

Exploring European students' meat consumption behavior

A survey based analysis of the relationships between various explanatory variables and meat consumption

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Abstract

In Europe current meat production is largely unsustainable and meat consumption levels are too high. A transition towards more plant-based diets is therefore desirable. This has inspired a growing body of research into the determinants of meat consumption behavior in order to identify leverage points to reduce its levels. However, so far the research field is lacking a strong theoretical foundation and methodological consistency. Also empirical studies and their findings remain limited.

This study aims to address these problems by exploring European students' meat consumption behavior. Its main objectives are hereby twofold. Firstly, to identify the main explanatory variables related to sustainable food consumption and meat consumption behavior in particular by conducting an extensive literature review of the research field. Secondly, to analyze the relationships between the identified explanatory variables and meat consumption behavior by means of a web-survey with European students.

In the literature review, nine main explanatory variables have been identified: values, attitudes, food choice motives, food involvement, social norms, environmental knowledge, consumer perceptions, habit and socio-demographics. The survey assessed most of these explanatory variables as well as European students' meat consumption behaviors. The statistical analyses of the collected data ($n = 238$) produced the following results. Average meat consumption in the sample was lower than expected while environmental awareness was quite high. Correlations showed that all of the identified explanatory variables were significantly related to meat consumption behavior. However, in various regression models only few of the variables turned out as strong and significant predictors. *Ecological food choice motives* and *perceived environmental benefit of consuming less animal products* were the two best determinants of reduced meat consumption behavior in this sample. Few of the remaining explanatory variables added significantly to the prediction of meat consumption behavior, leading to a rather moderate amount of explained variance (R^2 between .33 and .40).

Furthermore, methodological limitations of this survey lead to a limited generalizability of the results and make it difficult to draw any definite conclusions. Meat consumption behavior therefore remains a complex and challenging study subject and more research is required to improve current models for its explanation and prediction.

Keywords: Sustainable food consumption, meat consumption behavior, literature review, explanatory variables, (web-)survey, European students

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Table of Content

Abstract	i
Acknowledgements	ii
List of figures	vi
List of tables	vii
Abbreviations	ix
1. Introduction.....	1
1.1. Research background and problem description	1
1.2. Knowledge gap and research objective.....	3
1.3. Research questions.....	4
1.4. Research framework	5
1.5. Scientific relevance and societal relevance.....	6
1.6. Structure of the thesis.....	7
2. Literature review and theoretical framework.....	8
2.1 Theoretical basis.....	8
2.1.1 The Theory of Planned Behavior	8
2.1.2 Self-determination theory.....	10
2.1.3 The theory of cognitive dissonance.....	12
2.1.4 Self-perception theory.....	13
2.1.5 Final remarks	15
2.2 Explanatory variables	15
2.2.1 Values	16
2.2.2 Attitudes	18
2.2.3 Food choice motives (FCMs)	24
2.2.4 Food involvement.....	29
2.2.5 Subjective social norms	32
2.2.6 Environmental knowledge.....	34
2.2.7 Consumer perceptions	39
2.2.8 Habit	43
2.2.9 Socio-demographic variables	45
2.2.10 Synthesis and conceptual model.....	46

3.	Methodology	48
3.1	Participants.....	49
3.2	Procedure	50
3.2.1	Questionnaire development	50
3.2.2	Questionnaire structure	51
3.2.3	Survey distribution	52
3.3	Measures	53
3.3.1	Explanatory variables	54
3.3.2	Dependent variable	57
3.3.3	Control variables.....	57
3.4	Statistical analyses.....	58
3.4.1	Descriptive statistics.....	58
3.4.2	Correlations	59
3.4.3	Multiple regression.....	59
3.4.4	Binary logistic regression.....	61
3.5	Replicability, reliability and validity.....	62
4.	Results	64
4.1	Descriptive statistics and results	64
4.1.1	Socio-demographics	64
4.1.2	Explanatory variables	68
4.1.3	Dependent variable: meat consumption	74
4.1.4	Group comparisons	80
4.2	Analytical statistics	83
4.2.1	Correlations	83
4.2.2	Regression	86
5.	Discussion	91
5.1	Answers to the four research questions	91
5.1.1	Concluding answer to the main research question.....	95
5.2	Methodological limitations of survey research and the present study	96
5.3	Contributions of this research and lessons learned.....	98
5.4	Recommendations.....	100
6.	Conclusion	102

References..... 104

 Online sources 114

Appendices 115

 Appendix 1: Literature search 115

 Appendix 2: A practical example for the functionality of DT 115

 Appendix 3: The cognitive belief hierarchy as a theoretical distinction between values and attitudes
 116

 Appendix 4: Dimensions and items of the NEP scale as a measure of environmental attitudes 117

 Appendix 5: Measures and findings for product-related attitudes and their influence on sustainable
 food consumption behavior 118

 Appendix 6: FCQ and TEMS as measures for FCMs..... 120

 Appendix 7: Overview of environmental knowledge measures employed in the reviewed studies.... 122

 Appendix 8: Three measures of perceived consumer effectiveness 124

 Appendix 9: National differences in meat consumption in Europe 125

 Appendix 10: Measurement items used in this study..... 127

 Appendix 11: Control for outliers in meat consumption behavior 130

 Appendix 12: Multiple linear regression assumptions and diagnostics 131

 Appendix 13: Additional results 133

 Appendix 14: Regression models and R^2 s of other studies on sustainable food consumption..... 135

 Appendix 15: Explanations of possible response strategies used by survey respondents 136

 Appendix 16: Complete survey questionnaire 137

List of figures

Figure 1: Research framework	6
Figure 2: Theory of planned behavior	9
Figure 3: Self-determination theory continuum	10
Figure 4: Conceptual model for the explanation of meat consumption behavior.....	47
Figure 5: Grouped nationalities of respondents.	64
Figure 6: Study countries of respondents grouped into geographic regions.....	65
Figure 7: Academic disciplines of respondents.	66
Figure 8: Answers to the question: "How often are environmental issues and problems a topic of your study courses?"	67
Figure 9: Answers to the question: "How would you describe your interest in food consumption and its environmental impacts?"	67
Figure 10: Respondents' food purchase, preparation and consumption behavior.	68
Figure 11: Overview of answers to the 18 environmental knowledge questions.....	69
Figure 12: Answers about the PEB of various food-related environmental activities.	71
Figure 13: Type of diet and primary motivation of the 57 non-meat consumers.....	75
Figure 14: Respondents' frequency of meat consumption.	76
Figure 15: Detailed meat consumption frequency of respondents.	77
Figure 16: Frequency distributions of respondents' perceived level of meat consumption and sustainable meat purchases.	78
Figure 17: Respondents' ranking of meat preferences. The numbers indicate the number of respondents selecting this option for each rank. The total number of responses decreases with further ranks, as this question was not mandatory and some respondents only indicated the first few preferences.....	78
Figure 18: Responses to the question whether respondents' meat consumption did change in the past six months or will change in the next six months.	79
Figure 19: Meat price sensitivity of respondents.....	79
Figure 20: Four histograms showing the frequencies of the DV (meat consumption amounts) its residuals and two EVs (environmental and animal welfare attitudes) compared to a normal distribution curve..	132

List of tables

Table 1: Meat involvement facets, explanations and items.	31
Table 2: Two examples of PEB measures found in the reviewed literature.	42
Table 3: Overview of the questionnaire structure	51
Table 4: Cronbach's alpha values of the five largest multi-item scales in the survey.....	62
Table 5: Nationalities composing the five geographic groups.	65
Table 6: Study countries composing the geographic groups.	65
Table 7: Descriptive statistics of environmental knowledge test scores.	68
Table 8: Group statistics for environmental knowledge scores of environmental and other students.	70
Table 9: T-test to compare mean environmental knowledge scores between environmental and other students.....	70
Table 10: Ranking of food-related activities according to mean of PEB rating.....	71
Table 11: Mean and ranking comparison of PEB items between meat consumers and non-meat consumers.	72
Table 12: Descriptive statistics of attitude variables	73
Table 13: Descriptive statistics of FCMs and ranking according to their mean scores.....	73
Table 14: Descriptive statistics of PBC, PCE, Habit, social norm and food involvement.....	74
Table 15: Diet types amongst female and male non-meat consumers.	76
Table 16: Comparison of means between meat consumers and non-meat consumers including t-test statistics.....	80
Table 17: Mean scores and t-test values of FCMs for meat and non-meat consumers.	81
Table 18: Cross tabulation of responses to questions about meat consumption and studying an environmental program.	82
Table 19: Means of meat consumption frequency, amount and intake for various socio-demographic groups.....	82
Table 20: Correlation matrix for the three dependent and several EVs.....	84
Table 21: Correlation matrix for the three DVs and eleven FCMs.	84
Table 22: Results of the three regression models for explaining respondents' weekly amount of meat consumption.....	87
Table 23: Comparison of the three regression models.....	88
Table 24: Stepwise regression of model 3 to identify the individual contributions (R^2 change) of the five predictors.	88
Table 25: Results of the binary logistic regression models 2 and 3 for the prediction of meat consumption (yes/no)..	89
Table 26: Comparison of the binary logistic regression models in terms of R^2 values and % of correct predictions.....	90
Table 27: New Ecological Paradigm (NEP) scale.....	117
Table 28: Overview of scales used to measure attitudes towards the respective products in the three studies.	119
Table 29: Factors, explanations and two example items for each factor covered in the FCQ.....	120
Table 30: TEMS factors and examples of two items.	121
Table 31: Overview of environmental knowledge measures found in the reviewed literature.....	122

Table 32: Examples of PCE measures and their items 124

Table 33: Meat supply quantity (kg/capita/year) in the European Union, Norway and Switzerland..... 126

Table 34: Environmental knowledge questions to measure system and action-related knowledge and their sources..... 127

Table 35: Measurement of environmental attitudes..... 128

Table 36: Measurement of animal welfare and health attitudes 129

Table 37: Measurement of FCMs 129

Table 38: Measures of food involvement, PCE, PBC, social norms and habit..... 130

Table 39: EVs mean comparisons and t-test statistics for the groups of environmental and other students. 133

Table 40: FCMs mean comparisons and t-test statistics for the groups of environmental and other students..... 133

Table 41: EVs mean comparisons and t-test statistics for male and female respondents. 134

Table 42: FCMs mean comparisons and t-test statistics for male and female respondents. 134

Table 43: Regression models and R^2 s and Pseudo- R^2 s of some of the reviewed studies on sustainable (food) consumption..... 135

Abbreviations

AEGEE	Association des états généraux des étudiants de l'Europe
AIESEC	Association international des étudiants en sciences économiques et commerciales
BSE	Bovine spongiform encephalopathy
DT	Dissonance theory
DV(s)	Dependent variable(s)
EAI	Environmental attitudes inventory
EAK	Environmental action-related knowledge
EC	European Commission
ECCBs	Ecologically conscious consumer behaviors
EFCM	Ecological food choice motive
EK	Environmental knowledge
ESK	Environmental system knowledge
ESN	Erasmus student network
EU	European Union
EV(s)	Explanatory variable(s)
FAO	Food and Agricultural Organization
FCM(s)	Food choice motive(s)
FCQ	Food choice questionnaire
GHG	Greenhouse gas
HCNL	Health Council of the Netherlands
IDRE	Institute for digital research and education
LCA(s)	Life cycle assessment(s)
MC	Multiple choice
N	Number of respondents
NEP	New ecological/environmental paradigm
NGO(s)	Non-governmental organization(s)
PBC	Perceived behavioral control
PBL	Netherlands Environmental Assessment Agency
PCE	Perceived consumer effectiveness
PEB	Perceived environmental benefit
PVQ	Portrait value questionnaire
RQ(s)	Research question(s)
SD	Sustainable development
SDT	Self-determination theory
SPT	Self-perception theory
TEMS	The eating motivation survey
TPB	Theory of planned behavior
TRA	Theory of reasoned action
UNFCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization
WWF	World Wide Fund for Nature

1. Introduction

In recent years, meat consumption has come under more and more critique. Due to the industrialization of meat production animal welfare issues have worsened considerably (Curry, 2011). Additionally, recent food safety issues and food-borne illnesses have sensitized consumers about the risks of large scale meat production (Hoek et al., 2004). Furthermore, with increasing environmental awareness, concerns have grown about the environmental impacts of livestock and meat production (de Vries & de Boer, 2010). Finally, due to the health risks associated with high meat consumption the healthiness of such diets, prevalent in industrialized countries have been questioned and contested. This has led to a more and more vivid debate about the positive and negative aspects of meat consumption behavior. Looking at the previous concerns it becomes clear that the current development of high (in developed countries) and increasing meat consumption (in developing countries) is not compatible with the idea of sustainable development (SD) (Grunert, 2006; Vinnari, 2008). On the contrary, there is large agreement among SD scholars that considerable change is required to ensure the future well-being of the planet and its people (de Bakker & Dagevos, 2012; de Boer & Aiking, 2011; Garnett, 2011).

Consumers, while often neglected, are an important actor to achieve such societal change (Schösler et al., 2012). Through their combined purchases, they are able to influence the market and initiate changes on the production side. However, it remains to be seen whether consumers are actually aware of the problems associated with meat consumption. Do they care about it, and most importantly, are they willing to change their own behavior?

1.1. Research background and problem description

This research is motivated by the fact that current agricultural food production is largely unsustainable and causes many problems for the environment as well as human society (Baroni et al., 2007; Goodland, 1997;). Continuous population growth implies growing food demand that needs to be met by agricultural production. Modern agriculture and the recent green revolution have both resulted in tremendous yield improvements and increased agricultural output that helped to satisfy most of global food demand. However, besides distributional issues, these yield improvements came at a high price (White, 2000). Agriculture holds by far the largest share of total anthropogenic land use (Stehfest et al., 2009). “Animal farming and agriculture are responsible for 70% of freshwater consumption on the planet” (Baroni et al, 2007: 285). Increased application of chemical fertilizers and pesticides to ensure higher yields is associated with a growing demand for energy to maintain agricultural productivity and a main cause for

land, water and air pollution. This pollution is then linked to further problems like biodiversity loss, or health problems for humans. Soil erosion, greenhouse gas (GHG) emissions and large amounts of waste generation are further problems associated with agricultural activities (Fiala, 2008; Marlow et al., 2009). This all accumulates into a decline of the natural capital of our planet and tremendous pressures on ecosystem services (Goodland, 1997). Rockström et al. (2009) introduced the concept of planetary boundaries and according to their calculations many of the Earth's planetary systems are already being overexploited and much of it can clearly be linked to agricultural activities. Given that global population is expected to rise up to over 9 billion by 2050, combined with the fact that further expansion of agricultural land as well as substantial improvements in agricultural productivity are more and more difficult and costly to achieve, pressures on the environment are expected to increase causing larger problems for society (White, 2000).

While this problem is largely acknowledged in policy and science, much of the attention and search for solutions is focused on the supply side of the issue, namely further improving agricultural productivity and efficiency (Hobson, 2002; Lang & Barling, 2013). However, some authors suggest that a more simple, straightforward and beneficial solution would be to focus on the demand side, namely food consumption (De Bakker & Dagevos, 2012; Goodland, 1997). When taking a closer look at the negative impacts associated with agricultural production, many researchers have pointed out that much of it is associated with livestock production (De Boer et al., 2013; Pimentel & Pimentel, 2003). Comparing the importance of animal products for global food security with its share of negative impacts reveals a clearly unproportional relation (De Boer & Aiking, 2011; Marlow et al., 2009). Besides, consumption of animal products also raises strong ethical concerns. Firstly, it involves the suffering and killing of billions of animals each year (Curry, 2011). Secondly, it can be associated with global inequality as most of the animal products are being consumed in the wealthiest countries while the environmental impacts are shared globally and often more problematic for the poorest people (Goodland, 1997; White, 2000).

Based on all these reasons it seems clear that a shift in consumption towards lower levels of animal products (especially meat) could have large benefits for the planet and its people (Baroni et al., 2007; De Vries & de Boer, 2010; Schösler et al., 2012). Nutritional studies have shown that in most developed countries current intake of animal proteins is up to 200% above recommended levels for a healthy diet (De Boer et al., 2006). This adds yet another sustainability dimension, health, to the issue (Stehfest et al., 2009).

In summary, consumption of animal products has large negative impacts and its overconsumption in most developed countries makes a transformation towards a more plant-based diet in these countries very desirable from a sustainability perspective (De Boer et al., 2006).

However, currently there is little evidence that such a shift in food consumption is happening on a larger scale in the developed world (Lorek & Fuchs, 2013). Nonetheless, some people are actively trying to reduce their consumption of animal products, completely renouncing meat (vegetarians) or even all kinds of animal products (vegans). However, their numbers are rather small and it seems unlikely that large proportions of society will follow this example of “extreme” ethical restraint (Macdiarmid et al., 2012). Therefore, the role and behavior of so-called flexitarians that reduce or intend to reduce their consumption level of animal products becomes most important (De Bakker & Dagevos, 2012). While eggs and dairy are also unsustainable products, the largest environmental impacts are associated with meat, especially beef (De Vries & de Boer, 2010). Therefore the focus of the research will be on meat consumption behavior.

1.2. Knowledge gap and research objective

Recently, the consumption side of sustainable food and agriculture has received increasing attention. There is growing evidence that agricultural output is reaching its limits and a change on the consumption side is needed to achieve greater sustainability related to food and agriculture. The last decade, has produced a growing number of studies that focus on the sustainability of food consumption and purchase behavior among consumers in many different countries and contexts. Numerous of these studies try to explain certain pro-environmental consumption or purchase behaviors with various different explanatory variables (EVs). However, many of the results regarding the determinants of such behaviors are rather weak and sometimes contradictory. There is still a lack of strong theories and conceptual models that have proven fruitful for explaining and predicting sustainable food consumption behavior. This research field is still rather young and lacks consistency and structure. More research is therefore required (De Bakker & Dagevos, 2012; Hoek et al., 2011; Laestadius et al., 2013; Tobler et al., 2012; Vermeir & Verbeke, 2008).

Additionally, by carrying out a preliminary literature review certain knowledge gaps have been identified. First of all, there is still little research into the determinants of the level of meat consumption among consumers (Laestadius et al., 2013). Many studies on sustainable food consumption behavior focus on the purchase of labeled products such as organic or fair trade (Evans & Abrahamse, 2009; Loureiro & Lotade, 2005). However, given the much larger benefit of reduced meat consumption more research into

its determinants is required (Baroni et al., 2007; Tobler et al., 2012). Moreover, the few studies that analyzed meat consumption behavior mostly focused on very few variables in order to explain and predict consumers' behavior (Guenther et al., 2005; Saba & di Natale, 1999; Verbeke & Vackier, 2004; Yen et al., 2008). But other studies have tested and shown that a variety of other variables could also potentially influence sustainable food consumption behavior (García-Jiménez & Mishra, 2011; Larsson et al., 2002). This study therefore attempts to collect and combine all relevant EVs related to meat consumption behavior and test and compare their predictive strength.

Furthermore, among the new variables to be included, special attention will be paid to consumers' knowledge about environmental impacts associated with meat consumption. Lea & Worsley (2008), for example, have found that Australian consumers highly underestimated the environmental benefit of reducing meat consumption compared to other food-related pro-environmental actions (e.g. avoiding excessive plastic packaging). Also other authors have pointed out that many consumers may lack knowledge or be unwilling to acknowledge the large environmental impacts caused by meat consumption (De Boer et al., 2007; Vicente-Molina et al., 2013). As this could be a major barrier to reduced meat consumption, it is important to gain greater insights here.

Finally, based on the gathered data on consumers' level of consumption and their profiles with regard to the EVs interesting insights into the current perception of meat consumption as a sustainability issue will be gained.

1.3. Research questions

These research objectives lead to the formulation of the following main research question (RQ):

What are the main explanatory variables of sustainable food consumption and to what extent do they influence respondents' meat consumption behavior?

This main RQ can be divided into four sub-questions:

1. Which explanatory variables associated with sustainable food consumption can be derived from the literature?
2. What is the level of meat consumption among respondents?
3. How do the respondents perceive the effectiveness and environmental benefit of reduced meat consumption compared to other food-related pro-environmental behaviors?

4. What is the respective influence of the identified explanatory variables on respondents' level of meat consumption and how do they relate to each other?

The first sub-question will be answered through an extensive literature review, the second and questions by means of a survey. The fourth question requires a combination of literature findings, collected data from the survey and some statistical analyses. The first three questions aim at descriptive knowledge, while the fourth will also produce explanatory knowledge (Verschuren & Doorewaard, 2010). Answering all four sub-questions step by step will resolve the main research question.

1.4. Research framework

The research framework to answer the posed RQs is based on three main methods: a literature review, a survey and statistics. The literature review formed the starting point of the research but also continuously assisted and informed the research process. Its main aim was the identification of theories and EVs related to sustainable food consumption behavior. This formed the theoretical framework and methodological foundation for the development and design of the questionnaire (phase A).

The survey assessed respondents' meat consumption behavior as well as their characteristics with regard to the identified EVs. After all data was collected, descriptive statistics (frequencies, distributions, means, mean comparisons, contingency tables) were used to get an overview of the sample and the gathered information (phase B).

Then analytical statistics (mainly correlations and regressions) were employed to explore relationships between variables, most importantly between the EVs and meat consumption behavior.

Finally, interpretations to explain the results and a discussion on its implications are given, resulting in recommendations for future research about meat consumption behavior (phase C).

The following figure (1) summarizes and visualizes the just described research framework.

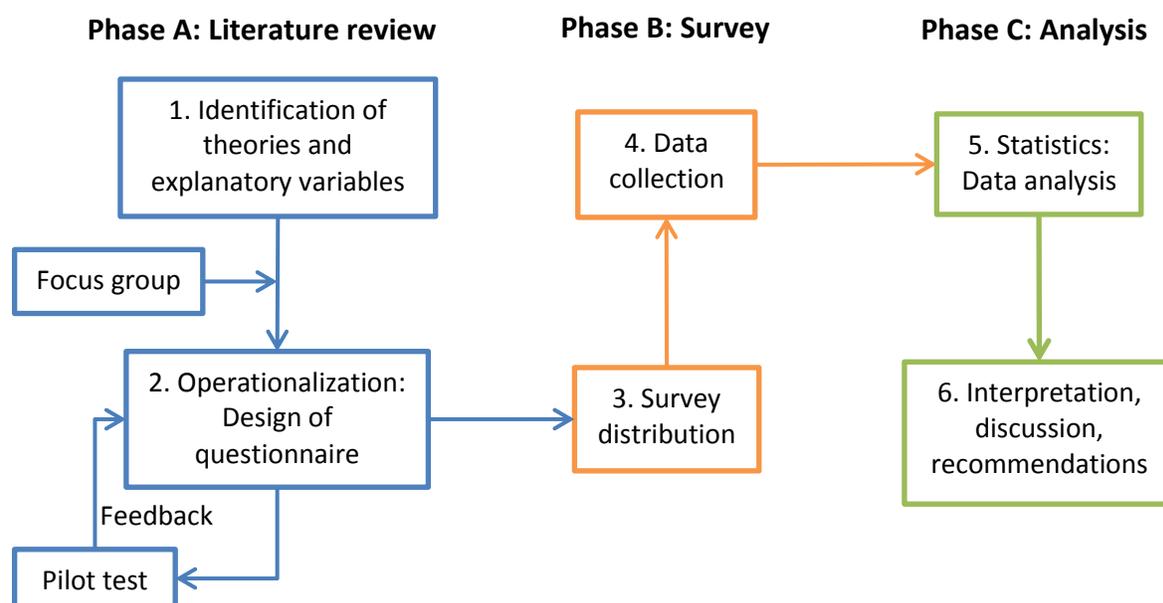


Figure 1: Research framework

1.5. Scientific relevance and societal relevance

Based on the identified knowledge gaps this thesis makes the following contributions. Firstly, by providing an extensive overview of current literature it will clarify relevant theories and variables associated with sustainable food consumption behavior.

