/medium-users were the unfamiliarity with meat substitutes and the lower sensory attractiveness compared to meat” (Hoek et al., 2011b, p. 662). Neophobia –the fear of unknown and new things– is thus considered an obstacle in the consumption of meat alternatives. However, this phenomenon can partially be countered via the provision of product samples, as is often done with new products in Dutch supermarkets. It turns out that people generally have more positive attitudes towards meat substitutes after trying them, and afterwards often claim they actually like them (Elzerman, Van Boekel & Luning, 2013). Thus, samples increase awareness of the products and make consumers more familiar with their taste.

In addition, consumers are not only frequently unaware of the nutritional values of many meat substitutes (Wansink & Chan, 2001), a lot of them are also uninformed of the fact meat is not necessarily healthy. A common issue that prevents people from eating these substitutes is the illusion that meat is healthier (Wansink, Sonka, Goldsmith, Chiriboga & Eren, 2005). Previous research points out that positioning a rather unknown product as a familiar one that could function as a substitute or complementary to traditional products, such as meat, is key in increasing the consumption (Wansink et al., 2005). The same researchers, specified on soy-based meat alternatives, argue that:

> One method used to influence consumers to discontinue the use of a product is by providing fresh and new information that changes the status quo. […] Thus, new information concerning the health benefits of soy-based products may cause consumers to reevaluate those traditional products that lack these health benefits. This is called an *interrupt* because it causes the consumer to interrupt their usual behavior (Wansink et al., 2005, p. 39).

An example of a way to communicate, i.e. promote meat substitutes, is by trying to adjust consumers’ initial thoughts about these products. For example, interrupting by emphasizing the negative aspects of meat products, while accentuating the positive aspects of their substitutes, will give meat alternatives the essential attention to get noticed (Wansink et al., 2005).

As was stressed in this section, creating awareness about the nutritional values of meat alternatives, and simultaneously emphasizing the destructive effects of meat processing and production, is a vital step in stimulating consumers to try alternatives for their everyday meat products. However, how to effectively inform food shoppers about these facts is a complete study in itself, which requires insights of

Environmental Sciences for the facts, and Cognitive Neuropsychology for its cognitive expertise. What is more, providing samples in supermarkets to make consumers used to their taste and more aware of their existence is a way to combat the problem of neophobia regarding meat alternatives. However, drawing on research by Hoek, Luning, Stafleu and De Graaf (2004), meat-eaters, in contrast to vegetarians, are generally less concerned with health and the environment with regard to their food choices. Their study points out that merely emphasizing the ethical and health claims of meat (substitutes) will not necessarily help to achieve a wider acceptance of the products by meat-eaters (Hoek et al., 2004). The following sections will provide complementary tactics to increase the consumption of meat alternatives.

Understanding consumer preferences

An additional relevant topic from a Communication Sciences' point of view is how meat substitutes should be presented in order to convince non-vegetarian and non-vegan consumers to try them. Likewise, it is fundamental to comprehend consumers' preferences regarding the physical characteristics and sensory aspects of these meat-free products, such as texture, (dis)similarity to meat, flavor and smell, to achieve consumer acceptance. In other words, should they have similar characteristics to meat, and be depicted like meat, or should they be considered autonomous products with an appearance that does not resemble animal products?

The fact remains that many have never tried a meat substitute before, and that these products are frequently not considered equally appealing. The adoption of soy-foods, for example, "has been slow because consumers are wary to try unfamiliar, initially unappealing foods" (Shork, 2000, cited by Wansink et al., 2005, p. 36). Hoek et al. (2011b) suggest that to raise the consumption of meat substituting products, improving the sensory quality and resemblance to meat is crucial. A 2011 study by Elzerman, Hoek, Van Boekel and Luning supports this claim and adds that:

> One prerequisite for the acceptance of meat substitutes is that consumers can recognize a meat substitute as being a product that should be eaten *instead* of meat. This means that the form and usage of meat substitutes should not be too different from meat (p. 233).

Framing is a technique that can be used to create a context that nudges people in a certain direction (Thaler & Sunstein, 2008). Thus, the way in which alternatives are framed –as an autonomous product

or as a replacement of meat– is decisive in consumer behavior. Evidently, consumers favor meat substitutes as products that replace meat in a dish.

Because food substitutes need to be considered as the replacements of existing products, consumers will logically compare the products in terms of their quality and appearance (Hoek, Van Boekel, De Graaf & Luning, 2010). The association with the reference product is of importance, meaning that non-vegetarian consumers will accept meat alternatives fastest when they are framed as the replacements of meat. However, as the substitutes are competing with the original product, Hoek et al. (2010) claim that they should offer something extra: "they need to be both similar and offer added value" (Hoek et al., 2010, p. 41). The added value of meat substitutes are the nutritive values and the lower ecological burden compared to meat products (Wansink & Chan, 2001; Reijnders & Soret, 2003).

Vegetarians and vegans, who mainly start their diets because of ethical beliefs or their dislike of meat, generally view meat alternatives as independent products without necessarily comparing them to meat. On the contrary, meat-eaters desire substitutes that resemble their known meat products. Ideally, a meat-like appearance of the meat alternatives should be combined with the framing of meat substitutes not as a different product, but as a product that is similar to meat and could replace it. These product preferences considered and taken together, including the added ecological and health benefits, will make meat substitutes a more appealing option. This will naturally lead to higher consumer acceptance.

Availability of products

A common obstacle in sales of meat substitutes is the fact that these products regularly remain unnoticed, as their position in supermarkets oftentimes is not as prominent as that of meat. In this section, the communicational technique of *nudging* through product placement will be discussed as a tactic to indirectly influence consumer choices.

In a study about the effects of environment on consumer behavior, Dijksterhuis, Smith, Van Baaren and Wigboldus (2005) argue that people usually choose unconsciously. The researchers point out that the majority of food shopping decisions are made in a brief moment of awareness (Dijksterhuis et al., 2005), which creates opportunities for modification of behavior with the help of communicational tactics. Because the consumption of food is mostly a habitual and thoughtless process, research has indicated that it is prone to nudging (Gronow & Warde, 2001; Lehner, Mont & Heiskanen, 2016).

Nudges are basically environmental interventions that indirectly modify undesired behavior, without explicitly prohibiting it (Thaler & Sunstein, 2008). From a Communication Sciences' point of view, nudging in supermarkets creates opportunities for achieving more sustainability, since the visibility, presentation and experience of food each have a significant impact on the consumption (Lehner et al., 2016). Thorndike, Riis, Sonnenberg and Levy (2014), too, conclude that nudging through specific product placement could have the intended effect on buyers to purchase healthier products. According to their research, even making preferred products slightly more visible and conveniently located on shelves could result in desirable, in this case healthier and more sustainable food choices (Thorndike et al., 2014).

By utilizing the subtle technique of nudging, meat alternatives are more likely to get noticed, which will result in decreased unfamiliarity and neophobia regarding the products (Apostolidis & McLeay, 2016). This step is particularly fruitful in situations in which a consumer is actually aware of the disadvantages of meat, but thinks that he or she is immune to its negative consequences. Drawing on research of Thaler and Sunstein (2008), this is a common phenomenon called *unrealistic optimism*: "Unrealistic optimism is a pervasive feature of human life; it characterizes most people in most social categories. When they overestimate their personal immunity from harm, people may fail to take sensible preventive steps" (p. 33). When health is at risk because of unrealistic optimism, as is the case with meat consumption, consumers might very well benefit from a nudge (Thaler and Sunstein, 2008).