Secondly, current research has often focused on very few EVs and this is a first attempt to apply and test such a large number of variables in one study. This will offer a very comprehensive comparison and help identify the more relevant variables with greater predictive strength.

Thirdly, the study has methodological value in presenting alternative ways to operationalize and measure the different EVs. While all measures are influenced by other studies many modifications have been made and some new items haven been constructed. Especially with regard to the measurement of environmental knowledge, this study will make a valuable scientific contribution by providing and testing a new measure, specifically designed for the context of sustainable food/meat consumption.

Finally, the paper adds to the scientific debate about the usefulness of survey methods in behavioral research. It is still somewhat contested whether surveys are an adequate research method to explain human behavior. The results from this study will shed light and provide further evidence for or against surveys in behavioral research.

Also from a societal perspective this research is of great relevance. As described above, current levels of meat consumption pose several environmental, social and health problems. Trends and forecasts indicate that these problems are likely to worsen in the future (Grunert, 2006). Thus, systematic change is needed to reverse the trend and reduce the negative impact of meat consumption on our planet. Consumers could be an important group to induce and lead this change by altering their food consumption behaviors. Less meat consumption has various benefits for the environment and the people. Therefore, people's meat consumption behavior certainly deserves greater academic attention. It is crucial to get a better understanding which variables are the most important determinants of people's level of meat consumption in order to develop successful strategies on how to promote the necessary transition towards more plant-based diets in developed countries or regions like Europe (de Bakker & Dagevos, 2012; Laestadius et al., 2012; Macdiarmid et al., 2012).

Governments are beginning to recognize the importance of this transition and several NGOs are already actively engaged in promoting dietary changes towards a reduced consumption of animal products, especially meat (PBL, 2011; WWF, 2011). However, the limited success thus far, indicates the difficulties in achieving substantial progress (Laestadius et al., 2013; Mont & Plepys, 2008). One needs to know what determines meat consumption and motivates its reduction to successfully address and motivate consumers for limiting their meat intake. For example, if lack of knowledge about the impacts associated with meat consumption is a main predictor for high meat consumption than informational campaigns can help promoting the transition. But if underlying values and attitudes are the main drivers of meat consumption behavior, more substantial policies and educational programs are necessary to achieve substantial change. Moreover, if price turns out as a very important motive for the consumption of meat products, price increases (e.g. through taxes) can be another effective strategy in decreasing meat consumption levels. Finally if sensory appeal turns out as a crucial motive, more attractive meat alternatives in terms of texture, taste, smell and visual appeal need to be developed to represent viable meat substitutes.

1.6. Structure of the thesis

The thesis is structured as follows. Chapter 2 presents the findings of the literature review. Chapter 3 provides a detailed explanation of the research design and methodology. Chapter 4 gives the survey results based on the statistical analyses. Chapter 5 discusses the main findings and implications of this research. Chapter 6 entails a summary and conclusion of the thesis.

2. Literature review and theoretical framework

In this section, the main findings of the conducted literature review on the topic of *sustainable food consumption* are provided. The main focus lies on theoretical foundations and EVs relevant to sustainable food consumption behavior and meat consumption in particular. As the number of studies focusing exclusively on meat consumption is still rather limited to date, the scope has been expanded and also incorporates studies on food consumption in general or certain other non-food-related types of sustainable consumption behaviors.¹ The chapter starts by presenting the most important theories and conceptual models related to sustainable food consumption behavior found in the reviewed literature.

2.1 Theoretical basis

The following review covers four major theories of human behavior within the disciplines of sociology and psychology. Given the background of the author and purpose of this thesis, the following review will not go too far into the details and complexities underlying these theories but rather focus on its relevant elements for the conducted research.

2.1.1 The Theory of Planned Behavior

The theory of planned behavior (TPB) has its origins in the theory of reasoned action (TRA) developed by Ajzen and Fishbein (1980). Both theories' main purpose is to predict and explain human behavior. Simply put, the TRA states that behavior results from a person's behavioral intention which is determined by that person's attitudes and subjective norms regarding the respective behavior. However, these theoretical relations only hold for behaviors under complete volitional control.² In order to also account for nonvolitional behaviors, Ajzen (1985) further developed the TRA into the TPB by adding perceived behavioral control (PBC) as a third determinant of behavioral intention to the model (figure 2). Thereby TPB is also able to account for situations in which persons would like to perform a certain behavior (intention) but perceive they lack behavioral control either because of external barriers or missing personal skills and capabilities to actually do so (Ajzen, 1991; Chatzisarantis & Biddle, 1998).

Depending on the behavior and situation, the relative importance of these three variables in the formation of behavioral intention may vary (Ajzen, 1991). In both theories, behavioral intention is considered as the most immediate determinant of behavior and "represents individuals' plans to perform or not to perform the behaviour in question" (Chatzisarantis & Biddle, 1998: 304).

¹ How the literature research has been conducted and what search terms has been used is explained in Appendix 1.

² "A behaviour is under complete volitional control when environmental barriers and/or personal factors do not interfere with performance of the behaviour." (Chatzisarantis & Biddle, 1998: 304).

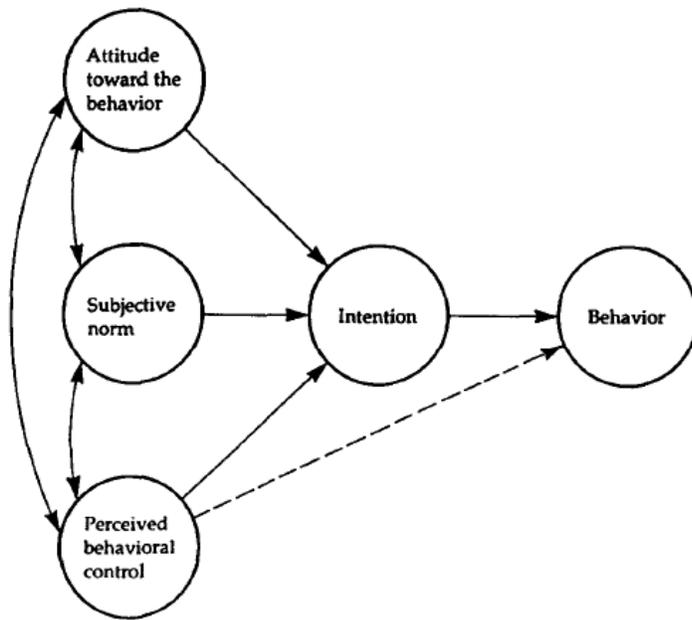


Figure 2: Theory of planned behavior (Ajzen, 1991: 182)

Furthermore, attitudes, subjective norms and PBC are based on different beliefs which can thus be considered indirect determinants of behavioral intention. Attitudes, for example, are a very broad concept but in this theory only the specific attitude towards the behavior in question matters for the behavioral intention. Based on past experiences and future predictions a person holds certain associations and beliefs about every behavior. Every behavior has then its salient beliefs that a person uses to evaluate the behavior and its potential outcomes, thereby forming an attitude about it. The theoretical logic is similar for subjective norms and perceived control. Subjective norms towards behaviors are based on normative beliefs and perceptions of societal pressures and the person's motivation to comply with these norms. Perceived behavioral control originates from control beliefs about access to necessary resources and opportunities and perceived power to engage in the respective behavior (Ajzen, 1991; Sparks & Shepherd, 1992).

Both theories are quite popular in the field of behavioral research and have been widely applied and tested. But despite its undisputable contribution in enhancing our understanding of behavior there is also a considerable body of criticism directed at the theories. Unsatisfying statistical results in a couple of studies have led some authors to believe that the theory fails to capture all important variables to successfully predict behavioral intention, let alone behavior (Conner & Armitage, 1998; Sparks & Shepherd, 1992). In a review of empirical evidence for and against the TPB and TRA, Conner & Armitage (1998) point out that salient beliefs, past behavior/habit, self-efficacy, moral norms, self-identity and affective beliefs may deserve greater attention in these theories and could provide valuable additions.

However, the authors also point out that an inclusion of all the variables may lead to an “unwieldy theory” (ibid: 1452). Another probably more problematic issue is the relationship between behavioral intention and behavior. To explain the latter is the ultimate goal of behavioral research but relatively little is known about the processes that lead from behavioral intention to behavior (Conner & Armitage, 1998). According to the TPB only behavioral intention and actual control determine the performance of a behavior (Ajzen, 1991). Logically, it sounds very convincing that the motivation to do something together with the ability will result in action, but looking at Conner & Armitage’s (1998) meta-analyses things seem somewhat more complicated in reality.

Nonetheless, the rather mixed empirical results regarding the TPB should not lead to the dismissal of the theory in itself. The high complexity of human behavior and difficulty in its assessment deem a more humble approach for its analysis and prediction.

2.1.2 Self-determination theory

Another theory focusing on the role of behavioral intention for the prediction and explanation of behavior is self-determination theory (SDT). In SDT, behavioral intention is termed motivation and is the main focus of the theory. A main difference compared to TRA/TPB is that motivation is not considered as a unitary concept but can take different forms (Chatzisarantis & Biddle, 1998; Ryan & Deci, 2000). According to Ryan & Deci’s self-determination continuum (see figure 3), amotivation, intrinsic motivation and different types of extrinsic motivation can be distinguished. “The term extrinsic motivation refers to the performance of an activity in order to attain some separable outcome and, thus, contrast with intrinsic motivation, which refers to doing an activity for the inherent satisfaction of the activity itself” (Ryan & Deci, 2000: 71).

Type of Motivation	Amotivation	Extrinsic				Intrinsic
Type of Regulation		External	Introjected	Identified	Integrated	Intrinsic
Quality of Behavior	Non-self-determined				Self-determined	

Figure 3: Self-determination theory continuum (Darner, 2009: 43; based on Ryan & Deci, 2002)

Many human behaviors are actually not intrinsically but extrinsically motivated (Darner, 2009). Here, based on the level of regulation four types of extrinsic motivation have been established: external, introjected, identified and integrated regulation (Ryan & Deci, 2000; 2002). External regulation is the type of extrinsic motivation with the lowest degree of personal autonomy and highest level of (external) regulation. The person feels the presence of a strong external force that motivates the performance of

the respective behavior. The most common example often used in social psychology is an offered reward or compensation for performing a behavior the person normally does not want to perform (Chatzisarantis & Biddle, 1998). Contrary to that, introjected regulation also originates from external forces, namely social pressures, but is formed within through negative emotions such as fear of punishment, guilt or shame (Obsalidston & Sheldon, 2003). These pressures bear some resemblance to the “subjective norms” concept introduced in the TRA/TPB (Hagger & Chatzisarants, 2009). The third type of extrinsic motivation is based on identified regulation. Here the person is still aware of the external forces that motivate his/her behavior but accepts these pressures more willingly. The person realizes that the behavior will ultimately help him/her to achieve an important and desired goal (Obsaldiston & Sheldon, 2003). Integrated regulation goes even further and “occurs when an individual has accepted externally imposed values and goals and has integrated them into his/her organizational cognitive structure, which contains that individual’s personally endorsed set of values and goals” (Darner, 2009: 43). Behaviors following this last type of regulation can be considered self-determined as they are in line with the person’s value system (ibid, 2009).

In recent years, this theory has received increasing attention from environmental researchers, especially in the domain of environmental education (Darner, 2009; Obsaldiston & Sheldon, 2003). The theory postulates that self-determined behaviors are much more stable than non-self-determined behaviors as they do not (intrinsic motivation) or hardly (integrated regulation) rely on external stimuli. Therefore, any substantial long-term behavioral change towards greater sustainability (as intended by environmental educators) should aim to facilitate these two last types of behaviors on the self-determination continuum (Darner, 2009; Pelletier et al., 1999). SDT states that autonomy, competence and relatedness are the three psychological needs that must be fulfilled for intrinsic motivation to develop (Ryan & Deci, 2000). Environmental education research is now trying to explore what types of education provide the best learning context for students to “internalize” the motivation to perform pro-environmental behaviors (Darner, 2009; Pelletier et al., 1999).

From this short overview it becomes clear that self-determination theory’s focus is not so much in explaining or predicting behaviors but rather in exploring and differentiating the underlying differences in the motivations that lead to certain behaviors (Pelletier et al., 1999; Ryan & Deci, 2000). Given the objective of this research, to explore the most important determinants of meat consumption, SDT may seem of less importance than TRA/TPB but it certainly has great value for the formulation of recommendations to induce necessary behavioral changes, e.g. towards less meat consumption (Darner, 2009). Additionally, Hagger & Chatzisarantis (2009) have recently conducted a meta-analysis to explore

possibilities of integrating TPB and SDT into one theoretical model and found some preliminary evidence to support their proposal. According to their integrated model, self-determined motivation affects behavioral intentions through attitudes and PBC. The two theories can therefore be considered as complementary rather than competing.

2.1.3 The theory of cognitive dissonance

A third major theory for explaining behavior is the theory of cognitive dissonance also shortly known as dissonance theory (DT) by Leon Festinger (1957). In the 1950s Festinger revolutionized social psychology by combining motivation and cognition as determinants of behavior (Aronson, 1992). Though not without initial critics, DT proved itself as a theory after more than 50 years still remains influential (Aronson, 1992; Harmon-Jones & Harmon-Jones, 2007).

“The theory asserts that a person has certain cognitive elements which are “knowledges” about himself, his environment, his attitudes, his opinions, and his past behavior. If one cognitive element follows logically from another they are said to be consonant to each other” (Oshikawa, 1969: 44). But “when an individual holds two or more elements of knowledge that are relevant to each other but inconsistent with one another, a state of discomfort is created. [Festinger] called this unpleasant state “dissonance” (Harmon-Jones & Harmon-Jones, 2007: 7). Festinger further observed that this state of dissonance often occurs after people make decisions (= post-decision dissonance) as they have “to cope with the cognitive elements concerning the attractive attributes of the rejected alternatives” (Oshikawa, 1969: 45). Empirical research testing DT then revealed that dissonance only occurs if certain conditions are met. Firstly, the person should make the choice independently (*volition*). Secondly, the person needs to show an *irrevocable commitment to the decision*, for example by telling others about it. And thirdly, “the dissonance-producing decisions must be an *important choice*; it must to some degree bear on the individual’s self-concept” (Cummings & Venkatesan, 1976: 304).³

Aronson further elaborated on the importance of an individual’s self-concept and argued that “most individuals strive [...] to preserve a *consistent*, [...] *competent* [and] *morally good* sense of self” (Aronson, 1992: 305; *own emphasis*). According to him, dissonance then arises if a person does something that threatens any of these three self-concepts. For example, if a person does something that he/she considers amoral he will experience dissonance in the form of guilt (Aronson, 1992).

³ The necessity of these conditions and their functionality is explained in a practical example in Appendix 2.

Coming back to the main author, Festinger (1957) postulated that dissonance, experienced as something unpleasant, will motivate people to change their cognitions or behavior in order to achieve greater consistency. Possible ways to reduce cognitive dissonance are: “[a]ttitude change, opinion change, seeking and recall of consonant information, avoidance of dissonant information, perceptual distortion, and behavioral change” (Oshikawa, 1969). Arguably, behavioral change is one of the more difficult modes of dissonance reduction but the possibility justifies increased scholarly attention. After all, behavioral change (towards the “better”) is often the ultimate goal of behavioral research.

Thøgersen (2004) has made one of the few attempts to apply DT to environmentally responsible behaviors. Following DT’s assumptions he reasoned that in order to increase consistency (and reduce dissonance) people should engage in multiple environmental responsible behaviors as they ultimately all serve the same goal (environmental protection). He tested this by correlating various environmental behaviors and found some support for his notion. However, the correlations largely depended on people’s perception of similarity between behaviors (most importantly in terms of behavioral control) and their moral norms showing the subjectivity of cognitive dissonance. If people did not think that two environmental behaviors were really similar or served the same goal they were less likely to engage in both. Likewise, people that held no or only weak moral norms for environmental protection were also less influenced or bothered by behavioral inconsistencies.⁴ He nonetheless concluded that “[a]ll the results support the social-psychological proposition that the desire to avoid inconsistency is indeed an important factor shaping behavioral patterns in the environmental field” (Thøgersen, 2004: 101).

Transferring the theory into the context of this research it therefore seems reasonable to assume that dissonance may occur among individuals that hold strong positive attitudes towards environmental protection, animal welfare and health but nonetheless consume large amounts of meat products. Of course, besides the previously mentioned necessary conditions for the occurrence of dissonance, people also need to be aware and informed about the negative impacts meat production and consumption can have for the environment, farm animals and personal health.

2.1.4 Self-perception theory

The final theory in this short theoretical review is self-perception theory (SPT). The theory was developed by Bem (1967, 1972) in reaction to DT. He seriously criticized DT for its assumptions, found its studies to be biased and questioned its empirical evidence as supportive for DT. On the contrary, he proposed

⁴ So it only matters how the individual perceives his/her own cognitions and behaviors. An outsider may find a person’s behavior inconsistent but for it to create dissonance the person itself must perceive it like that (Aronson, 1992; Thøgersen, 2004).

“self-perception [as] an alternative interpretation of cognitive dissonance phenomena” (Bem, 1967: 183). Bem defines self-perception as “an individual’s ability to respond differentially to his own behavior and its controlling variables” (1967: 184).

The dividing point between the two theories is their different conceptualization of attitude formation. DT follows “the traditional view that attitudes represent relatively enduring learned predispositions of persons” (Chaiken & Baldwin, 1981: 2). They are based on internal information, beliefs, judgments and affections. Contrary to that SPT proposes that attitudes “represent ‘top of the head’ evaluative judgments, constructed largely on the basis of contemporaneous and salient contextual and behavioral information” (ibid: 2), meaning external cues. More simply put, SPT proposes a reversed causality so that attitudes do seldom guide behavior but are rather inferred from behavior. Over the years, various experimental studies working with behavioral manipulations and other external cues have shown that study subjects’ attitudes can indeed be influenced by these types of stimuli (Bem, 1967; Chaiken & Baldwin, 1981; Fazio et al., 1976; Holland et al., 2002).⁵ But also the traditional view of attitudes has received empirical support and it seems like a good compromise to assume that both internal and external information is involved in the process of attitude formation (Chaiken & Baldwin, 1981). Some researchers (Chaiken & Baldwin 1981; Holland et al., 2002) have therefore assumed that attitude strength may be a decisive factor here. People with weak (initial) attitudes are more susceptible to experimental manipulations and resulting attitude change, whereas strong attitudes are more stable and therefore also more relevant for behavior. In their study, Holland et al (2002) measured attitude strength among participants and found that “[c]ompared to weak attitudes, strong attitudes (1) have more impact on behavior; (2) are less susceptible to self-perception effects; (3) [and] are more stable over time” (ibid: 874).

Again this debate shows that attitude-behavior relations are a very complex matter and difficult to decode for researchers. The fact that attitude measurements often need to rely on respondents’ self-reports further aggravates the problem. Faced with a survey respondents may have difficulties in retrieving the attitudes that are being assessed. Especially if they do not hold strong attitudes towards a certain issue or behavior, respondents may be inclined to base their answers on rather superficial and recent information that most easily comes to their mind (Chaiken & Baldwin, 1982; Holland et al., 2002).

⁵ A common design is to measure a study population’s attitudes, let some of the subjects engage in behaviors that are related to the measured attitudes and afterwards measure and compare the attitudes again. Results often showed that people’s attitudes become more favorable towards the behavior they have engaged in during the study (Bem, 1967; Chaiken & Baldwin, 1981; Fazio et al., 1976; Holland et al., 2002).

2.1.5 Final remarks

Confirmative and confutative evidence has been found for all four previously described theories and no strong evidence suggests favoring one theory over the others. Additionally, as respective critics have pointed out, all behavioral theories have certain limitations. It seems to be an impossible task to successfully explain and predict human behavior with one theory. Human behavior is simply too complex and diverse for that. Therefore, the chosen approach here is to bear in mind the various assumptions about how to best explain human behavior proposed by the different theories and focus more on their respective EVs. Many of them are actually reoccurring or overlapping between the theories and models (e.g. attitudes, behavioral control and norms). Additionally, while the review of theories had to be rather general and did not yet specify the behavior under study the main body of literature for the following section was derived from studies focusing on environmental consumption behaviors, preferably food consumption and meat consumption in particular.

2.2 Explanatory variables

As Ajzen (1991) pointed out, “explaining human behavior in all its complexity is a difficult task” (ibid: 179). Nonetheless, this study is making another attempt by trying to analyze and explain meat consumption behavior of European students. “If all factors – whether internal to the individual or external – that determine a given behavior are known, then the behavior can be predicted to the limit of measurement error.” (Ajzen, 1991: 202). The previously described theories already include a number of factors that are expected to be relevant for meat consumption behavior (e.g. attitudes, consumer perceptions, social norms). Besides these factors there are also other variables specific to food consumption behavior that are not incorporated into these more general theories of human behavior, such as food choice motives (FCMs) or food involvement. Thus, based on the theoretical proceedings and the conducted literature review this chapter describes all identified EVs that are likely to affect meat consumption behavior.

The chapter is structured according to the identified EVs, so that each variable is dealt with in its own sub-chapter. There is no specific reason for the order in which the variables are presented, although there was an intention to start with some more general variables and end with the more specific ones. Due to this structure, several studies that covered more than one EV will appear at various points of this chapter. Nonetheless, organizing the review in this manner (instead of describing one study after another) appears to be the clearest and most effective way of presenting the main findings.

2.2.1 Values

Values are a very broad concept with varying definitions among researchers. According to Vermeir & Verbeke (2008) “Human values are referred to as relatively stable beliefs about the personal or social desirability of certain behaviours and modes of existence” (ibid: 544). This definition is very fitting as it already mentions the relation of values to behavior. There is little doubt that values influence behavior but it is less clear how and to what extent. Several authors believe that values are a rather indirect determinant of behavior, mediated by other variables such as social norms and attitudes (de Boer et al., 2007; Honkanen et al., 2006; Vermeir & Verbeke, 2008). This view is also in line with the TPB (see 2.1.1). Other authors (Grankvist et al., 2007; Szmigin et al., 2009; Thøgersen & Ölander, 2002) go even further and also assume a more direct influence of values onto behavior. Grankvist et al., (2007), for example, describe values as antecedents of culture, society and personality and determinants of both, attitudes *and behavior*. However, the authors admit that values’ influence on behavior is often limited and largely depends on the importance attached to these values and environmental cues that trigger or activate the values in the behavioral context. Similarly, Szmigin et al. (2009) point out that many other (situational) factors influence human decision-making and can often overrule values. Some plausible examples they give for consumption situations are bad mood, social demands, convenience or price.