In the shopping environment, buyers are mainly sensitive to environmental cues. The nudging strategy of positioning a more favorable product in supermarkets at eye-height, instead of hidden in the back of the store or at ankle-level, is a well-known technique that proves effective. As considered earlier, arranging meat substitutes more visibly in supermarkets will very likely lead to increased sales (Marteau, 2011). However, as these meat substitutes are taking the part of replacing original meat products, nudging alone might not be sufficient. The difference between this scenario and for instance positioning fruits rather than candy on a prominent spot, is that both fruits and candy are products that people have often eaten before. Many have never tried meat substitutes before and do not know what they taste like, which makes them a less attractive option. As Dijksterhuis et al. (2005) note, behavior is often an unconscious result of the perception of environmental cues; a consumer might desire a snack and rather unconsciously picks an apple, simply because it is the first snack-like product he or she encounters. However, in the case of meat substitutes, the products are currently quite unknown to the consumer

public. For more effect, this step should be performed in combination with the previously mentioned advisory steps.

Instead of simply placing meat alternatives on separate, more eye-catching shelves, the substitutes that already resemble meat, such as vegetarian sausages, burgers, 'meat' balls and suchlike processed foods, could actually have a better chance of selling when positioned next to similar meat products. Research of Hoek et al. (2011a, p. 379) of the categorization of meat and meat substitutes reveals that: "the complete separation of meat and meat substitute products disappeared with processed products (like burgers and sausages)", because respondents considered these products visually similar. In some categories, for example 'balls', the meat substitutes were even considered typical for the shape; not the meat product (Hoek et al., 2011a). Product placement in this sense could be a promising tool, because the substituting products will get noticed, because people will get used to their presence and because they are easier to find in this more logical location. They will have a better chance of being purchased, which is relevant since research has demonstrated that repeatedly eating meat alternatives often leads to better appreciation of the products (Hoek et al., 2013).

Even when shoppers are aware of the more nutritional values of meat substitutes compared to meat, searching for their shelves after a tough day of work is not the most appealing activity; these products should be easy to encounter. A useful solution to improve consumer behavior could be as simple as providing environmental cues through product placement in food stores. Convenience is currently associated with less healthy foods instead of healthy products (Hanks, Just, Smith & Wansink, 2012) and this standard has to be overturned. Placing the meat substitutes in the meat department in supermarkets increases both findability and very likely the consumption of the products.

Conclusions

This study addressed a number of issues, such as current product placement and neophobia, that could be resolved using communicational techniques in order to make consumer behavior more sustainable in the choice between meat and meat substitutes. The research question: "How can communication contribute to the simulation of the consumption of meat substitutes as more sustainable products compared to meat?" has been answered on the basis of three interrelated steps.

Firstly, neophobia must be countered by informing customers of the pros and cons of meat and its substitutes. Consumers should however not be pushed explicitly to buy different products. Meat alternatives should be positioned as familiar products and providing samples in supermarkets would be an advantageous tool in this process, especially since repeatedly eating meat substitutes often leads to increased consumer acceptance (Hoek et al., 2013). Secondly, to get meat-consumers, as compared to vegetarians, to consume meat alternatives, the products should resemble meat in its sensory aspects and should be framed as the substitutes of meat, instead of as autonomous products. Finally, nudging through product placement will make meat substitutes easier to encounter or even undeniable in supermarkets, which is necessary because "people will need nudges for decisions that are difficult and rare" (Thaler & Sunstein, 2008, p. 74), and the choice between meat and the rather unfamiliar substitutes might be hard for some. Especially placing them in-between processed meat products will increase their chances of being bought, because the meat (substituting) products are considered similar (Hoek et al., 2011a).

The three elaborated steps provide a plan of how communication can contribute to increasing the consumption of meat substitutes. Each technique has its shortcomings, but when combined, implementing them in supermarkets will stimulate consumers to buy and try meat substitutes. As was previously mentioned, the results are part of an interdisciplinary policy advice for supermarket chains, the Dutch government and politicians. With these steps carried out and taken into account, a far-reaching step towards sustainability regarding meat consumption will be made.

Discussion

Nudging seems innocuous, but is it? Perhaps it is not as harmless as it seems, since, in a sense, it limits our freedom of choice. The 'better' choices that individuals are nudged towards, are not always desirable either. As Selinger and Whyte (2011) point out, the conceptions of what is 'better' according to choice architects (the people who carry out the nudge) are not guaranteed in line with what is best.

On the other hand, as Ferraro (2014, p. 1) explains: "based on insights from behavioral economics and psychology, nudges attempt to subtly change the environment in which people make decisions to help them make better choices — better for themselves and for society". This means that, perhaps, nudging

could be justified due to its beneficial value to society. Especially since drastic changes are required to stop the degrading of our planet, which is largely a product of our thriving meat industry. Moreover, positioning a supermarket's meat substitutes on a more eye-catching shelf does not entail decreased food options for the consumer. Not to mention, even if the results of buyers' behavioral changes would be minimal, nudging is not a costly adjustment, but certainly a contributory one to achieving sustainability (Ferraro, 2014).

Due to the restricting amount of words for this study, this research has certain shortcomings. For instance, further research to point out the most fruitful manners to inform people about the positive and negative facts respecting (meat) substitutes is needed. Nonetheless, this research has provided easy-to-implement strategies that will contribute to a more sustainable planet regarding meat (substitute) consumption.

As was previously mentioned, this study is part of larger research and is strongest combined with other disciplines. Environmental Sciences provide crucial insights and data about what, how and why certain products are environmentally more sustainable. This discipline proves specifically important in creating awareness through the provision of accurate information to consumers. The nudging aspect is however strongly related to Cognitive Neuropsychology, a discipline that focuses not only on the communicational side of the technique, but also on its behavioral and cognitive aspect. This study would not be as effective without these other disciplinary insights. In short, knowledge about sustainability is very important in this matter, however, the ultimate goal of shifting human behavior requires social, communicational and behavioral insights as well.

Giving Meat Substitutes the Advantage

Cognitive & Neurobiological Psychology – Yahya Algehaili

Introduction

The importance of eating less meat for sustainability reasons have been laid out in previous chapters on Environmental and Communication Sciences. Pollution of air and water, land degradation and climate change are severe environmental problems to which the production of meat is one of the main contributors (Steinfeld, Gerber, Wassenaar, Castel, & de Haan, 2006). The environmental impact of vegetarian foods, or meat substitutes, are significantly lower when compared to meat production and processing (Reijnders & Soret, 2003). Making the right decision between meat and its substitutes is hard and opaque, especially since many people underestimate the environmental cost of meat production. Consumers also think meat is healthier than it really is and do not know the health benefits of meat alternatives (Wansink, Sonka, Goldsmith, Chiriboga, & Eren, 2005). Consumers can very well benefit from a nudge, since direct feedback on the cost and implications is absent. Furthermore, it is difficult for the average consumer to translate aspects of the situation, like water costs and land degradation, into terms of which the impact is easily understood (Thaler & Sunstein, 2008).

In this chapter, there will be an elaborate analysis on how consumption of meat substitutes can be favored at the expense of meat consumption. Specifically, we will investigate neuro-cognitive factors that could play a role in consumers' selection of meat substitutes over meat. The three main factors that will be discussed in order to favor meat alternatives over meat are findability and appearance of, and attitudes towards substitutes and meat. Finding your way to the substitutes is of key importance and can be improved by adding salient and attractive landmarks. Appearances of the substitutes should also be more salient than meat and orientated differently. Creating implicit positive attitudes towards meat alternatives and negative ones towards meat will also be discussed. In these chapters, the following question will be addressed: "How can meat substitutes get an advantage over meat in Dutch supermarkets?".

Finding your way

What is the best path to meat substitutes?

Finding meat substitutes is often difficult, since they have a less prominent position in supermarkets. Also, there are no environmental cues, such as direction signs, that point towards the more sustainable products. Providing environmental cues can improve consumption of meat substitutes (Thorndike, Riis, Sonnenberg, & Levy, 2014). Processed substitutes, like burgers and meatballs, have a better chance when positioned next to similar meat products, because consumers consider these products as visually similar (Hoek, Voordouw, & Luning, 2011). However, supermarkets in the Netherlands often place meat substitutes on a very different location within the store. In this chapter, we will discuss how substitutes can be easier found in supermarkets.

Cognitive Maps & Wayfinding

Humans make use of cognitive maps, simply to avoid getting lost in our complex world. Cognitive maps are the internal representation of known and unknown environments and imply the encoding of environmental information such as where you are at any given moment, where specific objects are, how to get from A to B and how to communicate this spatial knowledge (Golledge, 1999). Humans have cognitive maps for many different settings and scenes. Most maps consist of a network of possible routes. Getting to the cash register in an average supermarket can be done via numerous routes through the store. Finding your way from the entrance to the cash register, is called wayfinding and is thus a form of navigation within a network of possible routes and refers to the cognitive and behavioral abilities to find a way from an origin to a destination (Golledge, 1999). The passive search mode is the most common in wayfinding, wherein consumers examine the immediate environment to orientate themselves by identifying the products and product categories in their immediate present. The in-store search process can be disrupted when you do not find what you are looking for, but do get feedback that you have the right product category all around you (Titus & Everett, 1996). People regard meat substitutes within the same category as processed meat, which means they will search for meat substitutes where processed meat is located (Hoek et al., 2011). Thus, confusion can arise when you cannot find the substitutes near the meat. These disorientations impair consumers' efforts for searching any further (Titus & Everett, 1996). Most people will choose the option which requires the least effort or which has the path of least resistance. We can expect a large number of people to end up with the default option, the option that

will be obtained if the chooser does nothing. In this case, it would mean someone could end up with meat burgers, while searching for a more sustainable option. These behavioral tendencies can be strengthened by the implicit or explicit suggestion that these defaults are the normal or even the recommended option. The power of defaults lies in the fact that they are unavoidable in every environment. There is always a rule that determines the course of action when the chooser does nothing (Thaler & Sunstein, 2008). As such, it is important to have meat substitutes closer to meat, even better so in-between meat on the same shelf. This could prevent confusion when standing in the meat department and result in a higher consumption of substitutes over meat.

Landmarks

Along the way from the entrance to the cashier desk, there will be many cues of where you and where products are. These cues are a form of landmarks and range from department labels to store maps. Landmarks are strategic foci and act as anchor points for organizing spatial information. It is often an object which is used as a point of reference. They lead toward or away from a specific point within an environment and they assist you in making the most efficient route possible (Golledge, 1999; Raubel & Winter, 2002). Landmarks are very helpful means of navigating; just imagine how hard it would be finding an address without a numerical system or road networks without direction signs. They are specifically important to older people (mean age of 69,2 years), who acquire less layout information than younger adults (mean age of 20,6 years). The negative relationship between age and general spatial ability makes the need of landmarks more prominent (Kirasic, 2000). Remembering and noticing of landmarks happens because of dominance of visible form, peculiarity of shape or structure, or because of sociocultural significance (Appleyard, 1970). However, having landmarks within a network of routes does not essentially mean that they help you getting efficiently from A to B. Landmarks need attractiveness, which is qualified in characteristics such as unorthodox shapes, sharp contrasts, and prominence of spatial location (Raubel & Winter, 2002). For a landmark to be useful, it has to stand out in these three ways to be noticed and therefore useable on a quick pace.

Thus, the use of landmarks is essential in finding what you are looking for and puts less strain on cognitive maps. Especially so with the ever-growing population of elderly people. Also, updating your cognitive map will be easier whenever something changes within an environment, due to landmarks pointing it out. Finding your way towards meat substitutes will become easier when there are clear and appealing landmarks available. An example of a salient and attractive landmark is provided in figure 1, of which the shape is an ellipse and the repeated text is readable from multiple angels. There is a sharp contrast between the text and its background, and more importantly, a strong contrast between the sign and the ceiling. In figure 2, an implementation of the sign is provided. A landmark could also be used on important intersections within a supermarket, of which an example is provided in the appendix.

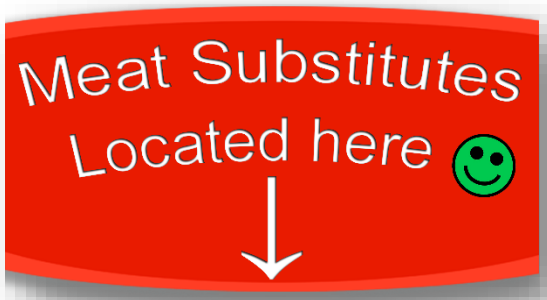

Figure 4 - Landmark for Meat Substitutes

Figure 5 - Implementation of Landmark

Appearance rules the world

Friedrich Schiller

Which aspects of appearance are of importance?

Sensory attractiveness, presentation and experience of meat substitutes compared to meat play a key role for consumers when choosing between products (Hoek et al., 2011; Lehner, Mont, & Heiskanen, 2016). The visual and appearance aspects can make all the difference when standing before the choice between meat and meat substitutes. Not only because consumers will prefer one product over the other aesthetically, but because appearance codetermines whether consumers will even notice a product. Therefore, it is crucial to investigate what factors determine whether an object stands out from its visual environment.

Saliency in Visual Search

"Where's Waldo?" puzzles are a good example of the fact that humans are bad in analyzing cluttered visual scenes. Humans have a hard time finding Waldo, simply because the retinal image contains far more information than we are able to consciously process at once. The human brain lacks the cognitive strength to analyze multiple objects simultaneously (Wolfe et al., 2015). Recognizing that you are in a supermarket, standing in front of the vegetable department is processed without delay, finding the gist of a scene occurs rapidly (Greene & Oliva, 2009). Selecting certain objects over others in a visual scene is determined by multiple factors of the visual system. Whenever an item is sufficiently salient and stands out visually from neighboring items, the amount of distracting attributes near it have little effect on the human ability of finding what they are looking for. The product which is most salient will 'pop- out' of the context it is situated in (Wolfe & Horowitz, 2004). The properties of visual objects which induce this pop-out effect include deviation in color, size, orientation, and luminance (Treisman, 1986). In general, when a visual object contrasts with its surroundings on any (or multiple) of these attributes, the object will pop-out from the environment. As a result, the visual system will most likely immediately select this visual object for further, and eventually conscious, processing. The higher the contrast between the items presented in a scene, the faster you can find what you are looking for. The number of eye fixations per search decreases dramatically when contrast increases (Näsänen, Ojanpää, & Kojo, 2001), which means that higher contrasting objects attract attention without having to make more eye movements. Giving meat substitutes the advantage means that their packaging should have a deviating color, size, luminance and/or orientation, relative to its surroundings.