Nonetheless, some studies showed that people who attach greater importance to value types along Schwartz’ self-transcendence value dimension⁶ were more inclined to environmentalism and environmental-friendly behavior (Hoogland et al., 2007; Thøgersen & Ölander, 2002).

In these studies values were mostly measured with the Schwartz Value Survey, its more “respondent-friendly version”, the Portrait Value Questionnaire (PVQ)⁷, or subsets thereof. However, both measures are quite item-extensive⁸ (Thøgersen & Ölander, 2002). Even smaller subsets, used in some of the studies, still contained a considerable number of items; depending on how many of the value dimensions and respective items were included.⁹ Therefore, these studies focusing on values were often limited in

⁶ Shalom H. Schwartz is one of the most influential researchers on human values. His theory of universalistic values proposes ten different values types ordered along two bipolar dimensions that can universally be applied to all human cultures. The first dimension of his value space differentiates between ‘openness to change’ and ‘conservation’, the other between ‘self-transcendence’ and ‘self-enhancement’. (Schwartz, 1994).

⁷ The PVQ was developed by Schwartz et al. (2001) as an alternative measure to the Schwartz Value Survey. It contains 40 items each consisting of two sentence portraits of a person in terms of a value. Respondents then have to rate on a six-point scale how much alike the person is to themselves (de Boer et al., 2007).

⁸ The complete Schwartz Value Questionnaire contains 56 items and tries to cover the full range of ten different human values: universalism, security, conformity, tradition, benevolence, self-direction, stimulation, hedonism, achievement and power (Vermeir & Verbeke, 2008). The complete PVQ is only a bit shorter with a total of 40 items.

⁹ Hoogland et al. (2007), for example, used the PVQ with only four of Schwartz’ value types (universalism, security, power and hedonism) and still ended up with 15 items. Thøgersen (2011) tried to include seven value types in his PVQ but decided to reduce its 29 items to 17 to keep the questionnaire brief.

the number of additional EVs they were able to include in their surveys. Nonetheless, the studies found some supportive evidence that universalistic and nature-related values are positively correlated with more ethical food choices (Grankvist et al., 2007; Hoogland et al., 2007; Thøgersen, 2011; Thøgersen & Ölander, 2002) and less or no meat consumption (de Boer et al., 2007; 2013; Ruby, 2012).

In more detail, Hoogland et al. (2007) found a stronger preference for organic products among subjects endorsing universalistic values. Additionally, “purchase intentions for organic products were lower among those participants who emphasized security values” (ibid: 53) indicating that these people have more difficulty to trust organic products and their associated ‘higher’ standards.

Also Thøgersen (2011) found that “buying organic food is strongly, consistently, and positively related to unselfish values (i.e. universalism) but not selfish values (e.g. status, security, pleasure)” (ibid: 1052). He further discovered that ethical consumers tend to rationalize their (unselfish) choice of organic products by claiming private (selfish) benefits like better taste and greater healthiness, although studies to date have found little evidence in support of these claims.

Furthermore, Grankvist et al. (2007) showed in their experimental study that participants who considered *warm relationships with others* an important value¹⁰ gave more favorable taste ratings to orange juice that was presumably organic or fair trade compared to the orange juice presented without any label. The value *security* led to favorable ratings of fair trade labeled orange juice but not for organic juice. This could mean that fair trade is a more accepted and trusted label compared to organic or that people embracing security values care only about the benefits associated with fair trade but not organic production.

In a panel study Thøgersen and Ölander (2002) were able to provide some evidence for a causal relationship from values to behavior, at least from a short to medium-term perspective. Universalism was the only value type with an influence on pro-environmental behaviors (they measured 17 different environmental-friendly consumer behaviors). Additionally, they found that within the year of their study, both, values and behavior remained quite stable but without being directly related. On the contrary, they argued that the observed behavioral inertia has probably little to do with underlying values as none of the value types besides universalism added any predictive power to the model when accounting for past behavior. They therefore concluded that other variables with little or no relation to values, such as habit, are stronger determinants of behavioral consistency (Thøgersen & Ölander, 2002).

¹⁰ Which is somewhat similar to values such as universalism and benevolence on the self-transcendence dimension of Schwartz’ values.

Quite recently, de Boer et al. (2007, 2013) have produced two studies that explored the impact of values on meat consumption. In their first study (2007) they correlated all ten value dimensions with sustainable meat consumption, using food involvement, FCMs (prevention-, or promotion-orientation¹¹) and animal welfare attitudes as mediators. Universalism prevailed as having the largest impact on food choices favoring less meat or free-range meat, with the impact being rather weak but robust. The impact was mediated by prevention-oriented FCMs, a high level of food involvement and animal friendly attitudes (de Boer et al., 2007).

In their second study de Boer et al. (2013) only focused on the two nature-related items from the PVQ¹² and termed this value *care for nature*. The assessed dependent variable (DV) was acceptance of a proposed meat-free meal idea. As expected, they found that the meat-free meal idea was viewed more positively by people who valued *care for nature* and more negatively by people who did not value *care for nature*.

Finally, the literature review by Ruby (2012) on vegetarianism also found ample support for the notion that vegetarians and omnivores (meat eaters) endorse somewhat different sets of values. Vegetarians are more often associated with holding more altruistic and liberal values and feeling greater empathy (towards other human beings, nature and animals). Omnivores on the other hand tend to be more conservative and traditional in their sets of values and seem to be less altruistic. It goes without saying that these are rather exaggerated generalizations and a lot of the recent research in this newly-created academic field is still rather value-laden and normative. But nonetheless it seems plausible to expect certain value differences between the people following such extreme types of diets (vegetarianism, veganism) based on ethical restraint (no meat, no animal products) and the general population.

2.2.2 Attitudes

Attitudes are probably the most prominent predictor of behavior. They are an important concept in all four previously reviewed behavioral theories. “General attitude is defined as a psychological tendency that is expressed by evaluating a particular object with some degree of favour or disfavour” (Honkanen et al., 2006: 422). So the defining characteristic of attitudes is the evaluation of objects or environments

¹¹ These two types of motivations are derived from Higgins’ (1997) Regulatory Focus Theory. According to him all behavior can be described following one of the two motivations. Promotion motivation is based on approach and aims for pleasure and positive outcomes whereas prevention orientation tries to avoid negative outcomes and is most concerned with obtaining security (de Boer et al., 2007; Higgins, 1997).

¹² 1) “She strongly believes that people should care for nature. Looking after the environment is important to her. [2]) It is important to her to adapt to nature and to fit into it. She believes that people should not change nature” (de Boer et al., 2013: 4).

leading to a positive (like) or negative (dislike) judgment or response. This differentiates attitudes from other concepts like values and motives that derive their core meaning from the importance attached to them (Honkanen et al., 2006).¹³

For the explanation of meat consumption behavior, three types of attitudes are particularly relevant: environmental, animal welfare and health attitudes.

Environmental attitudes: measures

In the literature many different approaches can be found towards conceptualizing and measuring environmental attitudes. Even the terminology is not always consistent. Many studies prefer the term environmental concern (Dunlap et al., 2000; Ellen, 1994; Roberts, 1996; Vicente-Molina et al., 2013). Here, two of the more comprehensive measures among the literature, the New Ecological Paradigm (NEP) scale and the Environmental Attitudes Inventory (EAI) will be reviewed in greater detail.

The NEP scale was originally introduced as the New Environmental Paradigm Scale in 1976 (Dunlap & van Liere, 1978) as one of the first attempts to measure the newly evolving environmental concern among the population.¹⁴ It has then been updated by Dunlap et al. in 2000, to account for the new developments in environmentalism and its terminology. The previous three dimensions of the scale, *balance of nature*, *limits to growth* and *anti-anthropocentrism* (Dunlap & van Liere, 1978) were extended by further two dimensions called *human exceptionalism* and *ecocrisis*.¹⁵ Based on reviews of the environmental science literature, the authors believe that these five dimensions, each assessed by 3 items, represent an appropriate and comprehensive measure of environmental attitudes/concern. All items of the NEP scale are reported in Appendix 4 (table 27). The items are rated on a five-point Likert scale (strongly agree – mildly agree – unsure – mildly disagree – strongly disagree) and ratings subsumed to a final NEP score.

Both NEP scales have received a lot of attention and been cited and applied in numerous studies.¹⁶ But despite their undisputable success, the NEP scales have also been subjected to criticism, most

¹³ For a more detailed distinction between values and attitudes see the explanation of the cognitive belief hierarchy in Appendix 3.

¹⁴ The authors referred to it as a *paradigm* or *worldview* in accordance to the Dominant Social Paradigm measure introduced earlier (1974) by Pirages and Ehrlich (Dunlap, 2008).

¹⁵ *Ecocrisis*, for example, was hardly an issue in the 1970s but rising awareness of global environmental threats like climate change has made it a major environmental concern.

¹⁶ Dunlap (2008) reported the following numbers: Social Sciences Citation Index: New Environmental Paradigm Scale, 379 citations, New Ecological Paradigm scale: 141 citations (in only 8 years). Google scholar produced even higher figures with 586 and 282 citations, respectively.

importantly their mixed records in their usefulness to predict pro-environmental behaviors (Dunlap, 2008).

A more recent and probably the most comprehensive attempt to measure environmental attitudes in all its dimensions to date, is the EAI by Milfont & Duckitt (2010). While bearing a certain resemblance with some of the items in the NEP scale, the authors have considerably extended the measure to a total of twelve dimensions¹⁷ a ten items (120 items in total). Each of the dimensions contains an equal number of positive and negative statements that respondents are asked to rate on a seven-point Likert scale (agree – disagree). Fortunately, Milfont & Duckitt (2010) also provided two shorter versions of the measure (six and two items per dimension) to enable a less item-expensive application for studies focusing on several other variables besides environmental attitudes.

Environmental attitudes: findings

For this review only three studies focusing on environmental consumption behavior have been found that use environmental attitudes as a predictor in their models. Unfortunately, none of them used the previously described scales. Instead fewer, but nonetheless comparable items of similar wording have been used. The findings are rather mixed. In Robert's study (1996) environmental concern helped explaining five percent of 'ecologically conscious consumer behavior'. Vicente-Molina et al. (2013) used environmental attitudes besides EVs like knowledge, perceptions, motivations and price sensitivity to explain various pro-environmental behaviors, one of them purchase of green products. As attitude did not evolve as a significant predictor they concluded that it "is not a significant variable in explaining pro-environmental behaviour" (Vicente-Molina et al., 2013: 136). However, they also admit that their results are contradictory to other findings and admit that conceptualization and measurement may partly be responsible for these differences. Unfortunately, the authors did not report their measure of environmental attitudes in the study (Vicente-Molina et al., 2013). One of these opposing findings was produced by Welsch and Kühling (2009). They found that "[w]hether people subscribe to green electricity [...] is strongly related to environmental attitudes" (ibid: 172).

In conclusion, the reviewed studies have provided limited empirical evidence for the theoretically assumed causal relation between attitudes and behavior. More specific measures of environmental attitudes, directly relevant for the pro-environmental behavior to be explained often led to more significant results (Dunlap, 2008; Vicente-Molina et al., 2013; Welsch & Kühling, 2009).

¹⁷ 1) Enjoyment of nature, 2) Support for interventionist conservation policies, 3) Environmental movement activism, 4) Conservation motivated by anthropocentric concern, 5) Confidence in science and technology, 6) Environmental threat, 7) Altering nature, 8) Personal conservation behavior, 9) Human dominance over nature, 10) Human utilization of nature, 11) Ecocentric concern, 12) Support for population growth policies

Animal welfare attitudes

Given that the DV of this research is meat consumption, animal welfare attitudes also seem like a plausible EV. People who care more about the welfare of animals should have stronger negative feelings towards the consumption of meat as it involves the killing and often the mistreatment of animals in the process (Curry, 2011; Loughnan et al., 2010). Again three studies analyzing the influence of animal welfare attitudes on meat consumption behavior could be found and will be reviewed here.

Cerjak et al. (2011) measured Croatian consumers' animal welfare attitudes through ten statements that were rated on a five-point Likert scale.¹⁸ Their main finding also revealed an attitude-behavior gap for animal welfare as Croatian consumers mostly reported animal welfare to be an important issue but did not really consider it in their meat purchase decisions.

A somewhat similar study was conducted by de Barcellos et al. (2011). They assessed consumers' attitudes towards industrial meat (pork) production in Brazil and how this influenced their meat purchase behavior. Despite the rather different cultural setting, the results were quite consistent: what people thought about pig production systems hardly influenced their pork consumption behavior.

Finally, de Boer et al. (2007) distinguished between taste-related (meat pickiness)¹⁹ and value-related (animal welfare)²⁰ attitudes (twelve items in total) and assessed and compared their role in predicting consumers' meat choices. "The first dimension differentiated consumers who do like meat and have feelings of ease with meat's animal origin, from those who have feelings of unease and who are picky about meat [e.g. skin, bones]. The second dimension differentiated consumers who pay attention to the treatment and the welfare of livestock animals, from those who do not seem to care about the origin of their meat" (de Boer et al., 2007: 989). The authors argued that these are two clearly distinct sets of attitudes that should be distinguished in their impact on a person's meat purchase behavior. The result of their study among 1530 Dutch consumers was that "taste-related attitude was more strongly correlated with meat choices than the value-related animal friendly attitude" (de Boer et al., 2007: 995). Additionally, they found some interesting socio-demographic differences in relation to these attitudes. Female and young people (and people with a higher education and those living in urban areas) showed

¹⁸ E.g. „Animal suffering should be everybody's concern“, „The taste of meat is more important than the way the animal was raised“, „I believe that intensive animal husbandry is important so supply world population“, „Animals should be able to express natural behaviors on farms“ (Cerjak et al., 2011: 285).

¹⁹ E.g. „Meat with bones or skin, such as chops, does not appeal to me“ opposed to „I love meat that is rich in fat such as a steak“ (de Boer et al., 2007: 989).

²⁰ E.g. „If I buy meat I want to know whether it has been produced in an animal friendly way“ (de Boer et al., 2007: 989).

greater meat pickiness and were thus more inclined to consume smaller quantities of meat (de Boer et al., 2007).

Health attitudes

A third group of attitudes relevant for the explanation of meat consumption behavior are health attitudes. A person's position on the importance of health is likely to impact on his/her diet. Concerning the consumption of meat, there is no clear consensus in the literature regarding its healthiness. Many types of meat combine desirable (e.g. high in protein and iron) with undesirable characteristics (high in fat and cholesterol) from a health perspective leading to rather contradictory findings and conclusions in health and nutritional sciences (Chao et al., 2005; Guenther et al., 2005; Micha et al., 2010). Nonetheless, with the growing trend of vegetarianism the argument that meat is a necessary and important component of the human diet seems to be crumbling, while evidence about the negative impacts of too much meat consumption (e.g. obesity, heart diseases) is hard to put aside. Current levels of meat consumption in Europe are considered too high by many nutritional guides for a healthy diet (HCNL, 2011; WHO, 2003). It therefore seems rather save to assume that a balanced diet with a lower level of meat consumption would lead to health improvements for European citizens. Given the greater media attention on this issue and the increasing popularity of healthy diets among Western cultures it can be expected that more and more people know about this (Lea et al., 2006b). This leads to the assumption that stronger health attitudes would lead to reduced meat consumption.

In the reviewed literature, two studies have been found that explored this relation. Hoek et al. (2004) explored differences in attitudes to food and health between vegetarians, non-vegetarian consumers of meat substitutes and meat consumers. Attitudes to food were based on a food-related lifestyle instrument²¹ consisting of 69 items covering 23 lifestyle dimensions rated on seven-point scales (totally disagree – totally agree), covering all aspects of food consumption, e.g. *“ways of shopping, quality aspects, cooking methods, consumption situations and purchasing motives”* (Hoek et al., 2004: 267). Attitudes to health were measured with *“the Dutch version of the 11-item health consciousness scale”*²² [...] rated on a five-point scale (ranging from ‘totally disagree’ to ‘totally agree’)” (ibid: 267).

Their results showed that vegetarians held stronger health attitudes than meat consumers who were more willing to sacrifice their health for the pleasure they derive from eating meat. Regarding the attitudes to food, vegetarians had a more positive attitude towards shopping in specialty shops, a higher preference for ecological products, paid more attention to labels and were more interested in new food

²¹ See, for example, Brunsø and Grunert (1995) or Scholderer et al. (2004).

²² See Schifferstein & Oude Ophuis (1998).

products and recipes than meat consumers. Non-vegetarian consumers of meat substitutes as the third group of consumers in the sample took an intermediate position between the two in terms of their attitudes (Hoek et al., 2004).

The study by Guenther et al. (2005) approached the topic of meat consumption from a purely dietary perspective. They conceptualized their attitudes as dietary attitudes and did not only ask respondents about their attitude towards health and healthy diets but also questioned more specifically what respondents considered to be a healthy diet and what they found important for their meat purchase decisions. The main finding of this study was that “[d]ietary attitudes and knowledge had less influence on amounts eaten than they did on the probability of eating specific meats at all” (Guenther et al., 2005: 1271). So while this study does not necessarily support the notion that health attitudes influence the level of meat consumption it seems to play at least a role for choice of meat types.

All three types of attitudes mentioned so far are also reoccurring issues in qualitative studies exploring vegetarianism. When asked about their reasons and motivations that made vegetarians stop eating meat, these three are the most common answers given (Ruby, 2012). Fox & Ward (2008) found that initially, animal welfare and health are the more important triggers for this radical dietary change but environmental concerns also have an influence and are increasing in importance. Over time the different attitudes often combine, forming a stronger foundation to justify and maintain this form of dietary restriction (Fox & Ward, 2008). By seeing vegetarians and daily meat-eaters as the two extreme end points on a continuum it is likely to expect stark differences in terms of their attitudes towards these three issues, probably founded on deeper underlying values. Differences in these attitudes are therefore expected to contribute to the prediction of meat consumption levels, or at least for the distinction between the two opposing groups of meat consumers and non-meat consumers.

Product-related attitudes

The final type of attitudes discovered in the literature review are being summarized and grouped together as *product-related attitudes*. These attitudes describe respondents’ favor or disfavor towards different products (e.g. meat), examined in the respective studies. This approach is based on the previously raised notion that more specific types of attitudes are oftentimes better predictors of specific behavior than more general types of attitudes (Hoek et al., 2011). Therefore, the following authors have tried to explain respondents’ food consumption through their attitudes towards food products. However, this approach appears somewhat obvious and redundant and some of the measures used

seem rather crude and arbitrary.²³ Additionally, there is considerable conceptual overlap between product-related attitudes and FCMs. Hoek et al. (2011), for example, clearly refer to product-related attitudes but use reformulated items from the food choice questionnaire for their measurement.²⁴ Also Tanner and Kast (2003) and Tobler et al. (2011) relied on many factors derived from FCMs (e.g. naturalness, health, environmental impact) to measure their product-related attitudes. As the concept of FCMs is more clearly defined and benefits from a strong and widely accepted measure it is preferred over product-related attitudes in this study and will be described in the following sub-chapter.

In conclusion, despite the strong theoretical foundation for an association between attitudes and behavior, the empirical evidence is considerably less explicit. Especially in the environmental field numerous articles can be found referring to the 'attitude-behavior gap'. While more and more people claim to favor a clean environment, nature protection and a sustainable management of the planet's resources, only very few are actively trying to contribute to these goals by living more sustainably (Kollmuss & Agyeman, 2002; Szmigin et al., 2009; Vermeir & Verbeke, 2006).

Three main problems have been identified that make it difficult to prove an influence of attitudes onto behavior. Firstly, the theoretical construct of attitude is rather ambiguous. Various definitions for attitude can be found and clear boundaries of the construct are lacking (Kollmuss & Agyeman, 2002). Secondly, as a latent construct the accurate measurement of attitudes still poses a challenge for researchers. Finally, many other variables are potentially intervening and mediating this relation. In the specific context of consumption behavior, price sensitivity, product quality, moral obligations, social pressures, lack of knowledge and information, or behavioral inertia represent some of the factors likely to obstruct a clear attitude-behavior relation (Bray et al., 2011; Szmigin et al., 2009). Additionally, the influence of attitudes onto specific behaviors seems to be rather unstable and may vary depending on the circumstances. Szmigin et al., (2009) refer to this as *flexibility* in the attitude-behavior relation necessary for people to be able to integrate the various influencing factors (with attitudes representing only one of them) in their daily decision-making.

2.2.3 Food choice motives (FCMs)

Honkanen et al. "propose that the distinction between ethical food choice motives and attitudes is that the meaningful variance of ethical motives and values is in importance, not in valence (positive-

²³ See Appendix 5 for more details about the measurement and findings regarding product-related attitudes.

²⁴ „The topics of FCQ [food choice questionnaire] were rewritten towards product-specific statements. For example, the FCQ item *weight control* 'It is important to me that the food I eat on a typical day is... low on fat' was concerted to 'These products are low in fat'" (Hoek et al., 2011: 666).

negative)” (2006: 423). So attitudes primarily refer to whether we like or dislike something whereas motives are mainly defined by the level of importance attached to them. The following definition by Vicente-Molina et al. further clarifies the concept of motivation and its role for behavior: “Motivation can be defined as a strong internal stimulus around which behaviour is organized [...]. It is shaped by two components: intensity and direction. Both determine the behaviour that is chosen and why” (2013: 132). Thus, “a motive is usually understood as a reason for behaviour” (Moisander, 2007: 404).

Food consumption can be influenced by a great variety of motives. People may choose meat because they like the taste, because they think it is healthy, because it is sold for a good price or simply because they are used to eating meat. These are all imaginable and valid reasons that can determine an individual’s motivation to consume meat products (or not). But usually it is not simply one motive that determines a consumer’s decision but the interplay between various motives (Hoek et al., 2011; Renner et al., 2012). Consequently, a consumer’s food choice will depend on the level of importance attached to the various FCMs (Honkanen et al., 2006).

A very comprehensive and commonly used list of such FCMs with their respective measurement items was produced by Steptoe et al. (1995) in their development of a food choice questionnaire (FCQ). By means of a factor analysis among 358 consumers the authors arrived at a list of nine factors: *health*, *mood* (both six items), *convenience* (five items), *sensory appeal* (four items), *natural content*, *price*, *weight control*, *familiarity* and *ethical concern* (each three items) and a total of number of 36 items for their FCQ. The items are all constructed as statements starting with “It is important to me that the food I eat on a typical day ...” ending with the various motives. These are then rated by respondents on a four-point response scale (not at all important (1), a little important (2), moderately important (3) and very important (4)). Short explanations of the nine factors and two examples of measurement items are given in Appendix 6 (table 29).