Search-Templates

Discussed above is a bottom-up approach to visual search, which means that visual search can be driven by external stimulus properties. However, visual search occurs also in a top-down fashion, whereby the observer's goals and desires are key (Wolfe, 1994; Wolve, Cave, & Franzel 1989). Humans create a search-template when searching for a particular object with specific attributes (Duncan & Humphreys, 1989). When, for example, searching for bananas, incoming retinal information is filtered in such a fashion that all yellow objects receive priority within the visual system. Templates visual features are defined by the observer's mental representation of the target. These features can guide eye movements during search tasks and facilitate perceptual decision tasks by increasing the weight of signals from target similar features in the scene percept while de-weighting signals from target dissimilar features. This allows us to target objects with similar features from the incoming scene percept and ignore noisy activity from target-irrelevant features (Malcolm & Henderson, 2009). Looking for meat in the Netherlands, means that you are looking for a red color themed product selection. Looking for an object with specific appearances, means that objects that are visually similar, yet slightly different, will also capture attention (Olivers, Meijer, & Theeuwes, 2006).

Therefore, since consumers classify meat substitutes similarly as meat in category, meat substitutes ought to be in the same search-template as meat and should be themed accordingly. When you want consumers to find meat substitutes when searching for meat, it is recommended to have similar visual attributes, like color, which for example could be red. Besides giving meat alternatives the same color as meat, making the packages more salient with a higher luminance, and different orientation relative to their surroundings, like suggested before, is also recommended, in order for substitutes to stand out over meat.

Implicit attitudes towards meat and its alternatives

How can consumption of meat substitutes be encouraged whilst discouraging the consumption of meat?

Meat substitutes, like soy, have major health benefits that people are often unaware of (Wansink & Chan, 2001). Getting people to consume more substitutes can be done by promoting the alternatives, while emphasizing the negative consequences of meat (Wansink, Sonka, Goldsmith, Chiriboga, & Eren,

2005). Naturally, consumers tend to purchase products of which they have a positive association, because it is healthy or good for the environment, for example. However, not everyone is aware of the positive aspects of substitutes and the negative aspects of meat. In this chapter, we will lay out possibilities to encourage the consumption of substitutes, while discouraging that of meat.

Indirect Associations

Preferences play an important role in human behavior, since people approach what they like and do the opposite to what they dislike. Emotions are tightly linked to our preferences. What we like and dislike is mostly learned rather than innate (Rozin & Millman, 1987). “Evaluative conditioning refers to changes in the liking of a stimulus that are due to the fact that the stimulus has been paired with other, positive or negative stimuli” (De Houwer & Baeyens, 2001 p. 1).

Levey and Martin (1975) conducted the initial experiment in which the evaluative conditioning effects came to surface. In their so called “picture-picture” paradigm, participants were shown 50 pictures of paintings, which they had to categorize as liked, disliked, or neutral. They paired neutral pictures with liked or disliked pictures and also paired two neutral pictures. All pairs were presented 20 times and had to be graded on a scale of 0 to 100. The experiment demonstrated that pairing a liked or disliked picture with a neutral stimulus results in a shift of evaluation: the neutral pictures were rated lower when paired with a disliked picture and better when paired to a liked one. The effect of the disliked pictures was stronger than that of the liked pictures. These results, and many further research, prove that preferences can be created or altered by pairing neutral stimuli with affective stimuli. The positive or negative emotional valence that is attributed towards initially neutral visual objects can thus be shaped by co-occurring presentation of visual objects that do carry an intrinsic emotional valence (De Houwer, Thomas, & Baeyens, 2001). In general, the effects for evaluative conditioning are stronger for high than for low contingency awareness, for supraliminal than for subliminal unconditioned stimulus presentation, and for self-report than for implicit measures (Hofmann, De Houwer, Perugini, Baeyens, & Crombez, 2010).

Emotional associations

Suggesting alternate behavior is often more abide when it has a positive over a negative tone. An experiment was conducted on what signs were best to prevent people from harming a natural reservoir.

Asking people politely not to remove petrified wood from the forest in order to preserve it had a better effect than a negative, informational one (Cialdini, 2003). Furthermore, a social nudge was given to nearly three hundred households in San Marcos, California. The residents were given detailed information about their own power consumption and the average of the neighborhood. The striking results were that above average consumers lowered their power usage, while below average consumers increased their consumption. This unwanted boomerang-effect was not present at half of the households that received an emotional signal whether their behavior was socially approved or not. They received visual feedback about their power consumption in the form of a happy or a sad smiley face. Combining information about the effect of consumption with this emotional additive, the biggest consumers showed an even larger decrease in consumption after receiving the sad emoticon, all while below-average energy users did not change. The feeling that they had room to increase consumption, since they were below average, completely disappeared (Shultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). The ease with which certain behavior comes to mind, can be influenced by emotional priming: People tend to make associations unconsciously, which can stimulate action without realizing it (Thaler & Sunstein, 2008). In this case, adding an emotional reinforcer in the form of a smiley, had a positive effect on consumers' power consumption. This opens a new option which can be used to increase the sales of meat substitutes over meat. Adding a happy smiley on meat substitutes and a sad smiley on meat packages, can result in the desired, more sustainable, result.

Hence, consumers can be influenced by linking meat substitutes to a positive and meat to a negative image. In order to create a negative association for meat and a positive association for the substitutes, we could create a context which nudges towards a particular outcome. The creating of a context is better known as framing (Thaler & Sunstein, 2008). Research in cigarette packaging also points out that pictorial warnings are more effective than text-only warnings, that pictorial warnings attract and hold attention better and garner stronger cognitive and emotional reactions. They also elicit more negative pack attitudes, negative smoking attitudes and effectively increase intentions to not start smoking (Noar et al., 2015). Increasing heavy smokers' motivation to quit smoking can be increased by pictorial warnings (Schneider, Gadinger, & Fischer, 2012; Loeber et al., 2011). The same method, albeit less aggressively, could be used and be effective for meat and meat substitutes.

Conclusion

We have addressed the question how meat substitutes can get an advantage over meat in Dutch supermarkets in three chapters, from a Cognitive Neuropsychological perspective. This discipline can contribute in the following ways.

Firstly, finding your way to meat substitutes relative to meat is very important. When meat substitutes have a less prominent location, people tend to overlook the more sustainable products. As such, it is important to have meat substitutes nearer to meat, even better so in-between meat on the same shelf. People regard meat substitutes within the same category as processed meat, which means they will search for meat substitutes where processed meat is located. Confusion can arise when you cannot find the substitutes near to meat. These disorientations impair consumers' efforts for searching any further. Therefore, placing alternatives between or near meat can prevent confusion and result in higher consumption of substitutes over meat. Finding your way to the substitutes can be supported and facilitated with the help of salient and attractive landmarks. The use of landmarks, such as direction signs towards meat substitutes, is essential in finding what you are looking for and puts less strain on cognitive maps. Especially so with the ever-growing population of elderly people, who benefit most from

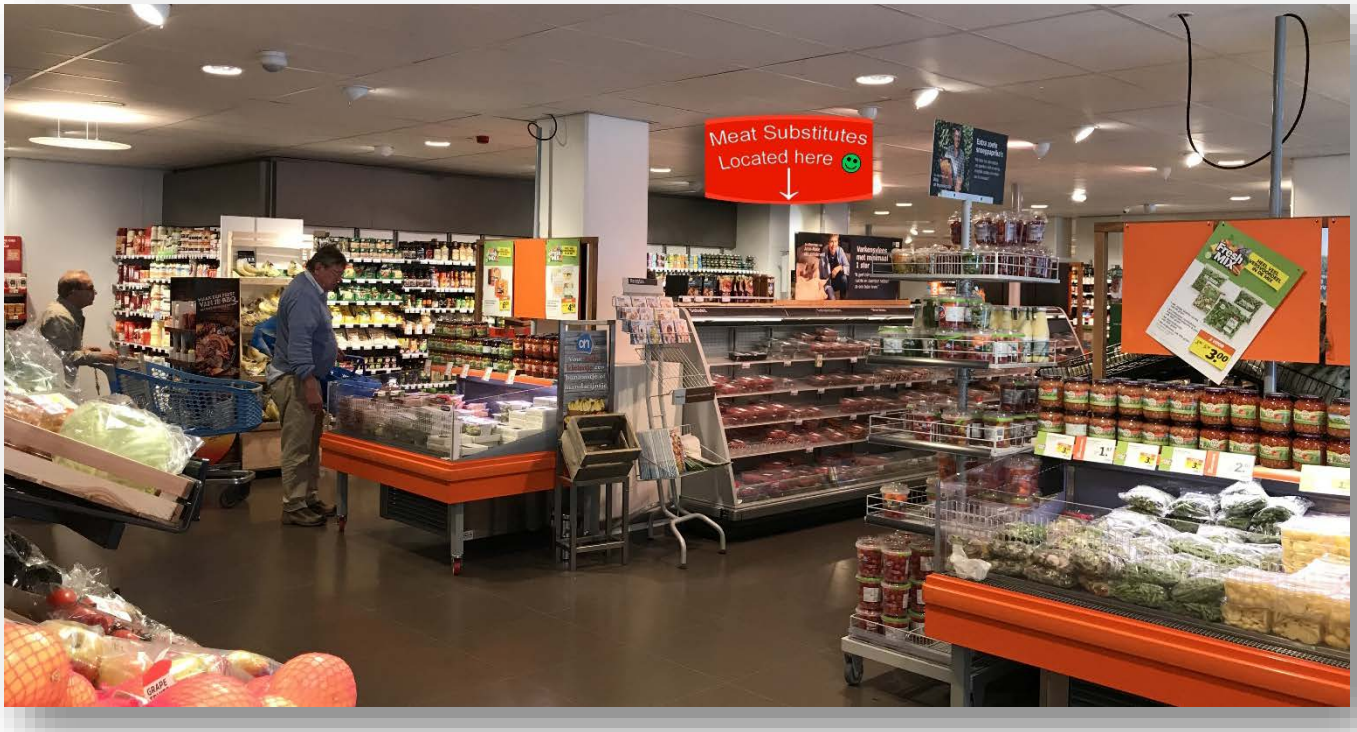

Figure 4 - Implementation of Landmark

landmarks. Also, updating your cognitive map will be easier whenever something changes within an environment, due to landmarks pointing it out. Finding your way towards meat substitutes will become easier when there are clear and appealing landmarks available. An example of a salient and attractive landmark is provided in figure 1 (in the chapter regarding landmarks), of which the shape is an ellipse and the repeated text is readable from multiple angels. There is a sharp contrast between the text and its background, and more importantly, a strong contrast between the sign and the ceiling. In figure 2, an implementation of the sign is provided. A landmark could also be used on important intersections within a supermarket, of which an example is provided in the appendix.

Secondly, since we ought to stimulate meat substitutes over meat, we want the meat substitutes to be more salient. Giving more sustainable products the advantage means that their packaging should be unique and need a deviant luminance relative to meat. Since consumers classify meat substitutes similarly to meat in category, meat substitutes ought to be in the same search-template as meat and should be themed accordingly. In the Netherlands, different animal products often have their own color theme. Chicken packages are yellow, fish is blue and meat is red. When you want consumers to find meat substitutes when searching for meat, it is recommended to have similar visual attributes, like the color of the packaging. In this case, giving substitutes a red colored package would be recommended. Besides giving meat alternatives the same color as meat, making the packages more salient with a higher luminance, and different orientation relative to their surroundings is also recommended, in order for substitutes to stand out over meat.

Finally, making meat the less attractive option and meat substitutes more appealing is the final discussed form in which advantages can be gained. Consumers can be influenced by linking meat substitutes to a positive and meat to negative image. By creating negative associations regarding meat, and doing the opposite so with the more sustainable meat substitutes, consumers will opt for the substitutes. In order to create these associations, we could create a context which nudges towards a particular outcome. Considering that alternate behavior has a greater impact when communicated in a positive over a negative way, kindly indulging and informing people of the better and more sustainable option could be sufficient for a shift in consumption. In this case, adding an emotional reinforcer in the form of a smiley, can increase the consumption of alternatives, while decreasing the consumption of meat, respectively. This opens a new option which can be used to increase the sales of meat substitutes

over meat. Research in cigarette packaging also points out that pictorial warnings are very effective and hold attention better, while garnering stronger cognitive and emotional reactions. Using the same method, albeit less aggressively, can benefit the consumption of substitutes over meat.

In conclusion, consumers can be influenced in their buying behavior by positioning meat substitutes between meat and by laying out salient and attractive landmarks, making the most sustainable products more salient than competitors, whilst being in the same visual search-template, and by linking meat substitutes to a positive and meat to negative image.

Integrating insights

In order to answer the research question: “How can consumer behavior be made more sustainable concerning the consumption of meat and meat alternatives?”, research was done using three disciplines and their disciplinary insights. In this chapter, the findings of the disciplinary studies are discussed and a more comprehensive understanding is constructed. In order to construct a more comprehensive understanding, the relevant differences between the disciplines will be identified and common ground will be created by applying the Organization and Transformation technique (Repko, 2012).

Conflicts

Each discipline has their insights, methods, concepts, assumptions, theories and epistemology. These differences need to be identified in order to integrate the findings and create common ground and a more comprehensive understanding. The most important conflicts between the involved disciplines that are relevant for our research, are discussed below.

According to Repko (2012, p. 102), “Environmental Sciences focuses on the large-scale physical processes of the planet Earth and is concerned with both the details and functions of the systems and their interactions”, which means that people are of secondary focus. Environmental sustainability in specific is of importance, while the other aspects are not taken into consideration. On the contrary, both Communication Sciences and Cognitive Neuropsychology have their main attention on human aspects. Their focus is on social sustainability: the ability of a social system, such as a country, to function at a defined level of social wellbeing indefinitely. That level should be defined in relation to the goal of Homo sapiens, which is (or should be) to optimize quality of life for those living and their descendants (Thwink, 2014).

Furthermore, Environmental Sciences’ research can look back in time and focus on trends in long-term periods that go beyond the length of a human life. Long-term perspectives are for instance of interest when considering unsustainability and its effects on our planet in coming decades. Cognitive Neuropsychological research on the other hand, focuses on shorter periods of time compared to Environmental Sciences. As within many disciplines, research time spans differ for the disciplines involved in this study. Research periods in Cognitive Neuropsychology can be as long as human lives, since human cognition and behavior are studied for social sustainability, but do not reach further back

in time, nor in the future. Even shorter than their research periods are those of Communication Sciences. The near past, the present and the near future are the main research scope of this discipline in studying and achieving social sustainability. When studying attitudes regarding a subject for example, their research period does not reach far back nor in the future.