Despite its popularity among researchers, the FCQ has not been without critics. In a recent analysis of the instrument, Fotopoulos et al. (2009) validated the reliability of the instrument and its items but doubted the robustness of the nine factors. Especially the factor *ethical concern* showed low internal consistency (Fotopoulos et al., 2009). This is hardly surprising as the factor covers environmental and political considerations that do not necessarily need to coincide as motives among respondents.²⁵

Two of the studies reviewed here have used this FCQ in their analyses. Eertmans et al. (2005) conceptualized FCMs as mediators between personality traits of neophobia and food involvement (EVs)

²⁵ E.g. it is conceivable that respondents may consider ecological packaging as an important FCM but care little about the country of origin and its political situation, or the other way around.

and food intake (DV). However, they found only partial support for this assumption. One slight modification was made to the response scale by extending it to six points (instead of four) “to allow for finer discriminations” (Eertmans et al., 2005: 717).

The study by Hoek et al. (2011) also modified the FCQ by replacing the response scale with a seven-point agreement scale. Furthermore, the three items measuring the motive ethical concern were extended by Lindeman and Väänänen’s (2000) more elaborate measure of ethical FCMs. This measure divides *ethical concern* into three independent factors, namely *ecological welfare*²⁶ (five items), *political values* (four items) and *religion* (two items), thereby increasing the number of items to measure ethical FCMs from three to eleven.²⁷ Lindeman and Väänänen (2000) justified this extension by pointing out that despite the little overall importance of many ethical FCMs (in comparison to other motives) for the general population, there are certain “groups” for whom these motives play a very important and dominant role (such as vegetarians or very political or religious people).

Focusing on the acceptance and consumption of meat substitutes, Hoek et al. (2011) argued that motives for consuming “meat substitutes would be a greater importance attached to the food choice motives health, natural content, weight control and ecological welfare (includes animal welfare and environmental issues)” (ibid: 664), while familiarity, price and sensory aspects like taste could be motives acting as barriers to the consumption of meat substitutes.²⁸ To some extent these assumptions can also be transferred to the behavior of this study, reduced meat consumption.

The ethical FCM scales from Lindeman & Väänänen (2000) have also been tested independently by two of the reviewed studies. Honkanen et al. (2006) used all eleven items of ethical FCMs to assess their impact on attitudes towards organic food. The results showed that “[e]cological motives had the strongest impact on attitudes, indicating the important role of environmental and animal welfare concerns in forming attitudes towards consuming organic food” (ibid: 426). Political motives also had a positive impact on attitudes towards consuming organic food, while religious motives only had a minor influence. The latter result can partly be explained by the fact that the study was conducted in Norway

²⁶ Ecological welfare is a combination of animal welfare (two items) and environmental protection (three items) (Lindeman & Väänänen, 2000).

²⁷ Examples for the newly added items are: „Has been produced in a way that animals’ rights have been respected“ (animal welfare), „Is packaged in an environmentally friendly way“ (environmental protection), „Comes from a country in which human rights are not violated“ (political values) and „Is in harmony with my religious views“ (religion) (Lindeman & Väänänen, 2000: 56).

²⁸ The underlying reasoning is rather self-evident. Meat substitutes are perceived as more healthy, more natural (plant-based, no antibiotics) and less heavy in terms of fat and calories. Additionally, they have a lower environmental impact and do not cause animal suffering. On the other hand, meat substitutes are still rather novel food products and therefore unfamiliar to many consumers. Additionally, prices are often high while taste ratings are rather mixed (Elzerman et al., 2011; Hoek et al., 2004; 2011).

where the majority of the population is Lutheran, a religion that does not prescribe any consumption constraints (Honkanen et al., 2006).²⁹

Vanhonacker et al. (2013) only used the five ecological welfare items from Lindeman & Väänänen (2000) in their study of consumer segments. As expected, “[t]he Active [as the consumer segment with the most positive position towards sustainable meat alternatives] attributed significantly more importance to EFCM [ecological FCMs] as compared with the Unwilling and the Ignorant (Vanhonacker et al., 2013: 13).

A very recent alternative measure for FCMs is the Eating Motivation Survey (TEMS) developed by Renner et al. (2012). Coming from a psychological background the authors’ intention was to develop a tool that can help “[u]nderstanding why people select certain food items in everyday life” (Renner et al., 2012: 117). To explore the plurality of FCMs Renner et al. conducted a literature review, several expert interviews and employed an online questionnaire to arrive at a comprehensive list of FCMs. They ended up with 15 factors and 78 items. Somewhat similar to the statement of the FCQ the TEMS statements start with “I eat what I eat ...” (Renner et al., 2012: 120f) followed by an explanation that contains the various motives. On a seven-point scale ranging from “never” to “always”, respondents could indicate how often the various motives affect their food choices (ibid, 2012). An overview of the 15 factors and some of its respective items is again given in Appendix 6 (table 30).

Testing their newly developed survey among 1040 participants (mostly students) revealed that the factors “Liking, Habits, Need & Hunger and Health were rated as triggering eating behavior fairly often. In contrast, Social Image, Social Norms, and Affect Regulation were seldom rated as a trigger for eating or food choice (Renner et al., 2012: 125). These findings are in line with results derived from the FCQ where sensory appeal and health also emerged as the most important motives and ethical concerns and familiarity of foods were the least important FCMs (Renner et al., 2012; Steptoe et al., 1995). Moreover, Renner et al. (2012) found some interesting socio-demographic differences regarding FCMs. Women paid more attention to the motives Weight Control and Affect Regulation than men. Further, “older participants gave more priority to ‘long-term-oriented’ eating motives such as Health and Natural Concerns [whereas] younger participants’ eating behavior was [...] more often driven by Need & Hunger, Pleasure, Convenience, Visual Appeal and Affect Regulation” (ibid: 126).

While there is substantial overlap and similarity between many motives of the TEMS and the FCQ³⁰, the TEMS puts way more emphasis on the social context of eating and its resulting pressures³¹. However,

²⁹ Actually, the author does not really follow the logic why any type of religion should influence organic food choice in the first place, as all major religions are way older than the notion of organic food itself.

clear ethical FCMs are missing in the TEMS (Renner et al., 2012; Steptoe et al., 1995). The different research field (psychology) may be a reason here. Nonetheless, it is quite surprising that such a recent survey failed to cover the role of ecological motives for people's food choices, given their increasing importance (Honkanen et al., 2006).

Findings for food choice motives as explanatory variables

Looking at consumers' willingness to adopt ecological food consumption behaviors, Tobler et al. (2011) suggested that "*concerns for health, environment, price, taste, and animals' suffering*" (ibid: 677) seemed like the most relevant FCMs and "asked respondents how convincing they found [these] motives for changing the respective behavior" (ibid: 677).³² The two most important findings were that health was a strong predictor for reducing meat consumption and "animals' suffering significantly influenced only consumers' willingness to consider reducing their meat consumption, not the transition to actual behavior" (Tobler et al., 2011: 680).

A slightly different approach and conceptualization of motives was taken by de Boer et al. (2007; 2009) and Schösler et al. (2012). De Boer et al. (2007; 2009) made a distinction between promotion and prevention oriented consumers. Consumers with a promotion focus tend to look for the best alternatives for them, while consumers with a prevention focus find it more important to avoid unacceptable alternatives (de Boer et al., 2009). Schösler et al. (2012) picked up this concept and rephrased it into taste-oriented and reflection-oriented motives. Evaluating their roles for meat substitute consumption, the authors concluded that both motivations could encourage consumers to buy meat substitutes. Taste-oriented consumers could buy meat substitutes out of curiosity, reflection-oriented consumers due to greater sensitivity for environmental concerns in their decision-making (Schösler et al., 2012).

As the previous paragraphs have shown, a diverse number of motives can play a role in determining food choices. Especially in the context of "environmentally responsible behaviour [...] motivational conflicts [often arise] from the fundamental incompatibility of environmental protection-related collective goals and individual consumers' personal or self-interested benefits and the resulting free-rider problem" (Moisander, 2007: 404). This well-known social dilemma in the environmental field is generally referred to as the "tragedy of the commons" (Hardin, 1968) and also seems applicable to the context of ecological

³⁰ *Health, weight control, naturalness/natural concerns, convenience and price* are identical factors between TEMS and FCQ. FCQ's *sensory appeal* was divided into the two factors *liking* and *visual appeal* in the TEMS. Just as FCQ's *mood* is comparable to TEMS' *pleasure* and *affect regulation*. And FCQ's *familiarity* turned into *habit* and to some extent also *traditional eating* in the TEMS.

³¹ It is present in four of the 15 factors, namely *traditional eating, sociability, social norms* and *social image*.

³² Answers were given on a six-point Likert-scale ranging from *not convincing* (1) to *very convincing* (6).

food consumption behavior. It may help understanding why apparently many people lack the motivation and determination to reduce their meat consumption or support more sustainable products (fair trade, organic). The individual certainly faces certain personal barriers and costs (e.g. necessity to change diet, higher costs of many more ecological products) while the collective benefits (e.g. improved ecological production conditions) are much less tangible for the individual consumer (Moisander, 2007; Thøgersen, 2004).

A final note on motivations is dedicated to the group of vegetarians. Following the assumed differences in values and attitudes mentioned earlier, it is only consequent to expect motivational differences between vegetarians and meat consumers. By means of ethnographic research among online groups and forums of vegetarians, Fox and Ward (2008) were able to distinguish two main types of vegetarians based on their underlying motivations: health vegetarians and ethical vegetarians. This motivational distinction is very important because the former group is driven by personal motives (health benefits, disease prevention) while only the latter group is driven by moral and altruistic motives (empathy with animals) (Ruby, 2012). Additionally, environmental motives have also gained in importance in recent years but it is less often a primary motivator for becoming a vegetarian. Over time, the three types of motives (health, animal welfare and environmental) often combine and reinforce each other to substantiate vegetarian's reasoning for their diets (Fox & Ward, 2008; Ruby, 2012).

2.2.4 Food involvement

As indicated before, a variable that affects motivation and FCMs is food involvement. In fact, Vermeir and Verbeke (2006) state that “[i]nvolvement [...] is a specific kind of motivation [...] activated when a product, service or promotional message is perceived as instrumental in meeting important needs, goals and values (ibid: 174). Consequentially, *food involvement* can be “defined as the level of importance of food in a person’s life, and operationalized as the extent to which people enjoy talking about food, entertain thoughts about food during the day, and engage in food-related activities all along the five phases of the ‘life cycle of food’ (acquisition-preparation-cooking-eating-disposal)” (Eertmans et al., 2005: 715).

A common measure for food involvement is the food involvement scale (FIS) developed by Bell & Marshall (2003). It consists of twelve statements each describing a food-related activity and evaluation therefore.³³ In a first test of their scale, the authors found that individual consumers show great variation

³³ E.g. “I don’t think much about food each day”, “I enjoy cooking for others and myself”, or “Compared with other daily decisions, my food choices are not very important” (Bell & Marshall, 2003: 238). As is typical for these

in their level of food involvement. Additionally, subjects with a higher level of food involvement were able to better discriminate between different food samples (Bell & Marshall, 2003). A year later, the same authors tried to relate the FIS to demographics variables, food choices and food choice patterns. Their analysis revealed food involvement as a mediator for differences in food choices and patterns. One interesting result of the study was that consumers with higher food involvement followed a more “healthy” diet, although the causal direction remains to be determined (Marshall & Bell, 2004).

Findings for food involvement as an explanatory variable

Eertmans et al. (2005) employed the FIS³⁴ to test the influence of food involvement on “daily food intake (and its healthfulness) through the weighing of various food choice motives [from the FCQ]” (ibid: 715). The authors found food involvement to be “positively associated with six of the nine measured food choice motives: Health, Sensory Appeal, Natural Content, Ethical Concern, Mood, and Price.” (ibid: 719). However, once FCMs were added to the regression equation, food involvement was no longer a significant predictor of food intake (Eertmans et al., 2005). Due to this connection to FCMs, it thus seems possible that food involvement is yet another variable that can help explain meat consumption behavior.

Three studies have been found that explicitly looked at food involvement in the context of sustainable food choices. De Boer et al. (2007) also conceptualized food involvement as a mediator between universalistic values (see 2.2.1) and meat choices. The results showed that consumers with a high food involvement seemed more inclined to purchase free-range meat, likely associating it with better quality compared to ordinary meat. Contrary to that, consumers with a low level of food involvement were less likely to purchase free-range meat. They seem to favor ordinary and convenient meals and are more driven by habit and impulse in their meat choice. However, the level of meat consumption was not directly related to food involvement and depended on consumers’ attitudes (de Boer et al., 2007).

Similar findings have been produced by Vermeir & Verbeke (2006) who looked at involvement with sustainability instead of food and its role in explaining sustainable consumption. Again they found that lower involvement results in more habitual behavior and thus, less probability for change. Behavioral change depends on new inputs (e.g. information) and reflection (e.g. about values), both are less likely to occur among consumers with low involvement in either food or sustainability. Whereas highly involved consumers tend to seek for new information, take more time to make their decisions and tend to give

measures, answers are given on a seven-point agreement scale (disagree strongly [1] – agree strongly [7]), which are then transferred into a final score (ranging from 12 to 74) that indicate respondents’ food involvement level.

³⁴ More precisely, the authors used the Dutch translation and modified the original scale by splitting one of the original items into two and adding an additional item, resulting in a total of 14 items (Eertmans et al., 2005).

more consideration to their beliefs, attitudes, intentions and possible behavioral outcomes (Vermeir & Verbeke, 2006).

Finally, the most elaborate and most relevant of the reviewed studies about involvement was conducted by Verbeke & Vackier (2004). Driven by the meat safety crisis (BSE) at that time, the authors explored consumers' "involvement in fresh meat" and its effects on consumption. Following Laurent and Kapferer (1985), who established consumer involvement as a multidimensional construct with five facets, Verbeke & Vackier (2004), created three meat-related items for each facet (see table 1).

Table 1: Meat involvement facets, explanations and items (Verbeke & Vackier, 2004: 162).

Facet	Explanation	Items
Product importance	Perceived importance and personal meaning of the product for the consumer	<ul style="list-style-type: none"> ▪ I don't care at all about meat ▪ Meat is very important to me ▪ For me meat is absolutely necessary
Hedonic value	Ability to provide pleasure and affect	<ul style="list-style-type: none"> ▪ I can say that I actually do not like to eat meat ▪ I enjoy a meal with meat more than a meal without meat ▪ I appreciate meat very much
Symbolic value	Bearing for consumer's self-concept	<ul style="list-style-type: none"> ▪ You can tell a lot about a person based on his/her choice of meat ▪ My choice of meat gives other people an image of me ▪ My choice of meat conveys nothing about me to other people
Risk importance	Perceived importance of negative consequences of a poor choice	<ul style="list-style-type: none"> ▪ I don't have a lot to lose when I make a bad choice of meat ▪ I would find a bad choice of meat terrible ▪ I find it very annoying to make a wrong choice of meat
Risk probability	Perceived probability of making the wrong choice	<ul style="list-style-type: none"> ▪ I never know if I make the right choice of meat ▪ When I buy meat, I know that I make the right choice ▪ I feel lost when having to choose meat

They then used this measure to investigate consumer profiles through cluster analysis. Four groups of meat consumers were found: *straightforward meat lovers* (15.7%), *cautious meat lovers* (36.1%), *indifferent meat consumers* (16.2%) and *concerned meat consumers* (32%). The first two groups are both characterized by high hedonic valuation of meat, but only the latter also perceives certain risks in its consumption. *Indifferent meat consumers* show little appreciation for meat but also do not perceive much risks, their meat choice is thus mostly driven by price. They represent the least involved group of consumers. Rather self-evidently, the *concerned meat consumers* have the highest risk perception (importance and probability) regarding the consumption of meat. From this analysis, Verbeke & Vackier (2004) concluded that tangible attributes like price or taste matter for all consumers, irrespective of their meat involvement, while only "more involved consumers additionally seek authenticity or quality

reassurance” (ibid: 167). Accordingly, taste resulted as the most important factor for meat consumption behavior showing that “meat is clearly perceived as a food product with a high hedonic or pleasure value” (ibid: 163).

2.2.5 Subjective social norms

The fifth EV reviewed here entails social norms. It is headlined as *subjective* social norms as there are no clear, objective and universal norms when it comes to eating. Depending on the socio-cultural context, norms about eating may differ substantially. Furthermore, norms tend to be subjectively perceived. Looking at various definitions, subjective social norms are best understood as perceived social pressures “to perform the behaviour in question from people that are important to the person and the motivation to comply with the wishes of these people” (McCarthy et al., 2003: 1075; see also Vermeir & Verbeke, 2006).

Looking at consumption behavior in general, Jansen and Jager (2002) identified four main modes of behavior. 1) *Repetition* of past behavior, 2) *imitation* of other people’s behavior, 3) *social comparison* of one’s own behavior with the behavior of others, and 4) *deliberation*, as the evaluation of all possible consumption patterns to identify the behavior promising highest satisfaction. Two of these four types of consumption behaviors (imitation and social comparison) are clearly affected by other people’s behavior and as thus subject to the influence of social norms.

While there are no clear social norms in the case of eating, there are nonetheless certain sources that help people develop normative beliefs. Religion, family traditions and childhood experiences but also dietary and nutritional guidelines, are likely to be factors that shape a person’s perception of social eating norms. Additionally, the observable eating behaviors of important others, like friends, family or role models represent another social influence. In many studies it is operationalized as such, asking respondents to indicate what they think, important others think they should eat (McCarthy et al., 2003; Vermeir & Verbeke, 2006; 2008).

As described in 2.2.3, some studies have integrated these social norms and pressures as FCMs. Especially, Renner et al. (2012) had four social motives (out of 15) in their TEMS: sociability, social norm, social image and traditional eating. This illustrates the social importance of food consumption. Eating in itself is often a social activity that helps people get together (sociability). Additionally, it is a way of expressing one-self and also inflicts on how we are perceived by others (social image). Additionally, through religion and traditions eating also carries an important socio-cultural and historic meaning (de Boer et al., 2006; Renner et al., 2012).

Due to this great social importance of eating, many studies have also established social norms as a separate, EV. This is also how it is conceptualized in the TPB (2.1.1), where it is one of the three variables (besides attitudes and behavioral control) driving behavioral intention (Ajzen, 1985; 1991).

As it becomes more and more evident that food consumption has large environmental impacts there are new norms developing among the environmentally conscious to try and reduce the negative impacts of one's diet. This development has been reinforced by introduced concepts such as food print measures, virtual water, food miles or LCAs that all aim to make the environmental costs of (food) production and consumption more transparent for the consumer (Panzone et al., 2013). Such norms include eating more local, eating more organic and fair trade, eating more natural foods and less food products with (unhealthy) additives, and finally also eating less meat. While the latter norm is still largely contested and only actively supported by a small part of the population, the former have clearly impacted on food consumption and production. Organic and fair trade food product sales are on the rise and eco-labels are spreading in supermarkets trying to attract this growing group of ethical and ecological consumers. While the trend for meat is somewhat less strong and clear, it is still observable that meat substitutes (e.g. various soy-based products resembling meat products) and other alternatives to animal products (e.g. plant-based dairy) also become more common in European supermarkets (Hoek et al., 2011). Also the idea of meat-free meals is slowly but steadily spreading (Elzerman et al., 2011) and many examples of initiatives to promote meat-free meals can be found (e.g. meat-free Mondays). Power (2012), however, points out that these newly developing social food consumption norms require much further support to really enable a substantial transition towards more sustainable diets in Europe.

Findings for social norms as explanatory variables

Five studies have been found that used a variable related to social norms, social pressures or the influence of "reference" groups or persons as a determinant of consumption behavior or behavioral intention. Conceptualizations and study designs varied to some extent but four of the five studies found a significant influence of social norms on consumption behavior or behavioral intention.

The oldest study in the sample (Sparks & Shepherd, 1992) used a model based on the TPB to explore green consumerism. Thus, subjective norm was employed as one of the three determinants of behavioral intention. The statement "Most people who are important to me think I should ... I should not eat organic vegetables"³⁵ (Sparks & Shepherd, 1992: 392) was used to measure subjective norm. The

³⁵ Intention to consume organic vegetables was the DV in this study representing "green consumerism" (Sparks & Shepherd, 1992).

results showed that the used measure of subjective norm correlated significantly with behavioral intention, as did the other two determinants proposed by the TPB: attitudes and behavioral control.

Welsch and Kühling (2009) tested whether the consumption behavior of reference groups had an influence on a person's own environmental consumption behavior. They looked at three different kinds of consumption behaviors, installation of solar panels, subscription to green electricity and purchase of organic food and found that "[c]onsumption patterns of reference persons are significant covariates of all three kinds of pro-environmental consumption" (Welsch & Kühling, 2009: 166). The influence was strongest for organic food consumption and least important (but nonetheless significant) for green electricity subscriptions (Welsch & Kühling, 2009).

Vermeir & Verbeke (2006; 2008), in their study about consumption of sustainable dairy products, measured social norms with five items stating that "People who are important to me [/family/society/friends/people who influence my buying behavior] think I should buy sustainable food products" (Vermeir & Verbeke, 2008: 546). Respondents rated their agreement/disagreement on a seven-point Likert scale. Results showed that also this measure of social norm had a significant effect on behavioral intention to consume sustainable food products. The authors therefore suggested that supporting these sustainable norms and making consumers more aware of them, could be a successful strategy to promote sustainable food consumption (Vermeir & Verbeke, 2006; 2008).

Finally, McCarthy et al. (2003) also found that "views of other people [...] significantly contributed to behavioural intention towards beef consumption" (ibid: 1081) in their study. They measured normative beliefs, subjective norms and motivation to comply each with one statement.

Only Tanner and Kast (2003) found no significant effect of personal norms on green food purchases in their study. But also for them this was a rather unexpected result, in opposition to the "[n]umerous studies [that] revealed that a personal norm – a feeling of moral obligation – is a powerful motivator of environmental behavior" (Tanner & Kast, 2003: 886). Thus, the empirical evidence for an assumed effect of subjective social norms on meat consumption seems rather supportive and worth investigating.

2.2.6 Environmental knowledge

A sixth rather prominent EV for pro-environmental behavior is environmental knowledge. Sometimes also referred to as environmental awareness, it is often assumed to be connected to the formation of environmental attitudes but may also directly affect behavioral intentions to act environmental friendly (Haron et al., 2005; Morrone et al., 2001).

“Environmental knowledge can be defined as one’s ability to identify a number of symbols, concepts and behaviour patterns related to environmental protection” (Vicente-Molina et al., 2013: 131) and “can be demonstrated through one’s ability to recognize environmental problems, the causes and consequences of such problems, including facts and concepts necessary for [its] explanation” (Haron et al., 2005: 429). This rather broad and general definition shows that *environmental knowledge* is yet another complex EV that lacks a very precise definition and clear boundaries.