Common ground

Common ground was created using the integration techniques developed by Repko (2012). The conflicts pointed out in the previous section will be reconciled and subsequently integrated.

Technique of Organization

The main focus for Environmental Sciences is the well-being of planet Earth; environmental sustainability is therefore an important concept. On the contrary, Communication Sciences and Cognitive Neuropsychology have their main focus on human behavior and have a more individualistic approach. Social sustainability is an important concept for these disciplines. This could result in a problematic process regarding the integration of the disciplinary sub questions' answers, as comparing them would be troublesome due to their deviation in nature. When the important concepts of disciplines are deviant, it could be difficult to translate the disciplines' goals into feasible solutions. The goals of the Environmental Sciences are focused on the preservation of Planet Earth, which can only be achieved with human intervention. On the other hand, Cognitive Neuropsychology and Communication Sciences do not focus on a large-scale problem like global warming, while it needs immediate attention. The Organization technique can be used to solve this conflict. This technique involves showing how different insights are related (Szostak, 2013). The insights will be mapped by organizing the concept of-social and environmental sustainability. Figure 6 depicts how the different insights relate to each other; the common ground is where the different aspects of sustainability in the circles overlap.

Although the Environmental Sciences' main focus is on the planet, people are not completely taken out of consideration. Human actions are the cause of Earth's current environmental state. Thereby, sustainability, both social and environmental, concerns the wellbeing of future generations. Besides, in Communication Sciences and Cognitive Neuropsychology there are environmental concerns for a solid basis for changing and improving human behavior, which certainly relates the different insights. External (environmental) factors that affect human behavior are also extremely important in

psychology (Repko & Szostak, 2017). Thus, influences of both environmental sustainability (such as greenhouse gases) and social sustainability related to people are important to stress.

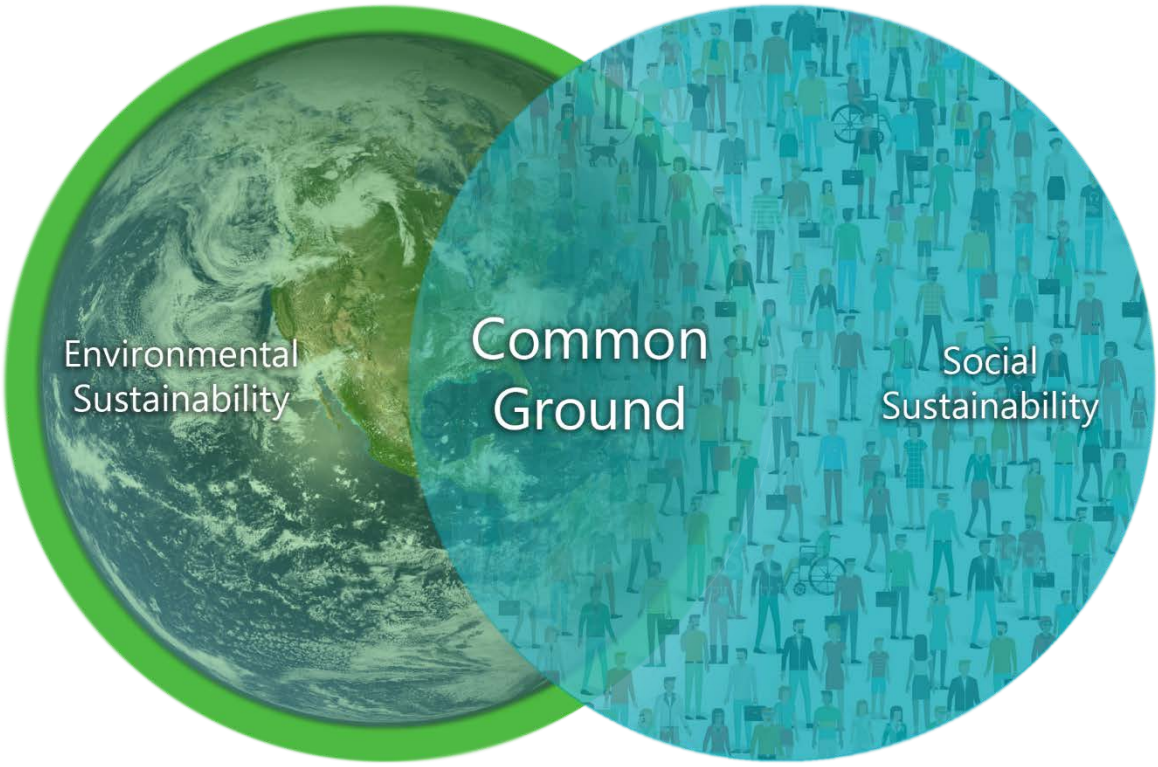

Figure 6 - The concepts of social and environmental sustainability, mapped in order to create common ground.

Technique of Transformation

The concept of environmental sustainability used by Environmental Sciences focuses on long-term periods that go beyond the duration of a human life. While investigating environmental impacts, the future is of great importance, since sustainability concerns our future generations. However, ultimatums will be developed for when certain actions must be taken. For example, during the the climate conference in Paris, countries have agreed that in 2050 all energy must be renewable. On the contrary, Communication Sciences and Cognitive Neuropsychology both concentrate on shorter periods of time compared to Environmental Sciences. The concept of social sustainability used in the disciplinary insight of Communication Sciences concerns the past, as well as the present and the future; communicational

issues can be resolved and communication can be improved in the future by analyzing current and past conduct, communication and attitudes. However, this does not necessarily apply to the future generations. This also applies to Cognitive Neurobiological Psychology. This discipline focuses on slightly longer-term periods than Communication Sciences, because it focuses on human cognition and behavior as well, and thus researches periods as long as human lives.

An effective method for creating common ground as for the differences in the research periods for the aspects of sustainability, is Szostak's Transformation technique (2013), with which opposites will be placed on a continuum. In this case, a continuum of disciplinary research time spans. In Figure 7 a time frame displays the differences between the three disciplines; the overlap on the continuum is the common ground. Environmental sustainability looks back the furthest into the past as well as the future, in contrast to the concept of social sustainability used by Cognitive Neuropsychology and Communication Sciences. Within this concept the focus is on the totality of a human life and shorter periods; Communication Sciences researches some years into the past and present.

This technique is relevant to resolve the imbalance in used time frames, because after creating common ground, we have chosen to look at the near past, present and near future. The part that is studied is highlighted on the continuum in Figure 7. In Figure 7 the disciplines are named on the continuum for clarity, however it is the different aspects of the concept of sustainability used by the disciplines that are actually integrated. When one would only focus on the time frame beforehand, the present, humanity would not have a livable planet in the near future. This is why using Figure 7's time frame makes research into Communication Sciences and Cognitive Neuropsychology useful. Conflict in research time span is hereby resolved.

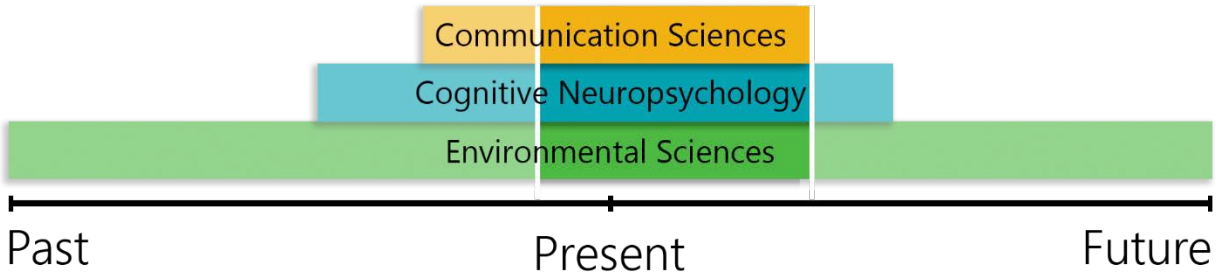

Figure 7 - The research time span continuum

More comprehensive understanding

By using horizontal causal integration and the common ground created in the previous chapter, a more comprehensive understanding has been created. According to Repko (2012, p. 389) one can speak of horizontal causal integration when: “the explanations are fully complementary but focus on separate aspects of the complex problem”. The disciplines have different suggestions of how consumer behavior could be made more sustainable, they thus focus on the same issue, but from a distinct perspective. Combined, their findings are complementary and form an integrated list of advisory proposals. As was stated in the general introduction, the consequences of the temperature on Earth rising more than two degrees Celsius will be severe. Measures must be taken, and the consumption of meat alternatives will be an outstanding initial step. Less water will be wasted, less ground will be degraded and more ground will be available, also the emissions of greenhouse gases will be reduced.

In this section, we will answer our research question: “How can consumer behavior be made more sustainable concerning the consumption of meat and meat alternatives?”. In order to make consumers actually purchase the more sustainable meat-free products, we have created a list of seven interdisciplinary techniques, incentives and nudges in order to advise the government, policy makers, producers and supermarket chains. Both aspects of sustainability are taken into account in this integration of the three disciplines.

Research has pointed out that meat substitutes are a perfect alternative for meat; taking into account beef, poultry and soy based meat substitutes, the environmental impact of the production of the latter is the smallest. It needs the least amount of water and land, and has the lowest carbon footprint. Consumers are, more often than not, unaware of these benefits of meat substitutes and the health and unsustainable disadvantages of meat. The created list of proposals offers solutions regarding different facets of the discussed issues. The discussed solutions consist of: providing accurate information (1), product placement (2), landmarks (3), packaging (4), implicit attitudes (5), the framing of meat substitutes (6) and samples (7).

1. Providing accurate information

First of all, consumers must be informed of the fact that there are environmentally more sustainable products that can function as substitutes of meat. It is important to inform consumers about planet-related and health benefits, but to not push them to buy the products, to prevent opposed behavior.

People should be informed about the consequences of the production of meat on the environment and to what extent the meat alternatives are more sustainable concerning land use, water use and emissions of greenhouse gases. It is important to create awareness. Suggesting alternate behavior is often more abide when it has a positive over a negative tone. This step involves the common ground created using the Organization technique defined by Repko (2012) and Szostak (2013), because this step means creating factual awareness concerning both the wellbeing of our planet and people.

2. Product Placement

As discussed earlier, easily finding the way to meat substitutes in supermarkets is important. When meat substitutes have a less prominent location than meat, as is currently the case, consumers tend to overlook these more sustainable alternatives. As such, it is important to have meat substitutes located in a more eye-catching and easier to find place in food stores, even better so in-between meat on the same shelf. This way, people do not have to search for the more sustainable substitute of meat, which will consequently result in a higher consumption of substitutes compared to the current situation. Thus, by increasing findability, the more sustainable and healthier choice will be made more often than is currently the case.

3. Landmarks

Finding your way to the substitutes can be supported and facilitated with the help of salient and attractive landmarks. The use of landmarks is of essence in finding what you are looking for and puts less strain on cognitive maps. Especially so with the ever-growing older population. Also, updating your cognitive map will be easier whenever something changes within an environment, due to landmarks pointing it out. We ought to use landmarks for the findability of meat substitutes. The best way of integrating landmarks in a supermarket environment is by giving them an unorthodox shape, sharp contrasts and prominence of spatial location. Hanging signs above the shelf, little above eye level will stimulate the findability of meat substitutes. Examples are provided in the chapter regarding Landmarks, as well as in the appendix.

4. Packaging

Since we ought to stimulate meat substitutes over meat, we want the meat substitutes to be more salient. Giving more sustainable products the advantage means that their packaging should be unique and need a deviant luminance relative to meat. Since consumers classify meat substitutes similarly to

meat in category, meat substitutes ought to be in the same search-template as meat and should be themed accordingly. In the Netherlands, different animal products often have their own color theme. Chicken packages are yellow, fish is blue and meat is red. When you want consumers to find meat substitutes when searching for meat, it is recommended to have similar visual attributes, like the color of the packaging. In this case, giving substitutes a red colored package would be recommended. Besides giving meat alternatives the same color as meat, making the packages more salient with a higher luminance, and different orientation relative to their surroundings is also recommended, in order for substitutes to stand out over meat.

Not only the color of the packaging should be innovated. In trying to achieve a more sustainably aware society, the actual packaging of food products should also change. The packaging used for both meat and meat alternatives is plastic; the production as well as the degradation of plastic have negative environmental impacts. The plastic packaging should be replaced with a more sustainable option, for which further research is necessary. In this matter, both social and environmental sustainability are taken into account.

5. Implicit attitudes

Making meat the less attractive option and meat substitutes more appealing is another way in which advantages can be gained. Consumers can be influenced by linking meat substitutes to a positive and meat to negative image. By creating negative associations regarding meat, and doing the opposite so with the more sustainable meat substitutes, consumers will opt for the substitutes. In order to create these associations, we could create a context which nudges towards a particular outcome. Considering that alternate behavior has a greater impact when communicated in a positive over a negative way, kindly indulging and informing people of the better and more sustainable option could be sufficient for a shift in consumption. In this case, adding an emotional reinforcer in the form of a smiley, can increase the consumption of alternatives, while decreasing the consumption of meat, respectively. A happy smiley indicates that the least amount of water is used and that the land is used efficiently. Besides a low water footprint and minimum amount of land, the emissions of greenhouse gases are, in comparison to meat, minimal as well. A sad smiley indicates a high carbon footprint, high amount of water use and inefficient land use. This opens a new option which can be used to increase the sales of meat substitutes over meat. Research in cigarette packaging also points out that pictorial warnings are very effective and

hold attention better, while garnering stronger cognitive and emotional reactions. Using the same method, albeit less aggressively, can benefit the consumption of substitutes over meat.

6. Associations and the framing of meat substitutes

Of importance is also that the meat alternatives actually resemble most of meats' sensory and physical aspects, to be able to stimulate authentic meat lovers to try them (Hoek et al., 2011). In contrast to many vegetarians, the association with real meat is important for non-vegetarians who must try the frequently rather unfamiliar products. To create consumer acceptance amongst meat-eaters it is crucial that the meat alternatives are framed as a product that should be consumed instead of meat (Elzerman et al., 2011), not as an autonomous product. This also combats neophobia, since substitutes will seem more familiar and as a result more appealing.

7. Samples

Last but not least, to further address the problem of neophobia, providing factual information would be an appropriate start. However, the problem remains that many have never tried meat substituting products before. Providing samples in Dutch supermarkets, as is often done with new products, will decrease the problem of neophobia. Consumers will be more aware of the existence and wide variety of these products, but most importantly will get used to their taste. Especially since research points out that the more often people eat certain meat substitutes, the more they will usually appreciate the products (Hoek et al., 2013). If consumers realize that they like the products, sales of meat substitutes will naturally rise.