Moreover, several authors have tried to further specify environmental knowledge into various subtypes. A very comprehensible categorization has been made by Frick et al. (2004) who divide environmental knowledge into *system*, *action-related* and *effectiveness* knowledge. System knowledge is understood as the most general type of knowledge about ecosystems and their operations as well as environmental problems in general. It is the type of knowledge taught at schools to help pupils and students understand the environment and its functioning. Action-related environmental knowledge is more specific and refers to know-how of “behavioral options and possible courses of action” (Frick et al., 2004: 1599) that can cause or mitigate environmental problems. Tanner & Kast (2003) share this understanding stating that “[t]he term factual knowledge [like system knowledge] refers to knowledge about definitions and causes/consequences of environmental problems, whereas action-related knowledge is used to refer to information about possible actions” (ibid: 886). Effectiveness knowledge, Frick et al.’s (2004) last type of environmental knowledge, is less common in the literature and refers to knowledge about the “relative gain or benefit that is associated with a particular behavior” (Frick et al., 2004: 1599).

Another possible distinction of environmental knowledge is the one between objective (actual) and subjective (perceived) knowledge. As the previous chapter on social norms has shown, it is often a person’s subjective view that influences his behavior, rather than some objective rationale. Thus, some authors hypothesize that what people think they know could be more important for their behavior, than what they actually do know (Martin & Smintiras, 1995; Vicente-Molina et al., 2013).

While “research often makes a connection between knowledge and behavior” (Morrone et al., 2001: 36), the studies and their findings have shown great variation. Unfortunately, no standardized measure of environmental knowledge has yet been established and many authors have used rather different measures to operationalize and assess environmental knowledge of respondents. A short overview on how the reviewed studies have operationalized and measured environmental knowledge can be found in Appendix 7 (table 31).

The measures differ in the type of knowledge, the number and type of questions and the questions cover very different content and vary considerably in their difficulty as well as in the number of given answers

(two to five). While some of these differences can be attributed to the different research purposes of the study, it nonetheless shows that a clear definition of environmental knowledge, what it contains and how to assess it is lacking so far. Some authors asked very specific questions about ecosystems, biology and its processes (Bradley et al., 1999; Morrone et al., 2001), while others asked more general questions about environmental problems, environmental concepts or initiatives in environmental politics and sustainable business (Fryxell & Lo, 2003). Haron et al. (2005) did not even stick to factual knowledge but also addressed the normative component of environmental knowledge with some of their statements.

But putting the methodological measurement issues aside, what did these and other studies report about the relationship between environmental knowledge and pro-environmental behavior or environmental attitudes?

Findings for environmental knowledge as an explanatory variable

As mentioned in the beginning of this subchapter, not all authors believe there is a direct effect of environmental knowledge onto pro-environmental behavior. Thus, two of the reviewed studies tested whether environmental knowledge affected respondents' environmental attitudes. Bradley et al. (1999) found that high school students who attended an environmental course that increased their environmental knowledge, also showed stronger environmental attitudes than high school students who did not attend the course and had less environmental knowledge. Morrone et al. (2001) assessed environmental knowledge and concern of a general population sample and looked for differences among specific groups (environmental students, minorities and a low-income group). They concluded that "the relationship between knowledge about and concern for the environment is complicated" (ibid: 40), as no consistent pattern could be identified. Students showed high levels of environmental concern and knowledge, while minorities had the lowest environmental knowledge scores but were still quite concerned about the environment. Concern thus seemed more associated with respondents' worldviews rather than their level of environmental knowledge (Morrone et al., 2001).

Relating environmental knowledge to attitudes and behavior, a Malaysian survey "found that [environmental] knowledge does correlate positively with environmental attitudes, behaviours and participation" (Haron et al., 2005: 435) in pro-environmental activities. The authors also suggested that performing environmental behaviors and engaging in pro-environmental activities in turn seemed to increase environmental knowledge as well.

Frick et al. (2004), in their study, employed a very extensive questionnaire to measure the proposed three types of environmental knowledge, developed by Kaiser and Frick (2002). They found that "the three knowledge forms exert different influences on conservation behavior: Action-related knowledge

and effectiveness knowledge have a direct effect on performance. In contrast, system knowledge is more remote from behavior, exerting only a mediated influence on it by way of affecting the other two knowledge types” (Frick et al., 2004: 1597). For the prediction of behavior, action-related knowledge seemed most relevant while the findings for effectiveness knowledge were rather inconsistent and non-conclusive. It turned out as an insignificant EV of conservation behavior in three of five models (Frick et al., 2004).

Fryxell and Lo (2003), in a study of managers in China, found only a limited effect of environmental knowledge on behavior. However, they admit that the small effect could partly be due to managerial constraints within the company. Managers with higher environmental knowledge may actually be willing to behave more pro-environmental but face restrictions to do so within their company. Another interesting finding of the study was that environmental attitudes/values (measured with the NEP scale) seemed to be necessary to “activate” environmental knowledge’s influence on behavior.

Two studies focusing on the distinction between objective and subjective knowledge for pro-environmental behaviors have also been found for this review (Ellen, 1994; Vicente-Molina et al., 2013). Both are quite comparable in their measurement as they used a few factual knowledge questions to assess objective knowledge and some self-reporting items as indicators for respondents’ subjective level of environmental knowledge. Also the findings are consistent as both studies found subjective knowledge to be more important for the explanation of pro-environmental behaviors. Additionally, Ellen (1994) found that subjective and objective knowledge were not significantly correlated “indicating that a person’s confidence in their ability to make “right” choices is not reflective of their objective knowledge” (ibid: 47). Moreover, in the study by Vicente-Molina et al. (2013), subjective knowledge turned out higher than the objective knowledge test scores reported. The authors interpret this as a sign that people may think they know more about environmental issues than they actually do, but it could also be a result of flaws in their (not reported) measurement of objective knowledge. Vicente-Molina et al. (2013) nonetheless conclude that “[f]ormal education and knowledge of environmental issues clearly influence pro-environmental behaviour, but they do so in a complex way” (ibid: 135). Thus, “a coherent causal link [...], as previous literature suggests, is difficult to be established reliably” (ibid: 135).

As the behavior under examination in this study is meat consumption, two studies looking at the influence of nutritional or dietary knowledge shall also shortly be mentioned. Both used the Diet and Health Knowledge Survey to measure consumers’ nutritional knowledge and tested whether it affected their meat intake. In the study by Guenther et al. (2005), “nutrition knowledge did not affect the amounts consumed” (ibid: 1271), but influenced meat (type) choices. As the measured knowledge is also

rather subjective (asking consumers about their perceptions) it is maybe not too surprising that consumers who thought pork to be more healthy than other meat types, also consumed relatively more pork compared to other types of meat (Guenther et al., 2005). Yen et al.'s study (2008) found that dietary knowledge led to decreased beef and pork consumption but did not affect poultry or fish consumption.

While more research is required to confound these reported findings, there can be little doubt that knowledge – environmental or dietary – is a factor likely to affect meat consumption behavior.

Another general and consistent finding throughout all reviewed studies was that respondents seemed to have fairly limited environmental knowledge (Frick et al., 2004; Haron et al., 2005; Morrone et al., 2001; Vicente-Molina et al., 2013). Tobler et al. (2011), for instance, reported that “consumers generally appear to lack knowledge about the environmental relevance of various ecological food consumption patterns” (ibid: 681). The authors further suggested that this may be one of the reasons for current unsustainable consumption patterns and only marginal change towards more sustainable diets. They therefore suggested campaigns to increase environmental knowledge as a viable strategy to promote more sustainable food consumption. However Kollmuss and Agyeman (2002) object that “[r]esearch showed that in most cases, increases in knowledge and awareness did not lead to pro-environmental behavior” (ibid: 241). They therefore criticize campaigns that focus on increasing environmental knowledge as they doubt any substantial positive effect. Given that this is a dominant strategy among many environmental organizations (e.g. NGOs like WWF, Greenpeace,...) it would be very important to find a more definite answer towards this question of whether environmental knowledge enhances pro-environmental behavior (Kollmuss & Agyeman, 2002; Laestadius et al., 2013).

A likely explanation for these contradictory findings and opposing views regarding the link between environmental knowledge and environmental behavior lies in the complexity of environmental knowledge itself (Tanner & Kast, 2003). As pointed out in the measurement section it is not really clear what exactly environmental knowledge is. Additionally, environmental knowledge also seems to carry a certain normative component and even in scientific debates there is often no universal agreement about causes, consequences and solutions of environmental problems (e.g. climate change). Also for meat consumption such discourses exist. Austgulen (2014), for example, explored the public discourse about meat consumption in Norway and found very different views about meat consumption, each bringing forward rather contradictory environmental information (knowledge) to back their claims.

Likewise, “understanding the environmental effects of various consumption activities requires often specialist knowledge about the causes of environmental problems and the trade-offs associated with the

different measures that may be taken for environmental protection” (Moisander, 2007: 406f). The complex and at times contradictory nature of environmental knowledge and information, thus tends to confuse and overwhelm consumers making it difficult to obtain reliable environmental knowledge to base their consumption decisions on (Moisander, 2007; Tanner & Kast, 2003).

Finally, even if a consumer is in the possession of the necessary knowledge to make the right decisions, he may still consider behaving differently due to the influence of other factors influencing his choice (Kollmuss & Agymena, 2002). In conclusion, it is reasonable to assume that environmental knowledge is a facilitating maybe even necessary determinant of pro-environmental behavior but clearly not a sufficient one.

2.2.7 Consumer perceptions

This section termed “consumer perceptions” subsumes three distinct but related EVs originating from the perceptions of consumers: *perceived behavioral control* (PBC), *perceived consumer effectiveness* (PCE) and *perceived environmental benefit* (PEB). In the following paragraphs, all three concepts will be clarified by providing definitions of the concepts and presenting the empirical findings regarding the variables’ roles for sustainable consumption behavior.

Perceived behavioral control

PBC was already introduced in the TPB as the third and final determinant of behavioral intention. Adding this factor to the TRA significantly improved the predictive capacity of the theory, already showing the importance of PBC for explaining behavior (Ajzen, 1991; Conner & Armitage, 1998). PBC “refers to people’s perception of the ease or difficulty of performing the behavior of interest” (Ajzen, 1991: 183). This perception can vary substantially from individual to individual and the behavior of interest. In the context of consumption behavior, PBC “indicates whether the consumer can easily consume a certain product or whether its consumption is difficult or impossible. Behavioural control is assumed to reflect past experience as well as anticipated difficulties or facilitating conditions” (Vermeir & Verbeke, 2008: 543). When people think it is (too) difficult or for them to perform a certain behavior, they are unlikely to even try. It is generally assumed that a more confident person is likely to have higher PBC about a behavior than a person that is insecure and doubtful about his abilities to perform said behavior.

The only study of this review employing PBC according to the definition of the TPB was conducted by Vermeir and Verbeke (2006; 2008). To measure PBC for the consumption of a specific sustainable dairy product they created three items asking about perceived availability of the product: 1) *How easily can you acquire sustainable dairy products?* 2) *How easily can you find them in your neighborhood?* 3) *To*

what degree do you think are these products easily available? (Vermeir & Verbeke, 2008: 546). However, they also used additional measures of PCE, which will be discussed in the following section.

Perceived consumer effectiveness

“Perceived consumer effectiveness is a measure of the subject’s judgment in the ability of individual consumers to affect environmental resource problems” (Roberts, 1996: 219). More simply put, a consumer who thinks his/her purchase behavior can make a difference for environmental problems has high PCE while a consumer who considers his/her consumption behavior to be irrelevant for the environment has low PCE. “High PCE is necessary to evoke consumers to translate their positive attitudes into actual purchase” (Vermeir & Verbeke, 2006: 175). The level of PCE is often measured through a few items, rated on Likert scales that are then transformed into a final score. Table 32 in Appendix 8 gives three examples.

Another somewhat similar concept in behavioral research and social psychology is that of “locus of control”. Digging deeper into people’s psyche the concept distinguishes between internal and external locus of control. “Individuals with an external locus of control tend to believe that ethical dilemmas are beyond their control whereas those with an internal locus of control are more likely to make ethical decisions in defiance of conflicting social or situational pressures” (Bray et al., 2011: 599). Tobler et al. (2012) also termed this external locus of control as a “feeling of powerlessness” (ibid: 199). Both studies (Bray et al., 2011; Tobler et al., 2012) state that external locus of control (or low PCE) often acts as a barrier for behavioral change and a justification for keeping current unsustainable habits (e.g. “Even if I would change what difference would it make?”). On the other hand “Meta-analyses of past studies demonstrated that internal locus of control or similar constructs [like high PCE] are positively correlated with pro-environmental behavior” (Tobler et al., 2012: 199).

These statements are consistent with the findings from the reviewed studies using PCE as a determinant of pro-environmental behavior. Roberts found that “[p]erceived consumer effectiveness was a highly significant predictor variable and had the highest beta coefficient in the full-model regression analysis” (1996: 226). In his study, 33% of the variation in ecologically conscious consumer behavior was explainable by PCE making it a very important predictor with greater influence than many of the previously mentioned variables (Roberts, 1996). Similar claims have been made by Ellen (1994) and Ellen et al. (1991). Also for sustainable consumption behavior, Vermeir & Verbeke (2008) demonstrated that “PCE and perceived availability [=PBC] are significant predictors of behavioural intention towards purchasing sustainable dairy products” (ibid: 547). Finally, in a very recent study on environmental

behaviors of students in Brazil, Mexico, Spain and the USA, results also showed that PCE [and motivation] are the factors that best explain the probability of high environmental performance in all countries” (Vicente-Molina et al., 2013: 135).

To conclude this section, Roberts (1996) gives the following interpretation for these strong relations between PBC, PCE and pro-environmental behavior found in the literature. “It appears that one’s judgment of the individual’s ability to abate environmental destruction (PCE) explains more of why a person performs ECCBs [=ecologically conscious consumer behaviors] than does one’s concern for the environment itself. Upon further reflection, it seems logical that if people feel they can have a positive impact on any situation, they are more likely to act. If people are concerned about the environment, but feel that their actions cannot cause change, they will be less likely to participate in such activities” (ibid: 226). Both, PBC but especially PCE are thus very promising EVs for pro-environmental behavior.

Perceived environmental benefit

The third type of consumer perception, looked at in greater detail here, is perceived environmental benefit. Like the name suggests, it can be defined as whether consumers think or believe that certain pro-environmental behaviors are beneficial for the environment (e.g. protection of nature, saving of resources, reduced emissions, pollution or waste generation) or not. PEB is thus closely related to environmental knowledge, and probably also effected by consumers’ environmental values and attitudes as well as the former types of perceptions. Nonetheless, it differs from environmental knowledge as it is a subjective measure that is based on the individual’s perception (Lea & Worsley, 2008; Tobler et al., 2011).

Two studies have been found in this review that operationalized PEB for several suggested consumption related behaviors. Respondents had to rate³⁶ these behaviors (reported in table 2) according to their perception of the associated environmental benefit.

³⁶ Lea & Worsley (2008) used a five-point agreement scale to let respondents indicate whether or not they think these behaviors are beneficial for the environment. Tobler et al. (2011) used a six-point response scale ranging from 1: “very small environmental benefit”, to 6: “very large environmental benefit”.

Table 2: Two examples of PEB measures found in the reviewed literature (Lea & Worsley, 2008: 211; Tobler et al., 2011: 676).

Study	Behavior items to measure PEB
Lea & Worsley (2008)	<ul style="list-style-type: none"> ▪ Food manufacturers using less packaging ▪ Composting household food scraps ▪ Consumers buying food that has been grown locally ▪ Farmers caring more for the environment (e.g. using fewer pesticides and less water) ▪ Supermarkets charging customers for plastic carry bags ▪ Consumers buying organic (food or non-food) products ▪ Consumers eating less meat
Tobler et al. (2011)	<ul style="list-style-type: none"> ▪ Avoid food products with excessive packaging ▪ Buy regional food ▪ Avoid food products that were imported by airplane ▪ Eat only seasonal fruits and vegetables ▪ Buy organic food ▪ Eat less meat (maximum once or twice per week).

There is substantial overlap between the two sets of items (e.g. packaging, consumption of organic food, local food, less meat consumption) with the difference that Tobler et al. (2011) only focused on consumer behaviors, while Lea and Worsley (2008) also included actions from other actors (e.g. farmers, manufacturers and supermarkets) that are beyond the control of the consumer.

The results from the study by Lea and Worsley (2008) are quite supportive for the assumed link between PEB and pro-environmental behavior. Respondents with a generally higher PEB score also engaged more frequently in pro-environmental consumption behaviors. Additionally, there was a high correlation between the PEB of specific behaviors and the frequency of performing this behavior.³⁷

Most interesting for the present study was that in both surveys, less meat consumption turned out as one of the least environmentally beneficial behaviors in consumers' perceptions (together with organic food consumption). Given the overwhelming evidence for meat's large environmental impact, presented in chapter (1.1), this is quite surprising and problematic. It seems that people either considerably lack knowledge about the environmental impact associated with meat consumption, or at least tend to disregard it to justify and maintain their current consumption patterns (Lea & Worsley, 2008; Tobler et al., 2011).

³⁷ E.g. a person who believed that composting was an important pro-environmental behavior also engaged more frequently in this behavior. (Lea & Worsley, 2008).

Also another study by Tobler et al. (2012) showed the importance of PEB for explaining climate-related behaviors. “Multiple regression analyses showed that perceived costs and perceived climate benefit turned out to be the strongest predictors for willingness to act [own behavior] or to support climate policy measures” (ibid: 197). Assessing how consumers perceive the environmental benefit of reduced meat consumption, compared to other food-related consumption behaviors, could thus be another factor adding to the aimed prediction of meat consumption behavior.

Other types of consumer perceptions

The literature review also revealed some sporadic mentioning of other types of consumer perceptions. Perceived responsibility was named by Moisander (2007) as yet another variable that could influence people’s decisions to act pro-environmental or not. However, in none of the surveys has an attempt been made to really conceptualized and measure perceived responsibility and correlate it with pro-environmental behavior. The author further believes that perceived responsibility is strongly embedded in respondent’s values and attitudes and can thus be partly covered by their respective measures.

Other types of perceptions refer to costs and barriers of pro-environmental behaviors (Sanne, 2002). Generally, these perceptions seem rather important for explaining pro-environmental behavior but in the specific context of this study, the author believes they can be disregarded. Costs and barriers are factors that result from the contextual setting of the behavior. However, this study focused mainly on personality-related variables. Additionally, few costs and barriers are to be expected for reduced meat consumption. The often stated myth from omnivores that a vegetarian diet would be more expensive has been dismissed by empirical evidence (Lea et al., 2006a; 2006b). Moreover, meat substitutes and alternatives are now easily available in European supermarkets and cooking suggestions for vegetarian meals are mushrooming. Thus, the author cannot think of any substantial external barriers that would stop consumers from reducing their meat consumption levels. Further support for this argument came from a very recent study by Mäkinieki and Vainio (2014). Asking young Finish adults about perceived barriers to climate-friendly food choices, they found that the reported barriers had actually little influence on respondents’ food choices. For instance, “[h]igh prices were perceived as the most relevant barrier, but were only weakly associated with the participants’ food choices” (ibid: 12).

2.2.8 Habit

The final EV derived from the reviewed literature is *habit*. “[H]abits can be understood as learned sequences of acts that have been reinforced in the past by rewarding experiences and that are triggered by the environment to produce behaviour, largely outside of people’s conscious awareness” (van’t Riet

et al., 2011: 586). This definition points out the three main characteristics of habitual behavior: it is based on past behavior that is frequently repeated, it requires little cognitive effort and it is largely based on intuition triggered by situational cues. It thereby differs substantially from non-habitual behavior that involves a lot more cognitive effort and planning to perform. Van't Riet et al., (2011) argue that behavioral intentions (and the factors determining it) are therefore often poor predictors for habitual behavior. They suggest that habit acts as a moderator between behavioral intention and behavior, in the sense that strong habits are diminishing the effect of intention on behavior. "Habit strength increases when behaviour is repeatedly reinforced by satisfactory experience" (van't Riet et al., 2011: 587).

Köster (2009) has a similar point of view. He harshly criticizes theoretical models like the TPB for its failure to incorporate habit and intuition as potential determinants for behavior.³⁸ Especially in the context of food consumption, as a behavior that is performed on a daily basis, it seems reasonable to assume that habits are influential. Findings that "most food purchases are repeated over time" (van't Riet et al., 2011: 586), seem to substantiate this claim.³⁹ Hence, Köster believes that "[p]ast behaviour, habit and hedonic appreciation are usually better predictors of actual food choice behaviour than psychological constructs like attitudes and intentions" (2009: 70). On that account, he is very critical towards most of current consumer research that tries to explain food consumption by using such constructs like attitudes, motives or knowledge as determinants of intention. According to him, many of these studies suffer from theoretical bias and weak methodologies⁴⁰ resulting in rather low predictive validity for the explanation of food consumption. In conclusion, Köster (2009) strongly suggests including habit as an additional factor into research models of food consumption behavior to account for the often intuitive and unconscious nature of food choice.

Both articles also consider this strong influence of habit on food consumption to be a major reason why many informational campaigns and educational interventions are rather ineffective in inducing behavioral change (Köster, 2009; van't Riet et al., 2011). Bray et al. (2011) have found support for this argument by identifying purchasing inertia as a strong barrier for the change of consumption patterns. Similarly, in a study by Mäkineniemi and Vainio (2014), habit also turned out as one of the strongest

³⁸ In line with that, Conner & Armitage (1998) also suggested that including habit as an additional factor in the TPB could improve the predictive abilities of the theoretical model.

³⁹ Also from personal experiences and observations, the author would agree that many people develop certain habits of repeatedly consuming the same types of foods and meals.

⁴⁰ Köster (2009) has substantial doubts towards studies based on self-reported measures (e.g. survey, questionnaires) and suggests that only direct observation of behavior would lead to accurate insights into consumer behavior.

barriers to climate-friendly food choices. The authors interpreted this as another indication that “people are not necessarily aware of the factors affecting their [food] choices; they make habitual choices without reflecting on them and, at least in some cases, make post hoc justifications for their habits” (Mäkiniemi & Vainio, 2014: 16). These post hoc justifications obviously pose a certain threat for studies collecting data from respondents’ self-reports (e.g. surveys).

Three empirical studies were found that incorporated habit as an EV. Renner et al. (2012) conceptualized habit as one of his FCMs and found it to trigger eating behavior fairly often. Additionally, they did not find any age differences regarding the importance of habit, indicating that these consumption routines already develop at an early stage of life. Saba and di Natale (1999) developed their own, rather direct measure of habit by simply asking respondents whether and how often they eat different types of meat (preserved, red, white) out of habit. The reported findings are in line with previous results and “confirm the important role of habit in influencing frequently performed behaviour” (Saba & di Natale, 1999: 76).

Finally, de Boer and Aiking (2011) took a closer look at consumers’ meat consumption habits. Unfortunately, from a sustainability perspective, the results showed that consumers’ meat consumption habits “are strongly adapted to the chain of industrial activities that produce highly standardized meat products, commonly sold in supermarkets and de-animalized to avoid reminding customers about the link between the meat dish and the killing of an animal” (ibid: 1261). Consequentially, in order to achieve more sustainable diets (e.g. reduced meat consumption), these stagnant meat consumption habits first need to be overcome (see also Latvala et al., 2012).

2.2.9 Socio-demographic variables

Besides these eight explanatory (groups of) variables, socio-demographics as control variables should also be considered. All of the previously reviewed empirical studies controlled for some socio-demographic variables. The most common ones are *age* and *gender*. Especially gender consistently proved to be an influential characteristic for pro-environmental behavior, sustainable food consumption and reduced meat consumption and more vegetarian diets in particular (de Barcellos et al., 2011; Verbeke & Vackier, 2004). Compared to men, women performed pro-environmental behaviors more often and showed higher consumption levels of sustainable food products (Hoek et al., 2004). Furthermore, they reported lower levels of meat consumption, found meat to be less important for their diets and were more positive towards meat substitutes and meat alternatives (Fox & Ward, 2009).

These findings can partially be explained by differences between men and women regarding some of the variables, i.e. values, attitudes or FCMs. Women seem to be more perceptive to universalistic values and

show greater sympathy for environmental, animal welfare and health attitudes. Subsequently, these also turned out as more influential FCMs. Men generally attach greater importance and value to meat as a product, appreciating it for its unique qualities and associated characteristics. Ruby (2012), for example, showed that many people among both sexes associate meat eating with masculinity. Gender, is thus definitely a socio-demographic factor that needs to be controlled for.

For the other variables, findings were less consistent. Nonetheless, as it is fairly easy to assess these variables and they are helpful in characterizing the respondents, they should not be neglected. As this study uses students as respondents and looks at food consumption behavior, the variables *education* and *income* can be transcribed into *study program* and *monthly food budget*. Additionally, *housing situations* are likely to vary substantially between respondents (e.g. living alone, living with parents, living in a shared flat with other students), while *age* will have a rather small range.

Nationality is definitely another interesting variable for food consumption behavior as regional (not necessarily country-specific) differences are to be expected. Despite globalization of food products and meals, there are still distinct culinary traditions to be found in different parts of Europe. De Boer et al. (2006) looked at protein consumption and diet diversity in the EU-15 and found some interesting differences. Also recent FAO data reveals considerable variance in national meat supply levels within the EU. There is considerable deviation above and below the EU average of 82.6 kg per capita per year.⁴¹ Thus, it seems reasonable to expect differences between consumers from different countries and control for it by assessing students' nationality and country of study.

2.2.10 Synthesis and conceptual model

This chapter has provided a very extensive and detailed literature review on the EVs relevant to sustainable food consumption behavior. This was necessary to provide a well-founded answer to the first RQ. Moreover, the review also serves as an important basis for the development of the survey questionnaire.

“[T]he question of what shapes pro-environmental behavior is such a complex one that it cannot be visualized through one single framework or diagram” (Kollmuss & Agyeman, 2002: 239). Still, as a synthesis of the review, the following figure (4) integrates all previously mentioned variables in one conceptual model. Due to the large number of variables and the complexity of their relations it is impossible to accurately depict all relations in one figure. Nonetheless, this conceptual model can help

⁴¹ More detailed information about European country differences in meat supply can be found in Appendix 9.

clarifying the theoretical assumptions of the conducted research. Additionally, it provides a good summary and overview of all relevant variables and their most important relations, identified from the literature review.

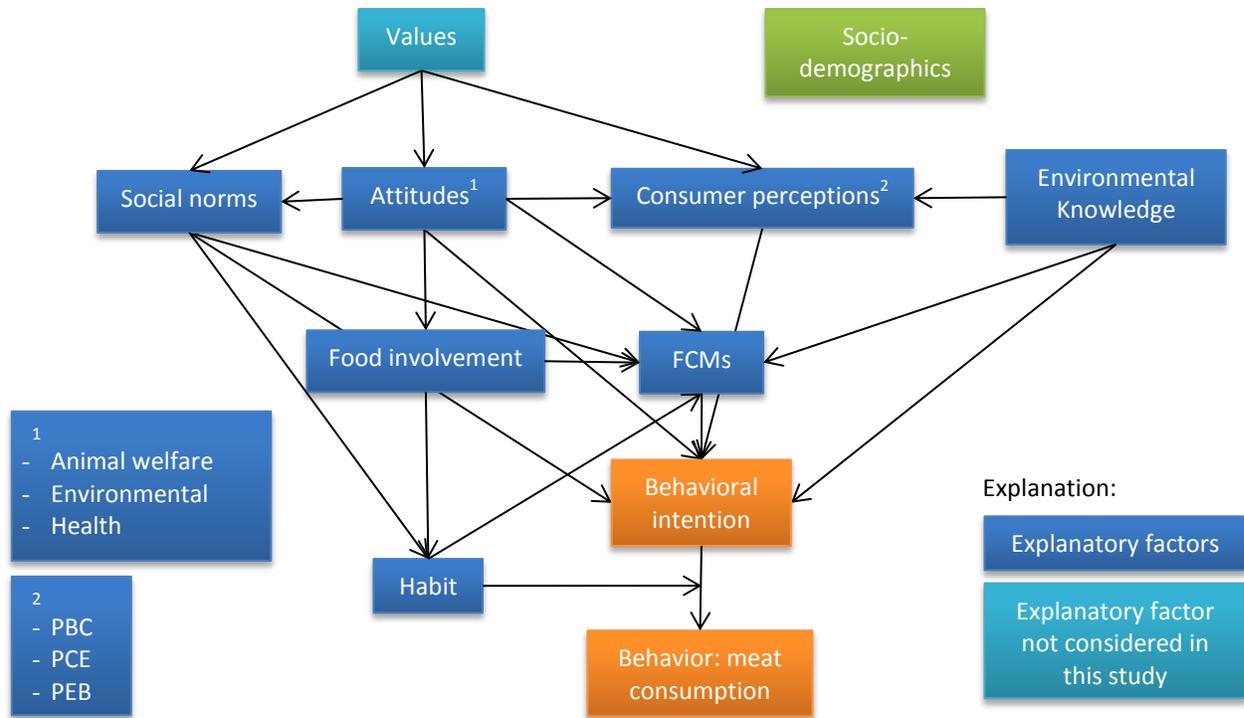


Figure 4: Conceptual model for the explanation of meat consumption behavior

As the model shows, except for values, all variables mentioned in the literature review have been incorporated in this study. The decision to leave out values is based on two arguments. Firstly, values have a rather distant and indirect influence on behavioral intention (as depicted in the model). This influence can possibly also be accounted for through the other variables that are affected by values and are more directly linked to behavioral intention, such as attitudes, social norms and consumer perceptions. Secondly, every empirical study faces certain limitations regarding the data collection. There is a limit to the number of items that can be put into a questionnaire, and as values are also a factor that often requires a considerable amount of items to measure, dropping it seems like a pragmatic decision. For the same reason, many of the other variables can also not be assessed to the same extent and depth. The exact operationalization and measurement of each variable is reported in the following section (3.3) about the methodology of this study.

3. Methodology

The explanation of this study's research design starts with a general description of surveys as a research method, entailing a justification why this specific method was selected here.

“A ‘survey’ is a systematic method for gathering information from (a sample of) entities for the purpose of constructing quantitative descriptors of the attributes of the larger population of which the entities are members” (Groves et al., 2004: 2).

All surveys share certain core characteristics. “Information is gathered primarily by asking people questions” (Groves et al., 2004: 3). These questions are being standardized in the form of a questionnaire to ensure consistency in the data collection and allow for subsequent coding, aggregation and statistical analyses of responses. Unless a complete population survey is conducted (which is generally very costly and difficult to achieve), only a sample of the population of interest takes part in the survey. If the selection of this sample follows certain criteria (random or probability sample), the survey results can be used to make inferences about the general population the sample is derived from (Groves et al., 2004).

Czaja and Blair (1996) further mention three conditions that need to be met for a survey to be conducted. Firstly, the target population must be clearly defined. Secondly, the researcher needs to be convinced that participants will be able to answer all the survey questions and thus provide the information the research tries to uncover. “Finally, the goals of the analysis should generally be statistical in nature, such as to describe or model an aggregate set of population characteristics or to answer a single or related set of research questions dependent on quantitative measures” (ibid: 4). All conditions are met in the present study. With European students, the target population is clearly defined. There is no reason to expect that respondents will be unable to answer all questions of the survey. And the survey is designed to help answer the stated research questions which partly require quantitative measures and statistical analyses. Thus, under these considerations using a survey seems clearly appropriate and justified.

There are several ways how the data can be collected, here a web survey has been chosen. It is “[a] form of data collection via the Internet in which respondents complete questionnaires on the World Wide Web. The questionnaire is accessed by means of a link to a web page” (Bethlehem & Biffignandi, 2012: 33).

A web-surveys offer several distinct advantages that make it a very suitable tool for the present research. Most importantly, a web-based survey is faster, simpler and cheaper to conduct than other types of surveys. It is faster because “the entire data collection period is significantly shortened”

(Bethlehem & Biffignandi, 2012: 45). It is simpler because the web-survey can be directly tailored to the survey situation making it easier for respondents to fill in (e.g. filter questions and automatic routing) and for the researcher to analyze and evaluate (e.g. automatic data processing, less risk of human error). Finally, costs are generally lower and do not increase much with further respondents.

Other attractive properties of web surveys are that they “are less intrusive, and [...] suffer less from social desirability effects” (ibid: 47). Furthermore, a web survey is the only method that allows for data collection throughout Europe as geographical boundaries do not apply. Finally, as all students are nowadays expected to have internet access, no coverage bias is expected from this decision. However, a major problem associated with web-surveys is sample selection and lack of control about who will participate in the survey (Bethlehem & Biffignandi, 2012; Groves et al., 2004).

The following subchapters detail the sampling method and the general survey procedure applied in the present study. Then, the applied measures for all relevant variables are specified. Afterwards, the statistical analyses used to derive at the results are shortly explained. Finally, some remarks about replicability, reliability and validity of the research design are made.

3.1 Participants

As already mentioned before, *European students* are the target population of this research.

For the purposes of this study, *European students* are defined as students who study in a European country. European country is understood in geographical, not political terms. Thus, also countries like Switzerland or Norway count as European.⁴²

Besides representing a very interesting demographic group in itself, European students as respondents have several characteristic advantages for this study.

First of all, they represent a very consistent group of consumers as they are quite similar and thus more easily comparable in a number of socio-demographic factors such as education, profession, income or age. Thus, it is easier to single out potential influences due to these characteristics. This advantage is especially useful for answering the fourth RQ about the predictive strength of various EVs on respondents’ meat consumption behavior. It is also conducive for the cross-country comparison intended in this survey (Vicente-Molina et al., 2013). Secondly, students are in a very decisive life phase with high individual freedom. Many are able to make their food consumption choices independently. Thus, food consumption is likely to be less biased and influenced by other people (e.g. compared to family households) (El Ansari et al., 2012). Thirdly, with increasing numbers of students in yearly cohorts,

⁴² This rather broad definition was chosen to allow for wider participation.

students can now be considered a quite representative sample for the young and upcoming generations. In prospective study fields like sustainable development, it is informative to look at the younger population to get an indication for future trends (Vermeir & Verbeke, 2008). A fourth argument is based on practical reasons. Students are more easily accessible through web-surveys. Furthermore they tend to be more willing to participate and generally more familiar with research surveys and their purposes. Hence fewer non-responses, misunderstandings and inaccurate or biased responses can be expected (ibid, 2004; 2008).

However, the main disadvantage of using students as respondents is that the results are not generalizable and likely to differ from a general population sample. But as the main objectives of this research are rather exploratory, this lack of generalizability is acceptable. With the sample population defined and justified, the exact procedure of the data collection is explained next.

3.2 Procedure

3.2.1 Questionnaire development

Naturally, the data collection began with the development of the questionnaire. This process was mainly based on the previously reported findings from the literature review. Looking at other studies various EVs and possibilities to measure them were collected and compared. From this large source of information the most suitable operationalizations of variables for the present research purposes were selected. Several discussions with the supervisor and student colleagues assisted these decisions. While for some variables, the decisions were more straightforward due to rather established or fairly consistent existing measures, especially the development of questions to assess environmental knowledge proved rather difficult. No widely established operationalization of environmental knowledge was found and reviewed measures showed considerable divergence in content and difficulty. Thus, a pool of 24 environmental system knowledge and 24 environmental action-related knowledge questions (all MC) was gathered, reviewed and discussed in a focus group to arrive at a refined measure of environmental knowledge.⁴³

Finally, a first draft of the questionnaire was developed and prepared for a pretest. This draft questionnaire intentionally contained more items than would be feasible in the final survey to evaluate their quality and usefulness. Additionally, a feedback section with open questions about the questionnaire and some unresolved issues was added at the end of the survey. Also each “page” of the

⁴³ The participants of this focus group were six other Master students of Sustainable Development at Utrecht University. As such they can be considered ‘experts’ of environmental knowledge.

web-survey included a comment field in case pretesters wanted to give direct feedback on the questions of that respective page. All this was clearly explained at the start of the survey, respondents were informed about their role as pretesters and strongly encouraged to provide extensive feedback. Again many student colleagues⁴⁴, this time from various disciplines, and some researchers from the department of Geosciences at Utrecht University were recruited to participate in the pretest. 24 complete responses and four partial responses were collected, providing a very elaborate amount of data and feedback. This information provided the final guidance to complete the questionnaire.

3.2.2 Questionnaire structure

The survey was created with the *lime survey* software and hosted on the server of the Copernicus Institute of Sustainable Development at Utrecht University. It was accessible through a link leading to a website. In total the survey consisted of 24 webpages (22 questionnaire pages) and was divided into the following parts (table 3).

Table 3: Overview of the questionnaire structure

Part	Description	Page(s)
1	Introduction: framed as an inquiry about “environmental awareness” among European students and its influence on their daily decisions.	1
2	Environmental knowledge: 18 MC questions to test respondents’ environmental knowledge.	2-7
3	Environmental attitudes: 2 matrixes of 7 statements rated on 7-point agreement scale.	8-9
4	Perceived environmental benefit: matrix of 8 statements rated on 5-point agreement scale.	10
5	General questions about respondents’ food consumption behaviors and filter question about meat consumption.	11
6	Assessment of PBC, PCE, food involvement, social norm and habit: matrix of 7 statements rated on 7-point agreement scale. Additional matrix of 5 statements about meat consumption behavior and attitudes (only displayed to meat consumers).	12
7	Food choice motives: matrix of 11 FCMs rated on 7-point agreement scale.	13
8	Meat consumption behavior: questions about frequency, amounts and types of consumption, past and future changes, price-sensitivity and purchases of sustainable meat products.	14-17
8.1	Religion: questions about the influence of religion on meat consumption (only displayed to meat consumers influenced by religion).	18
8.2	Non-meat consumption behavior: questions about non-meat consumers’ diets and motivations.	19
9	Animal welfare and health attitudes: 2 matrixes of 6 statements rated on 7-point agreement scales.	20-21
10	Student information: questions to assess respondents’ socio-demographic information (gender, age, nationality, study country, study background).	22-23
11	Thanks for participation and link to Blog ⁴⁵ for feedback and correct responses to knowledge test.	24

⁴⁴ This time, many of the students did not have environmental study backgrounds. Only seven of the 28 pretesters reported that they study an environmental program.

⁴⁵ <http://nilspilblog.wordpress.com/2014/04/06/answers-to-survey-questions-about-environmental-knowledge/>

The rather general introduction was intentional in order to minimize potential influences on respondents (e.g. social desirability bias). Czaja and Blair (1996) recommend using little information in introduction and transitions of surveys to hide the researcher's position on the issues and avoid language likely to evoke emotional responses. It was important that respondents would not feel pressured towards giving more pro-environmental responses.

The introduction also contained an ethical disclaimer ensuring participants that all responses would remain anonymous and only be used for the stated research purposes (master thesis). Participation was voluntary could be ended at any point of the survey and was not rewarded with any compensation.

The order of the questionnaire parts followed certain principles. The questionnaire needs to appear coherent and convenient for respondents and minimize potential effects between the various questions. Therefore, the environmental knowledge part was put at the beginning,⁴⁶ even though it was arguably the most difficult section of the questionnaire and deterred many respondents from continuing the survey.⁴⁷ As an incentive for filling in the complete questionnaire, respondents were informed that the correct answers to the knowledge test would be provided at the end of the survey.

The complete questionnaire in its original order, including all text before, during and after the questions, is reported in Appendix 16. Moreover, the measures for the most important variables are also explained and discussed in chapter 3.3.

3.2.3 Survey distribution

As not all elements of the study population (all European students) are known or accessible for the researcher it was not possible to create a probability or random sample, "in which every element has a known non-zero chance of selection and the elements are selected through a random procedure" (Czaja & Blair, 1996: 108).⁴⁸ Such a sample is usually desirable in scientific research due to its superiority regarding the produced empirical evidence and its generalizability. However, for present research purposes a nonprobability sample design still offers great insight and is sufficient for answering the

⁴⁶ The author wanted respondents to answer the knowledge questions before they knew that the main topic of the survey would be about the environmental impact of food and meat consumption in particular. This information could have influenced respondents' answers to some of the knowledge questions (e.g. where one of the answers was referring to the high environmental impact of food or meat consumption).

⁴⁷ The collected data showed many incomplete responses that ended after the first few pages.

⁴⁸ A contemplated scenario would have been to find some European universities that agree to share a register of all their students' email addresses and then randomly select and contact students from this list to create the sample. However, this approach was not feasible because even the home university of the student did not agree to share this kind of personal information.

posed RQs. It intends a purposive selection of respondents that is feasible for the researcher (Czaja & Blair, 1996).

The following methods have been used to reach out to European students, collect their responses and arrive at a proper sample size.

- Several European university administrations (at a general and at a faculty level) have been contacted and asked for cooperation. While many negative responses were received also some support in sharing the survey via mailing lists was offered from various universities.
- The survey has been shared three times through the author's own Facebook account. With a network of 371 friends, many of them students from various European countries, a considerable outreach was gained. Additionally, the author strongly encouraged his Facebook friends to share the survey again to further increase the outreach through this snowballing technique.
- The survey link was shared on various study-related Facebook groups including official university groups, faculty groups or student groups (e.g. AEGEE, AIESEC, ESN, student unions).
- An entry on a sustainability Blog⁴⁹ was published, introducing the survey and inviting readers (mostly students) to participate in the research.
- Accessible mailing lists and google groups have also been employed to share the survey with other followers.
- The author engaged in many personal communications with friends, relatives and other known students to encourage them to fill in the survey and ask some of their friends to do so as well. This tactic, while requiring much personal effort for persuasion, appeared to be quite effective.⁵⁰

This whole process of data collection took place during a three month time period from 6th of April, 2014 until 6th of July, 2014. It resulted in 238 collected complete responses, 94 incomplete responses and at least double as many accesses (people opening the survey link but not starting the questionnaire).

3.3 Measures

When developing measures to operationalize variables “[w]e can borrow questions other surveys have used or we can develop our own. Neither method is inherently better than the other” (Czaja & Blair,

⁴⁹ The respective article: “The attitude-behavior gap – do you put into practice what you think is right?” can be accessed through the following link: <http://www.lead-ahead.com/general/attitude-behavior-gap-put-practice-think-right/#>.

⁵⁰ The author could not gather any direct information on how or why respondents accessed the survey but knowing when and where the survey was shared and following the increase in responses on a regular basis, the author got some indication on which approaches were more or less successful. It seemed that sharing it for the first time on Facebook and several university mailing lists provided a big share of responses. Also the google groups and personal communication with snowballing techniques seemed fairly effective.

1996: 60). Here, some questions or items were directly taken from reviewed studies, others were changed or rephrased and some were newly developed.

Further one needs to remember that “[w]ithin the limited resources we have to design and conduct our study, [e]ach question has a cost and must be justified” (Czaja & Blair, 1996: 61). While using more questions would have been desirable, a limitation was necessary. A time of 30 minutes for filling in the questionnaire was considered the maximum still acceptable to respondents. Based on the pretest findings, several items and questions that provided little additional information and variation have therefore been eliminated.

The reporting of measures starts with the EVs continues with socio-demographic variables and ends with the measures of the DV (meat consumption) and its related questions.

3.3.1 Explanatory variables

As a large number of EVs was incorporated into this study not all of them could be measured in the same detail as in many of the reviewed studies. Due to the particular interest in the role of environmental knowledge for explaining meat consumption behavior, this variable was measured more thoroughly. Measures for other variables such as attitudes, FCMs, food involvement, social norms, habits and consumer perceptions thus needed to be shortened.

Environmental knowledge

Environmental knowledge was measured through 18 MC questions. Nine of the MC questions assessed system knowledge and nine assessed action-related knowledge. The questions offered three to six answers and the additional option “I have no idea” in order to allow respondents to indicate their lack of knowledge rather than forcing them to make a guess.⁵¹ Three MC questions of each type of knowledge had the possibility of one or more correct answers. Hence, these questions were more difficult to answer correctly and could also be answered partially correct. This was accounted for in the calculation of the knowledge scores.⁵² Table 34 in Appendix 10 reports the questions used to assess each of the two types of environmental knowledge and their respective sources.

⁵¹ This decision was again informed by the pretest. In the pretest survey this option was not yet implemented and some respondents, especially those having difficulties in answering the knowledge test, commented that they would have preferred such an option. The prior concern that respondents could use the “I have no idea” option as a quick and easy way through the knowledge test appeared unfounded as this option was only selected 365 times (8.52%) in a total of 4284 answers (=238 respondents *18 questions).

⁵² For the calculation the author simply divided all possible answers (except for “I have no idea” which instantly resulted in 0 points for the question) into separate parts and awarded one point for every correct answer and zero for every wrong answer. In this case correct answers are both, the rightful selection of a correct answer and the

Only a few questions have directly been taken from other studies, most of them with some modifications. Questions formulated by the author were based on the literature review and specific readings about the environmental impact of agriculture and livestock production. The aim was to develop a number of questions directly related to important concepts, issues and problems of food production and consumption in order to assess respondents' knowledge thereof. Additionally, some more general questions about important environmental concepts were incorporated. Many of the reviewed questions also appeared too easy for a student sample, an assumption supported by the pretest findings. Thus, the difficulty was increased by opting for more complex questions and answers in the final survey in order to achieve greater discrimination between respondents' knowledge scores.⁵³

Attitudes

As outlined in the literature review (2.2.2), three types of attitudes appear relevant for the explanation of meat consumption behavior: environmental, animal welfare and health attitudes.

The measure applied for environmental attitudes here is based on Milfont and Duckitt's (2010) 24-item version of the EAI. Due to redundancy and little added variation in the pretest results these 24 items were then further decreased to 14 (see Appendix 10 table 35). They were rated on a seven-point Likert scale with the following labels: *strongly disagree – disagree – somewhat disagree – undecided – somewhat agree – agree – strongly agree*. Most researchers recommend the use of five-, six (no neutral middle position) or seven-point scales. As a seven-point scale offers the greatest differentiation between respondents, it was selected here.⁵⁴ Larger scales are usually not recommended, as more than seven answers tend to confuse respondents in their ability to easily discriminate between the answers (Bryman, 2001). Thus, for the highest environmental attitude score a respondent should strongly agree with all pro-environmental statements and strongly disagree with all reversed statements.