Conclusion

Research has been conducted using the insights of three disciplines: Environmental Sciences, Communication Sciences and Cognitive Neuropsychology. Interdisciplinary conflicts have been resolved by creating common ground, using the Organization and Transformation techniques developed by Repko (2012) and Szostak (2013). This study focuses on both environmental and social sustainability in the near past, present and relatively near future. Research results have been integrated to create a more comprehensive understanding to be able to answer the research question: "How can consumer behavior be made more sustainable concerning the consumption of meat and meat alternatives?" A summation

of techniques in order to increase the consumption of meat alternatives over meat is provided as an answer to the research question, and can be used to advise governments, policy makers, producers and supermarket chains.

First of all, consumers must be informed of the fact that there are environmentally more sustainable products that can function as substitutes to meat, and why these products are more sustainable and healthier. It is also important to have meat substitutes located in a more eye-catching and easier to find place in food stores, even better so in-between meat on the same shelf. Furthermore, finding the way to the substitutes can be supported and facilitated with the help of salient and attractive landmarks. Since people regard substitutes as within the same category as meat, the color scheme for the substitutes should also be red, yet be more salient. The orientation of the packages can attract attention as well, when meat and meat substitutes have a different lay-out within the same shelf. What is more, the actual packaging of food products should also change from plastic to a more sustainable material. Adding a happy smiley on the packaging of meat substitutes and a sad smiley on meat packages, can improve consumption of substitutes. The environmental impacts that the products have are communicated in a distinctive way, indicated with the depicted emotion. Furthermore, it is of importance that the meat alternatives actually resemble most of meats' sensory and physical aspects, to be able to stimulate authentic meat lovers to try them. Last but not least, to address the problem of neophobia, providing samples in Dutch supermarkets will decrease the problem, since consumers will get used to the alternatives.

With the implementation of these techniques by governments, policy makers, producers and supermarket chains, meat consumption will decrease, while consumption of meat substitutes will increase. All this put together results in less water and land usage and lower greenhouse gas emissions, which will be beneficial for everyone living on Planet Earth.

Discussion

The integration of the three disciplinary insights have resulted in a more comprehensive understanding. However, it is interesting to reflect on the research, in order to find its strengths and limitations.

Complimentary disciplines

The disciplinary insights of Environmental Sciences, Communication Sciences and Cognitive Neurobiological Psychology are not the only insights of importance. Other disciplines can offer insights that are thus far not taken into account. Anthropology can be used to better understand consumption behavior in the Netherlands, and in that regard in every culture and country. Ideally, we want to stimulate the consumption of substitutes over meat worldwide, which can result in problems in some cultures where meat has a more prominent position within the culture. Economics and business management is also a viable discipline that can produce one of the strongest incentives there is, money. Improving production and retail management can result in more consumption, duo to lower pricing. Also, the last aspect of economic sustainability could thereby be taken into account. Marketing Sciences does not only fit in well with Communication Sciences, but also with economics and business management. Marketing techniques can be used to enlarge the consumption of meat substitutes and decrease the consumption of meat with campaigns and promotion activities. Packaging Sciences, again in combination with communication sciences, marketing and Cognitive Neuropsychology, would not only shed light on what packaging should look like, but also how material cost and sustainability could be improved.

Reflection on Interdisciplinary research

This study contributes to solving a societal and environmental issue and creates a foundation for future research. We have proposed several steps to improve the communication towards meat substitutes in order to create a more sustainably aware society. Future research could be done about the best way to make meat substitutes appealing, and the opposite so for meat. In this study, we have opted for a smiley face as a nudge, but in the tobacco industry, stronger incentives are used, such as pictures of people suffering from severe diseases. Future research is also necessary regarding product packaging. Plastic packaging has several negative impacts on the environment, but this study did not focus on this part of the environmental issue.

Reflection on Integration Techniques

The integration techniques used to form a more comprehensive understanding are the Transformation technique and the Organization technique. These techniques did result in an interdisciplinary answer to the research question. However, by creating common ground some disciplinary insights might have been neglected. This could result in a limited More Comprehensive Understanding, because of the missing nuances of the disciplinary insights.

The technique of Extension could have further extended the research. However, this step is not taken into account because it partly overlaps with the Organization technique. However, the Extension technique could have been useful to map the overall perspectives of Cognitive Neuropsychology, Environmental Sciences and Communication Sciences. The overall perspective of Environmental Sciences concerns entire ecosystems, of which people are part. The overall perspective of Communication Sciences is focused on society; how a society could benefit most and how communication within it could be used most efficiently. The last discipline, Cognitive Neuropsychology, has an overall perspective that focuses on the individual and more precisely on the cognition and behavior of humans. These disciplinary perspectives could be mapped in a pyramid figure, in which Environmental Sciences lays the base, Communication Sciences follows, and Cognitive Neuropsychology is on top.

Criticism on constructing the More Comprehensive Understanding

The appeal of our seven proposals, is that most of them can be implemented quite easily, while having a high success rate for the improvement of consumption of substitutes over meat. Small nudges, such as simply placing meat alternatives on the same shelf as meat, can already improve the findability, and therefore the consumption of the alternatives. Another strength is that most proposals do not have an excessive cost to implement. The cost, for example, of creating and placing landmarks, and of promotional sampling of substituting products is overseeable. Unfortunately, other suggestions, like the emotional reinforcing smileys and the color theming of both meat and meat substitutes require stronger persuasion for different stakeholders, such as the meat industry and governments.

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Table of Figures

Appendix

Category	Information	Keywords	Type of Data
Sustainable use of land	Information what accounts for sustainable land use	Sustainability, environmental sustainability, land use	Scientific articles, scientific reports
Sustainable use of water	Information what accounts for sustainable water use	Environmental sustainability, water footprint	Scientific articles, governmental website
Sustainable amount of greenhouse gases emitted	Information about what accounts for a sustainable amount of GHG emitted	Carbon footprint, environmental sustainability	Scientific articles, scientific reports
Land used for beef	Information about the land used by the production of beef	Land use beef, area beef, production systems	Scientific articles,
Land used for poultry	Information about the land used by the production of poultry	Land use poultry, area poultry	Scientific articles, scientific reports
Land used for soy based meat alternatives	Information about the land used for the production of soy based meat alternatives	Land use soy burger, area production soy	Scientific articles, scientific reports
Water used for beef	Information about the water used by the production of beef	Water use beef, water footprint	Scientific articles,
Water used for poultry	Information about the water used by the production of poultry	Water footprint, water use poultry	Scientific articles, scientific reports
Water used for soy based meat alternatives	Information about the water used by the production of soy based meat alternatives	Water footprint soy based meat alternatives, water use soy, water footprint soy	Scientific articles,
GHG emitted beef	Information about the amount of GHG emitted by the production of beef	Carbon footprint beef	Scientific articles,
GHG emitted poultry	Information about the amount of GHG emitted by the production of poultry	Carbon footprint poultry	Scientific articles, scientific reports
GHG emitted soy based meat alternatives	Information about the amount of GHG emitted by the production of soy based meat alternatives	Carbon footprint soy based meat alternative	Scientific articles,

Keywords and research categories used in order to answer the research question.

Implementation of a Landmark on an intersection