Also for the measures of animal welfare and health attitudes the reviewed literature served as orientation. For the animal welfare scale, items from Cerjak et al. (2011) and de Barcellos et al. (2011) were mainly applied. The items to measure health attitudes were mainly taken from the rather established health-consciousness scale (e.g. Hoek et al., 2004). As some modifications were made, again all items are reported in a table (36) in Appendix 10. Both measures contain six items with an equal

non-selection of an incorrect answer. Then, all points were added and divided by the number of answers to arrive at the final score for the respective question (a value between 0 and 1).

⁵³ However, one should note that the evaluation of difficulty is always a bit subjective and arbitrary.

⁵⁴ This was also an issue addressed in the pretest, and the feedback supported the use of a seven-point Likert scale (ten pretesters favored seven-point scales, six preferred five-point scales and one argued for a six-point scale).

number of positive and negative statements rated on the previously explained seven-point agreement scale.

Food choice motives (FCMs)

FCMs have been measured using seven items from the FCQ (Steptoe et al., 1995) found to be most relevant for the present study. To account for ecological concerns (environmental and animal welfare) two items from Lineman & Väänänen's (2000) addition to the FCQ were chosen. Two further items were included representing *social norms* as another FCM (Renner et al., 2012). All eleven items are reported in table 37 of Appendix 10 and were rated by respondents with the seven-point agreement scale from above.

Motives like convenience, mood or natural content (Steptoe et al., 1995) were considered less important for the current research purpose and social motives (familiarity, traditional eating, sociability, social norms, and social image) were condensed into the two reported items. This is certainly a simplification and will inevitably lead to a loss of information. But past studies have revealed that these motives are often of minor importance for consumers' food choices (Eertmans et al., 2005; Renner et al., 2012).

Food involvement, habit and consumer perceptions

Further EVs considered in this study are food involvement (1 item), PCE (2), PBC (1), social norms (1) and habit (2). All are directly phrased towards food purchase and consumption behavior and measured with only one or two items. These are reported in table 38 of Appendix 10.

Due to the questionnaire limitations, only few items have been used to measure these variables. Also most other studies (Ellen et al., 1991; Ellen; 1994; Roberts, 1996; Vermeir & Verbeke, 2006; 2008) only used very few items to account for these factors. Furthermore, as social norms and food involvement (taste) are also partly covered through FCMs, one additional item was considered enough for these variables.

Perceived environmental benefit

The measurement of PEB of several food-related environmental behaviors was largely influenced by a study from Lea & Worsley (2008). However, contrary to the reviewed study, here only personal behaviors were considered relevant. Thus, eight statements describing personal food-related environmental behaviors were developed that respondents had to rate according to their perceived importance of these activities for environmental protection. This time, as responses were given in terms of importance instead of agreement, a five point scale (*unimportant – of little importance, moderately*

important – important – very important) was considered sufficient. All eight items are reported in the results section (table 10), together with the collected responses.

3.3.2 Dependent variable

Meat consumption is the DV in this study. The first question about it (*Do you eat meat? Yes - No*) served as a filter and split respondents into meat consumers and non-consumers.

Meat consumption has mostly been measured in terms of frequency of consumption. Such a measure has also been applied in this study. A filter question asked respondents whether they eat meat products daily, weekly, monthly or yearly. Then a respective follow-up question was asked to determine how often a day or how many days a week/month/year, respondents eat meat products. Additionally, respondents were asked about the amount of meat they averagely eat in the course of a week.

Both measures are somewhat difficult to answer for respondents. As food consumption is a daily routine behavior many consumers are unlikely to reflect a lot about it. Thus, respondents may have difficulties to accurately recollect and report their actual meat consumption behavior. Especially the question about the weekly gram average of meat is rather abstract. It requires not only a good memory but also good estimation capabilities for respondents to be able to correctly estimate how much gram they consume in a week. Some examples about grams of meat contained in some typical food products were given to aid calculations, but nonetheless a certain deviation is to be expected. Thus, having two measures leads to a more accurate picture of respondents' meat consumption behavior and also enables to identify and control for strong outliers (see explanation in Appendix 11).

Furthermore, questions to assess respondents' meat type preferences, own perception of their amount of meat consumption, past or future changes in meat consumption, price sensitivity of their meat consumption and how often (percentage) they purchase "sustainable" meat products were also included in the survey. The group of non-meat consumers has also been explored in some more detail. Respondents who answered that they do not eat meat were asked to classify their diet, how long ago they stopped eating meat and what their primary motivation was.

3.3.3 Control variables

In the present study, socio-demographic variables can be thought of as control variables. The main variables looked at here are *age*, *gender*, *religion*, *nationality* and *study country*. *Age* arguably seems of less relevance in a student sample but was still gathered for completeness. The literature review has already elaborated on the crucial role of *gender* with regard to meat consumption. Also *religion*, while

probably irrelevant for the majority of consumers in this sample⁵⁵, can play a decisive role for students holding strong religious beliefs that dictate certain rules for meat consumption behavior. For *nationality* and *study country* the author has no decisive expectations. Data on meat consumption from several EU countries showed considerable variance but it is unclear whether these will show in such a homogenous population sample of (cosmopolitan) students.

Moreover, some additional questions have also been included to account for further factors that could potentially influence the results. These questions assess students' food consumption situation, academic disciplines and the environmental content in their study program. Finally, students had to rate their interest in the environmental impact of food consumption on a five-point answer scale (*very high – high – neither high nor low – low – uninterested*). This control question was considered necessary to account for self-selection bias in the sample. Even though the topic of food consumption was not revealed at the outset, the environmental focus of the survey may have attracted more respondents interested in environmental issues.

3.4 Statistical analyses

In order to answer the RQs the collected data needs to be analyzed through statistics. Before describing the results of these analyses the author first wants to explain what analyses have been conducted and for what reasons. All analyses have been run with the statistics program SPSS (Version 22) and only used the data from the 238 completed questionnaires.⁵⁶

3.4.1 Descriptive statistics

First of all, some descriptive statistics were conducted to get an overview of the data and information about its distributions and frequencies of answers. Also means, medians, variances and standard errors of responses and aggregated variables were calculated. This section also includes some group comparisons to explore differences between for instance, male and female respondents, meat consumers, and non-consumers or environmental students and other students. These analyses enable a good first description of the sample in terms of the assessed characteristics. It also allows answering RQ2 and RQ4 about the level of meat consumption and the PEB of consuming less animal products. The results are reported in section 4.1.

⁵⁵ As few respondents are expected to follow a religion that would influence their meat consumption behavior (e.g. Buddhism, Hinduism, Islam) in this European sample.

⁵⁶ While for earlier questions and variables like environmental knowledge or environmental attitudes, some more responses are available it would only lead to confusion to work with different sets of respondents within the analyses. It also seems unnecessary given the sufficiently high number of complete responses.

After describing the different variables independently, the relationships between the variables need to be explored, most importantly, the associations between the various EVs and the outcome variable of meat consumption. For this purpose, correlation and regression analyses were mainly conducted but also some cross-tabulations and contingency tables were used to check and confirm the results.

3.4.2 Correlations

When exploring the relations between variables looking at their correlations is a usual first step. “Correlation is primarily concerned with finding out whether a relationship [between two variables] exists and with determining its magnitude and direction” (Ho, 2006: 183). “Calculating the covariance is a good way to assess whether two variables are related to each other. A positive covariance indicates that as one variable deviates from the mean, the other variable deviates in the same direction” (Field, 2009: 169). However, as the calculation of covariance depends on the measurement scale of variables it does not provide a standardized measure. Thus, the correlation coefficient was introduced which produces values between -1 (for a perfectly negative correlation) and +1 (for a perfectly positive correlation). By squaring the correlation coefficient it is also possible to derive the coefficient of determination R^2 , “a measure of the amount of variability in one variable that is shared by the other (Field, 2009: 179). Multiplying R^2 by 100 gives the percentage of variance in one variable explained by another.

A methodological limitation of correlations is that they do not allow for any conclusions about the causation of relationships. They simply show that two variables occur in relation. To explore causality more complex research designs such as time-series or experiments with control groups would be required and even then causality can never be proven but only be assumed with certain confidence. Another issue is the so-called third-variable problem. As most correlations only look at two variables and their relation, one must always acknowledge and consider the possibility that a third (possibly unobserved) variable is in fact the reason for their correlation. Thus, “[a] correlation is the start, not the end, of an investigation, and its explanation is likely to involve theoretical considerations and the triangulation of knowledge from other data sources” (Gorard, 2003: 205).

3.4.3 Multiple regression

Regression represents a further step in the investigation. “Regression and correlation are closely related. Both techniques involve the relationship between two variables, and they both utilize the same set of paired scores taken from the same subjects. However, whereas correlation is concerned with the magnitude and direction of the relationship, regression focuses on using the relationship for prediction”

(Ho, 2006: 195). This is the kind of knowledge this research is ultimately seeking. Is it possible to explain and predict the variance of meat consumption (DV) through the collected information about respondents' traits and characteristics (EVs)? There are plenty of different regression models available and their choice depends on the variables one wants to use. Here, several EVs are used to explain one DV (meat consumption). As a linear relation is expected, multiple regression is the appropriate model for the data analysis.

“Multiple linear regression is a method of analysis for assessing the strength of the relationship between each of a set of explanatory variables (sometimes known as independent variables [...]), and a single response (or dependent) variable” (Landau & Everitt, 2003: 102). The set of EVs is then used to build a model that best fits the present data and provides the most accurate explanation and prediction of the dependent variable. The formula to describe such a model is:

$$Y_i = (b_0 + b_1X_{1i} + b_2X_{2i} + \dots + b_qX_{qi}) + \varepsilon_i$$

Where Y is the outcome or dependent variable and X_1, X_2, \dots, X_q are the q explanatory variables. b_1, b_2, \dots, b_q represent the regression coefficients for the respective explanatory variables while b_0 stands for the intercept or constant. “The term ε_i is the residual or error for individual i and represents the deviation of the observed value of the response for this individual from that expected by the model” (Landau & Everitt, 2003: 103). i simply refers to the individual respondent with $i = 1, 2, \dots, n$ (where n is the sample size).

Another important value in regression analyses is R^2 which (similar to the R^2 in correlations) indicates the explained variance of the model. Multiplying R^2 by 100 then gives the percentage of variance in the DV explained by the regression model and its predictors (EVs) (Field, 2009; Landau & Everitt, 2003). Nonetheless, while regression analysis is set to find the best model, this model can at times still represent a poor fit to the collected data (thus, the error term in its formula). Additionally, “[r]egression cannot [...] prove that the independent variables determine the variation in the dependent variable, but it can show whether that is possible” (Gorard, 2003: 213).

There are several important underlying assumptions for multiple regressions. First of all, the DV needs to be a continuous variable with interval or ratio scale level; therefore the item on meat consumption amounts (in gram) was used here (Field, 2009; Ho, 2006). Further, it is suggested that EVs are measured at least at an ordinal level, preferably at an interval or ratio level. Categorical variables tend to cause problems in regression models (when having more than two categories). Thus, *nationalities* and *study countries* were grouped (see table 5 and 6 in chapter 4.1.1) and recoded into several dummy variables

(0; 1). Further assumptions and some of the checks can be found in Appendix 12. Additionally, some outliers were identified in the data and needed to be excluded from the regression.

A final methodological issue before running the regression is the decision on how to select and enter the predictor variables into the model. Three main alternatives can be distinguished: forced entry, hierarchical or stepwise regression. In forced entry, all predictors are entered into the model at the same time and “[s]ome researchers believe that this method is the only appropriate method of theory testing” (Field, 2009: 212). In hierarchical regression the research sets up an order in which the predictor variables are entered into the model starting with the most important one. Finally, in stepwise regression a statistical program will automatically try to find the best predictors to be included in the regression model. Therefore, all predictors that do not meet the set criteria are excluded from the model.⁵⁷ However, this method poses the danger of over-fitting (too many unimportant predictors in the model) or under-fitting (not all relevant predictors in the model) the data and is best avoided if theoretical literature and past research are available to assist the manual selection of predictors (Field, 2009; Gorard, 2003; Landau & Everitt, 2003). As the theoretical literature was not strong and consistent enough to suggest a hierarchical order in which to enter the predictor variables, a forced entry regression was employed in this study.

3.4.4 Binary logistic regression

Besides the multiple regression model to explain the amount of meat consumption (gram/week) another regression model was employed for predicting whether respondents are meat consumers or not. As this represents a binary DV (0=no meat consumption, 1=meat consumption) linear models cannot be used (as the assumptions of normal distribution and constant variance are violated) and a logistic model is required (Landau & Everitt, 2003). Through logarithmic transformation it is possible to express a non-linear relationship in a linear way (Field, 2009). However, apart from these mathematical differences in the model calculation the general purpose of the regression remains the same. Based on the information from the various EVs, the regression will still try to identify the model that provides the best fit to the data and offers the strongest explanation for why respondents do or do not eat meat. Based on the predictors entered into the regression, the model will try to predict whether respondents belong to the

⁵⁷ In forward regression, the statistics program first tries to find the best predictor of all available ones (based on its regression coefficient and significance in predicting the DV). It will then try to find another significant predictor that adds to the model and so on. In backward regression, all predictors are first entered into the model and the statistics program will then take out all insignificant predictor variables that do not contribute to the regression model (Field, 2009; Landau & Everitt, 2003).

group of meat consumers or not. This is then compared with the actual outcome to judge the quality and predictive strength of the regression model (Field, 2009).

3.5 Replicability, reliability and validity

The three main criteria for the quality of every research design are replicability, reliability and validity (Bryman, 2001). The replicability of this particular research is ensured by the preceding detailed description of all the steps and procedures that led to the data collection and its analyses. This allows other researchers to understand and evaluate how the research was conducted and the results obtained. It further enables them to replicate the study by following the outlined methodological procedures (Schnell et al., 2008). Then, similar results would be expected from such a replicated study. However, as this study used a convenience sampling technique instead of a probability sample drawn from all members of the target population, it is possible that results may vary due to a different sample composition. The sampling technique employed here, largely relied on the author’s personal network and it is imaginable that this entails a certain bias. Thus, a replication of this study is strongly encouraged to confirm or refute these assumptions.

Reliability and validity largely depend on the adequacy and accuracy of the measures employed to operationalize the constructs. To test the reliability of constructed measurement scales, Cronbach’s alpha is a common measure (Schnell et al., 2008). It is a measure that indicates how well several items of a certain scale relate to each other and thus gives an indication of the internal consistency of the constructed scale. In the present study, various multi-item scales have been employed. The largest scales were constructed to measure environmental knowledge, PEB and the three types of attitudes. The following table (4) reports the number of items for the respective scales and their alpha values.

Table 4: Cronbach's alpha values of the five largest multi-item scales in the survey

Scale	Number of items	Cronbach’s alpha
Environmental knowledge	18	0.674
Perceived environmental benefit	8	0.777
Environmental attitudes	14	0.792
Animal welfare attitudes	6	0.791
Health attitudes	6	0.796

Generally, an alpha value above 0.7 is considered a reliable result (Field, 2009) and only the environmental knowledge scale falls short of this criterion. However, considering the variety of questions incorporated in the environmental knowledge scale, its lower internal consistency is not entirely unexpected. Furthermore, Verbeke & Vackier (2004) consider an alpha value above 0.6 still acceptable

for newly developed scales. Thus, while it shows that the environmental knowledge scale still requires further testing and refinement in future studies it can still be considered a sufficiently reliable measure for the purposes of the present study.

Further indication for the quality of the scales is that, except for PEB, none of the alpha values increased when excluding an item from the respective scales. On the PEB scale, Cronbach's alpha slightly increased (to 0.785) when deleting the item about "consuming less animal products". This indicates that respondents were more inconsistent in their responses regarding this particular item, compared to the overall scale. All of the remaining variables were measured with only one to three different items. For such small scales Cronbach's alpha values tend to inherently be lower due to its calculation formula and therefore give little indication about the reliability of the scales (Field, 2009).

For validity, a differentiation is made between internal and external validity. Internal validity concerns the decisions and assumptions made within the research design and process while external validity stands for the possibility to make inferences and generalizations from the obtained results. For the present study, internal validity was ensured by conducting an elaborative literature review and including various forms of feedback (e.g. focus groups, pretest) in the survey development process. Thereby it was made sure that the questionnaire items are appropriate for measuring the constructs they intend to measure and respondents are capable of providing accurate information. A limitation to the internal validity of the present study is the impossibility to identify causal relationships within the data. For this, a more complex design involving experimental settings or time-series data would be required (Gorard, 2003; Schnell et al., 2008).

Also the external validity is limited in the present study as no probability sample was used. This would be required for making valid inferences from the present results onto the larger target population. Here one has to acknowledge the possibility of a bias in the sample and needs to refrain from generalization of results (Bryman, 2001; Schnell et al., 2008).

4. Results

This chapter presents the survey results. It starts with providing some descriptive statistics about the data set in general before going into detail about the results of the various statistical analyses.

4.1 Descriptive statistics and results

To be coherent in the analysis and presentation of results, only the 238 respondents who completed the whole questionnaire are considered in the following. While for earlier questions like environmental knowledge or environmental attitudes, some more responses are available it would only lead to confusion to work with different sets of respondents within the analyses. It also seems unnecessary given the sufficiently high number of complete responses.

4.1.1 Socio-demographics

First of all, to give a better picture of the sample, some socio-demographic characteristics of the respondents will be described. The majority (60.92%) of respondents are female with 145 compared to 93 male respondents. As expected from a student sample, respondents turned out to be rather young, with a mean age of 24.66 years. Ages ranged from 19 to 41 with the latter representing one of a few older outliers. Most respondents (168; 70.59%) are between 21 and 26 years old. Looking at the nationalities of the 238 respondents, the three largest groups are Germans (80; 33.61%), Austrians and Finns (both 23; 9.66%). Many other European nationalities are also represented in the sample but with fewer respondents. Despite advertising it as a European survey, 9 respondents have a non-European nationality. To enable a meaningful comparison, nationalities were clustered into geographic regions. Its counts and percentages are visualized in figure 5.

Grouped nationalities of respondents

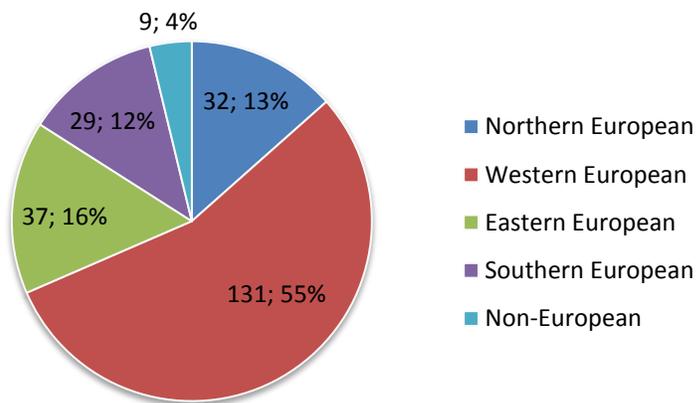


Figure 5: Grouped nationalities of respondents.

Table 5 shows what nationalities the five groups consist of.

Table 5: Nationalities composing the five geographic groups.

Northern European (32)	Western European (131)	Eastern European (37)	Southern Europe (29)	Non-European (9)
<ul style="list-style-type: none"> ▪ Danish (3) ▪ Finnish (23) ▪ Latvian (1) ▪ Lithuanian (4) ▪ Swedish (1) 	<ul style="list-style-type: none"> ▪ Austrian (23) ▪ Belgian (4) ▪ British (2) ▪ Dutch (6) ▪ French (10) ▪ German (80) ▪ Luxembourgian (2) ▪ Swiss (3) 	<ul style="list-style-type: none"> ▪ Bulgarian (3) ▪ Croatian (15) ▪ Czech (6) ▪ Hungarian (1) ▪ Polish (4) ▪ Romanian (4) ▪ Slovakian (4) 	<ul style="list-style-type: none"> ▪ Cypriot (1) ▪ Greek (14) ▪ Italian (8) ▪ Portuguese (3) ▪ Spanish (3) 	<ul style="list-style-type: none"> ▪ American (1) ▪ Brazilian (1) ▪ Canadian (1) ▪ Chilean (1) ▪ Chinese (1) ▪ Indian (1) ▪ Indonesian (1) ▪ Serbian (1) ▪ Turkish (1)

The results for the countries where respondents study are mostly in line with the nationalities (see figure 6 and table 6). Germany (26.05%), Finland (13.45%) and Austria (9.24%), are again amongst the largest groups. Only the Netherlands is a clear outlier with 26 respondents studying in the country while only six of the students in the sample are of Dutch nationality.

Grouped study countries of respondents

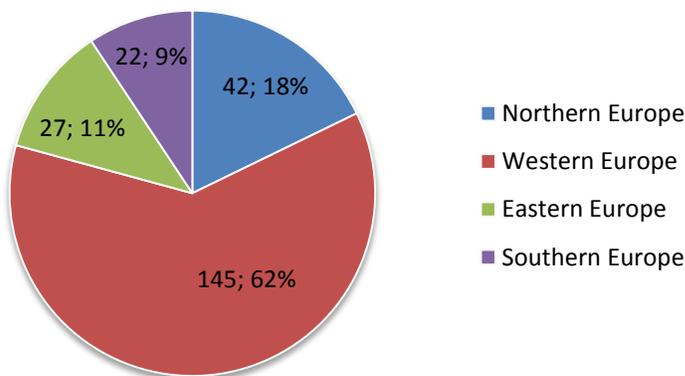


Figure 6: Study countries of respondents grouped into geographic regions.

Table 6: Study countries composing the geographic groups.

Northern Europe (42)	Western Europe (145)	Eastern Europe (27)	Southern Europe (22)
<ul style="list-style-type: none"> ▪ Denmark (3) ▪ Finland (32) ▪ Lithuania (3) ▪ Sweden (4) 	<ul style="list-style-type: none"> ▪ Austria (22) ▪ Belgium (6) ▪ France (12) ▪ Germany (62) ▪ Luxembourg (5) ▪ Netherlands (26) ▪ Switzerland ▪ United Kingdom (9) 	<ul style="list-style-type: none"> ▪ Bulgaria (1) ▪ Croatia (12) ▪ Czech Republic (5) ▪ Hungary (2) ▪ Poland (2) ▪ Romania (2) ▪ Slovakia (3) 	<ul style="list-style-type: none"> ▪ Cyprus (2) ▪ Greece (8) ▪ Italy (7) ▪ Portugal (4) ▪ Spain (1)

These strong differences in represented nationalities and study countries found in the sample can be attributed to the distribution process. As a German himself, the author has various connections (many friends on FB, university contacts) to other German students that proved valuable for the distribution and led to Germans and students studying in Germany being by far the largest groups in the sample. Also some successful contacts with Austrian, Finnish and Croatian universities have been made leading to higher responses from these countries as well. Finally, the fact that the author studies in the Netherlands has also clearly impacted on the sample, as the Netherlands is the third-largest study country among respondents.

Also noteworthy is, that a large number of respondents (115; 49%) studies social sciences (figure 7).

Academic disciplines of respondents

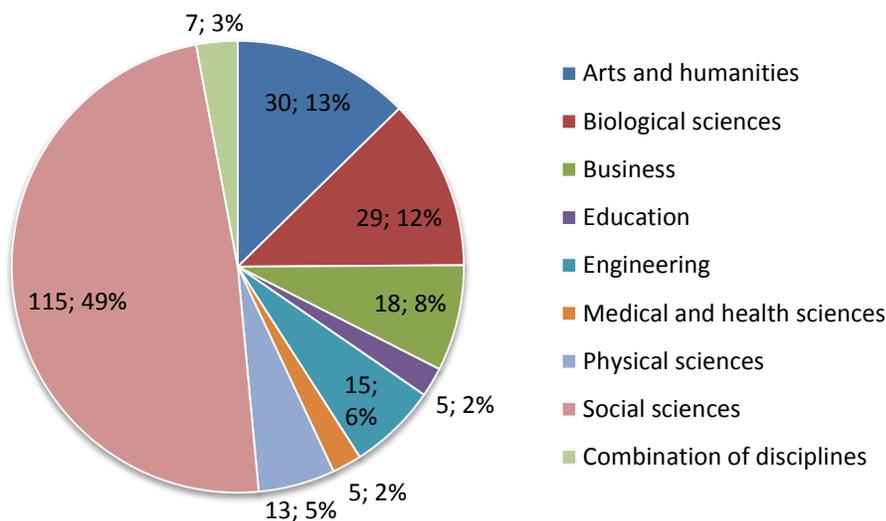


Figure 7: Academic disciplines of respondents.

Also students following an environmental program (65; 27.3%) are overrepresented in the sample. Possible explanations are that some associated student colleagues filled in the survey or that this group of students shows greater interest towards the subject and is thus more likely to fill in the questionnaire (self-selection). However, among the remaining 173 students without an environmental background, very few reported to be frequently or very frequently exposed to environmental issues in their studies (figure 8).

Exposure to environmental issues in studies

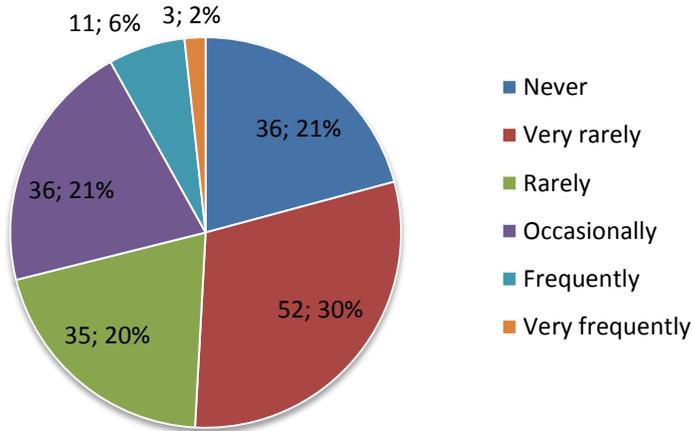


Figure 8: Answers to the question: "How often are environmental issues and problems a topic of your study courses?".

Nonetheless, the personal interest in the environmental impacts of food consumption seemed to be quite high in the sample with only a small minority showing little or no interest (figure 9).

Interest in food consumption and its environmental impact

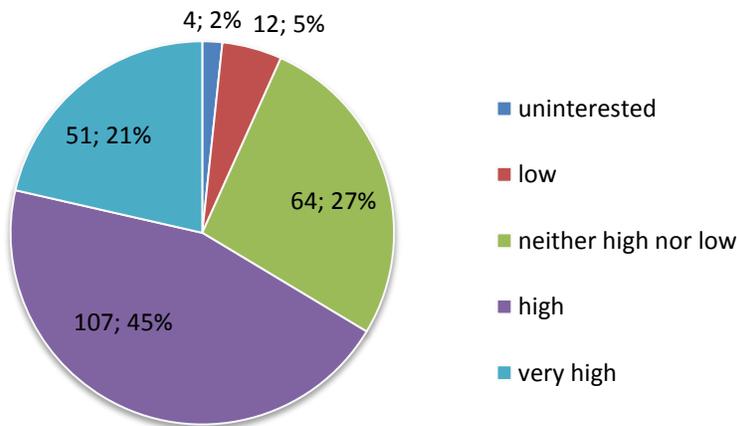


Figure 9: Answers to the question: "How would you describe your interest in food consumption and its environmental impacts?".

Looking at respondents food purchase and consumption behavior it becomes clear that the vast majority takes own or shared responsibility (figure 10). Only 14 (6%) respondents left it completely to others what they end up eating. So the prior concern that many students would not make their food consumption decisions themselves seems unfounded in this sample.

Respondents' food consumption behavior

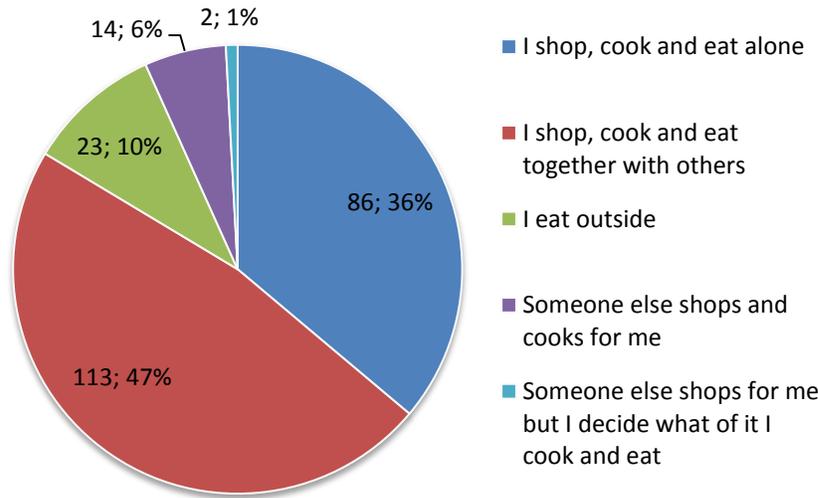


Figure 10: Respondents' food purchase, preparation and consumption behavior.

4.1.2 Explanatory variables

In this section an overview regarding the descriptive statistics of the EVs is provided.

Environmental knowledge

According to the calculation procedure described in 3.3.1, the following statistics (table 7) describe the environmental knowledge scores (system, action-related and combined) of the sample population.

Table 7: Descriptive statistics of environmental knowledge test scores.

	Mean	Median	Std. Deviation	Lowest score	Highest score
System knowledge (S)	5.33	5.35	1.67	1.05/9 (11.67%)	9/9 (100%)
Action-related knowledge (A)	5.02	5.01	1.59	1/9 (11.11%)	9/9 (100%)
Combined	10.35	10.16	2.82	2.8/18 (15.56%)	16.63/18 (90.56%)

Looking at the 18 questions individually shows that they varied considerably in their difficulty (figure 11). S1⁵⁸ and A6⁵⁹ were the questions most respondents were able to answer correctly (S1: 187, 78.57%; A6: 186, 78.15%). Contrary to that A13⁶⁰ and A8⁶¹ were the most difficult questions seemed with only 37 (15.55%) and 39 (16.39%) respondents getting it right. Also how often respondents opted for “I have no

⁵⁸ “What is the major source of global human land use?”

⁵⁹ “Which of the following represents the greatest threat to wild species populations?”

⁶⁰ “Ecologically speaking, which of the following types of water use are harmless?”

⁶¹ “What is the major driver for the deforestation of the Amazonian rainforest in South America?”

idea” differed from question to question (no one used it for question S14⁶² but 49 used it for S7⁶³) and gives some indication about their difficulty.

As logically expected, the answers with multiple possibly correct answers were a bit more difficult to get completely right. Except for question A18 about the potential environmental benefits of replacing old cars, none of the others from this group (A13-A18) was answered correctly by the majority. On the other hand, generally fewer people also ended up with 0 points for these questions as chances of selecting correct answers or not selecting incorrect answers were higher.

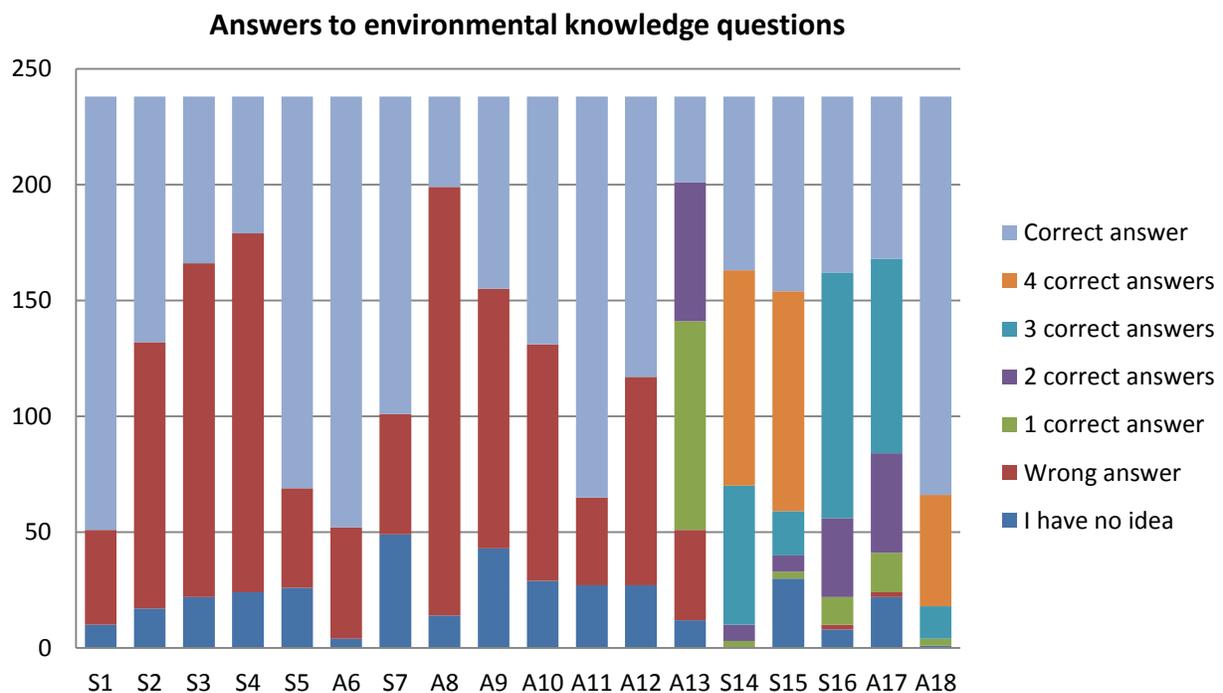


Figure 11: Overview of answers to the 18 environmental knowledge questions. (1, 2, 3 or 4 correct answers only apply to the six last knowledge questions with multiple selectable answers. “1 correct answer” therefore means that one out of 3, 4 or 5 options was correctly selected or not selected).

As a control for the validity of this knowledge test, the mean scores for environmental students and other students were compared (table 8). It clearly shows that environmental students had higher environmental knowledge test scores (on average).

⁶² “Climate experts warn that global warming will have severe consequences for the planet. Which of the following environmental problems are such expected consequences of global warming?”

⁶³ “The international community considers global warming a serious threat. Therefore the United Nations Framework Convention on Climate Change (UNFCCC) has set the goal to keep the global temperature rise compared to pre-industrial levels below...?”

Table 8: Group statistics for environmental knowledge scores of environmental and other students.

Do you study an environmental program?		N	Mean	Std. Deviation	Std. Error Mean
EK	No	173	9.7183	2.69110	.20460
	Yes	65	12.0305	2.44211	.30291
ESK	No	173	4.9673	1.58895	.12081
	Yes	65	6.3038	1.47517	.18297
EAK	No	173	4.7510	1.56592	.11905
	Yes	65	5.7267	1.42153	.17632

Running Levene’s tests and t-tests (table 9) confirmed the significance of the differences in variance and means (on a 95% confidence interval) for all types of knowledge (system, action-related and combined).

Table 9: T-test to compare mean environmental knowledge scores between environmental and other students.

	Levene’s test for equality of variances		T-test for equality of means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% Confidence Interval of the difference	
								Bottom	Top
EK	.349	.555	-6.053	236	.000	-2.31221	.38202	-3.06482	-1.55960
ESK	.248	.619	-5.893	236	.000	-1.33651	.22679	-1.78330	-.88971
EAK	.692	.406	-4.389	236	.000	-.97570	.22231	-1.41367	-.53773

Hence, with environmental students performing significantly better in the environmental knowledge test it can be considered an adequate measure for environmental knowledge.

Perceived environmental benefit (PEB)

Figure 12 shows how respondents rated the PEB of the various food-related activities.

"How important is it for the environment, that consumers..."

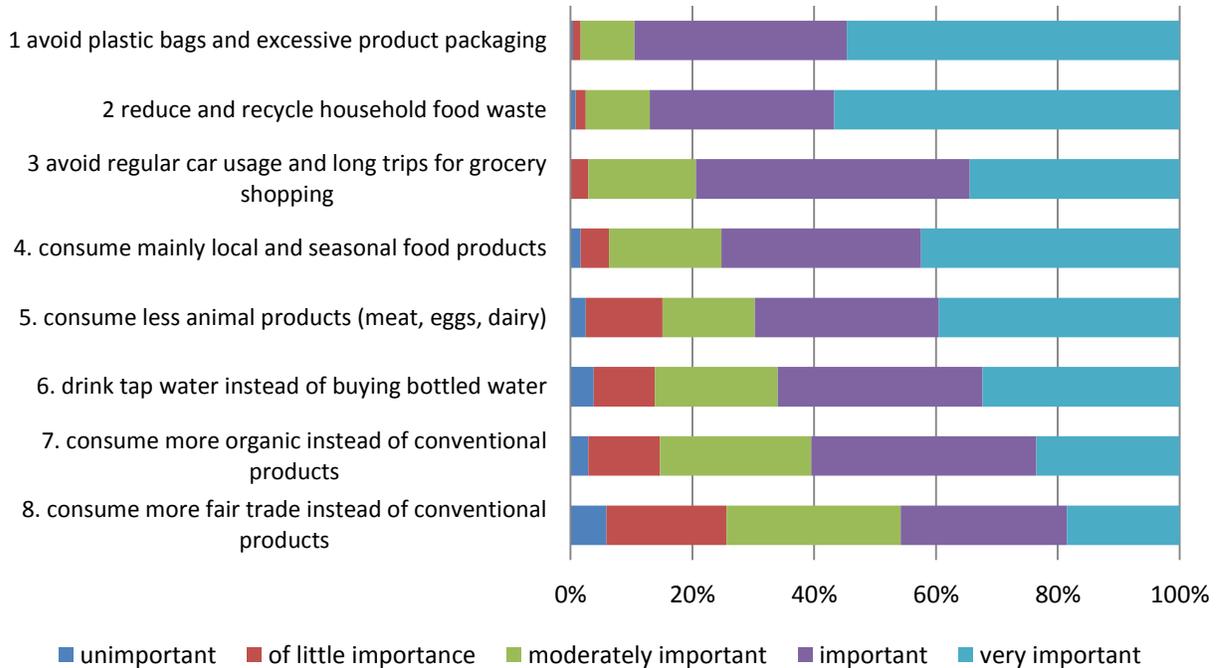


Figure 12: Answers about the PEB of various food-related environmental activities.

Looking at the mean scores for the various items reveals the following ranking (table 10).

Table 10: Ranking of food-related activities according to mean of PEB rating (also shows median and mode of the items).

#	How important is it for the environment that consumers ...	Mean	Median	Mode
1	avoid plastic bags and excessive product packaging.	4.42	5	5
2	reduce and recycle household food waste.	4.40	5	5
3	avoid regular car usage and long trips for grocery shopping.	4.11	4	4
4	consume mainly local and seasonal food products.	4.10	4	5
5	consume less animal products (meat, eggs, dairy).	3.92	4	5
	▪ Meat consumers (181)	3.65	4	4
	▪ Non-meat consumers (57)	4.75	5	5
6	drink tap water instead of buying bottled water.	3.81	4	4
7	consume more organic instead of conventional products.	3.66	4	4
8	consume more fair trade instead of conventional products.	3.33	3	3
All	Total (all items aggregated)	3.97	4	5

For this sample *avoid plastic bags and excessive product packaging* resulted as the most important food-related activity with the greatest PEB, closely followed by *reduce and recycle household food waste*. On

average these two items are considered *important* to *very important*. However, even the lowest ranked item *consume more fair trade instead of conventional products* is still considered *moderately important* to *important*. Thus, the variance in PEB for the various activities is fairly low and most respondents consider all eight activities as important (mean 3.97) and beneficial for the environment. The item about consuming less animal products (including meat) is ranked in the middle (fifth) and only slightly below the overall average. It can therefore also still be considered fairly important.

Interestingly, when dividing respondents according to whether they eat meat or not one finds rather different ratings for the two groups, especially for the item “consume less animal products (meat, eggs, dairy)”. A large majority non-meat consumers (45; 78.95%) find reducing animal product consumption to be very important, eleven (19.30%) consider it important and only one non-meat consumer thinks it is of little importance. Contrary to that, the perceived importance is much more balanced and generally lower for meat consumers. Thus, distinguishing between the two groups changes the ranking of food-related activities dramatically.

Table 11: Mean and ranking comparison of PEB items between meat consumers and non-meat consumers.

Rank	Meat consumers		Non-meat consumers	
	Item	Mean	Item	Mean
1	avoid plastic bags and excessive product packaging	4.40	consume less animal products (meat, eggs, dairy)	4.75
2	reduce and recycle household food waste	4.38	avoid plastic bags and excessive product packaging	4.49
3	avoid regular car usage and long trips for grocery shopping	4.02	reduce and recycle household food waste	4.47
4	consume mainly local and seasonal food products	3.99	consume mainly local and seasonal food products	4.42
5	drink tap water instead of buying bottled water	3.71	avoid regular car usage and long trips for grocery shopping	4.40
6	consume less animal products (meat, eggs, dairy)	3.65	drink tap water instead of buying bottled water	4.11
7	consume more organic instead of conventional products	3.58	consume more organic instead of conventional products	3.93
8	consume more fair trade instead of conventional products	3.25	consume more fair trade instead of conventional products	3.58
	Total mean	3.87	Total mean	4.27

Table 11 clearly shows that the item about animal products is the only one that really differs between the two groups. Additionally, non-meat consumers find all activities more important and beneficial for the environment than meat consumers.

Environmental, animal welfare and health attitudes

The following table (12) reports the descriptive results for the three attitude variables. The variables were calculated as the sum of the individual items divided by the total number of items for each type of attitudes. Thus, the variables had a value between 1 and 7 (with decimals).

Table 12: Descriptive statistics of attitude variables

	Mean	Median	Std. Deviation	Lowest score	Highest score
Environmental attitudes	5.43	5.5	0.75252	2.57	7
Animal welfare attitudes	5.57	5.75	1.03267	2	7
Health attitudes	4.62	4.67	1.06159	2	6.83

In line with previous research this study also revealed rather high pro-environmental attitudes among respondents. Animal welfare attitudes showed an even larger mean. For both attitudes one can say that on average respondents *somewhat agree* (5) to *agree* (6) with all of the statements.⁶⁴ For health attitudes, the mean was considerably less positive leaning only slightly more towards *somewhat agree* (5) than *undecided* (4).

Food choice motives (FCMs)

Calculating the means of all FCM items reveals the following ranking (table 13).

Table 13: Descriptive statistics of FCMs and ranking according to their mean scores.

Rank	FCMs	Mean	Median	Mode	Min.	Max.
1	tastes good	6.28	6	6	3	7
2	keeps me healthy	5.97	6	6	2	7
3	is largely free from food safety risks	5.81	6	7	1	7
4	is good value for money	5.29	5	6	1	7
5	has been produced in a way that respects animals' rights	5.24	6	6	1	7
6	is not expensive	5.11	5	6	1	7
7	has been produced in an environmentally friendly way	5.11	5	5	1	7
8	helps me control my weight	4.24	5	5	1	7
9	is high in protein	3.99	4	4	1	7
10	is in line with what I perceive to be socially acceptable	3.51	4	4	1	7
11	is similar to what many of my friends and family eat	2.53	2	2	1	7

⁶⁴ For precision sake, reversed items were also reversely coded meaning that a 5 or 6 for a reversed item actually stands for *somewhat disagree* or *disagree*.

A few things are worth mentioning from this table. First of all, taste, health and food safety emerged clearly as the most important FCMs. The two ecological FCMs are found in a middle position with animal welfare being more important than environmental concerns. The social FCMs appear as least important for respondents' food choices. Also high protein content does not appear as a particularly important FCM. The most common answer here was 'undecided' (mode=4) showing that many respondents lack a clear opinion on the importance of this FCM. Furthermore, except for the two first FCMs all others cover the full range of answer options from 1 to 7. This indicates that the importance attached to the various FCMs differs greatly between individual respondents.

Remaining variables: PBC and PCE, habit, social norm and food involvement

Of the remaining five EVs used for later analyses, *PCE* and *habit* were measured with two items and *PBC*, *social norms* and *food involvement* with one item each. The following table (14) gives an overview about the descriptive statistics of these variables.

Table 14: Descriptive statistics of PBC, PCE, Habit, social norm and food involvement.

Variables	Mean	Median	Mode	Minimum	Maximum
PBC	4.39	5	6	1	7
Social norms	2.73	2	2	1	7
Food involvement	5.98	6	6	1	7
	Mean	Median	Std. Deviation	Minimum	Maximum
PCE	5.17	5.5	1.31090	1	7
Habit	3.65	3.5	1.05133	1.5	6

In line with the results for the social FCMs also the *social norm* item had a rather low mean. Similarly, *food involvement*, conceptualized here as eating enjoyment, had a really high mean (comparable with the FCM taste). For later analyses these two (food involvement and FCM taste) were thus aggregated into one variable. For *PBC* and *PCE* the mean scores were also positive (more agreement). The rather low mean for the habit variable resulted from rather detrimental scores for the two composing items. The reversed item (stating that variation in diet is desirable) received large agreement, then coded into lower scores. Thus, the *habit* mean ranges close to the middle, indicating that habit does not exert strong influence on respondents' food consumption behavior.

4.1.3 Dependent variable: meat consumption

This section will present the results regarding respondents' meat consumption habits. The first question to this matter was whether students consume meat products or not. 181 of the 238 respondents (76.05%) do eat meat, while 57 (23.95%) do not. Compared to speculative numbers from the general

population the amount of non-meat consumers in this sample certainly seems quite high. Self-selection bias is a first speculative guess as non-meat consumers may have a greater interest in environmental issues and are thus more likely to fill in a survey about environmental awareness. However, one can also not rule out the possibility that students in fact represent a demographic group that has a higher percentage of non-meat consumers compared to the general population. For example, past research about vegetarians or people following similar meat-free diets has indicated that these consumers are often fairly young and have a high level of education (Fox & Ward, 2008; Hoek et al., 2004).

Non-meat consumers (pescetarians, vegetarians, vegans and flexitarians)

Asked to describe their diet and primary motivation for it, the 57 non-meat consumers gave the following answers (figure 13).

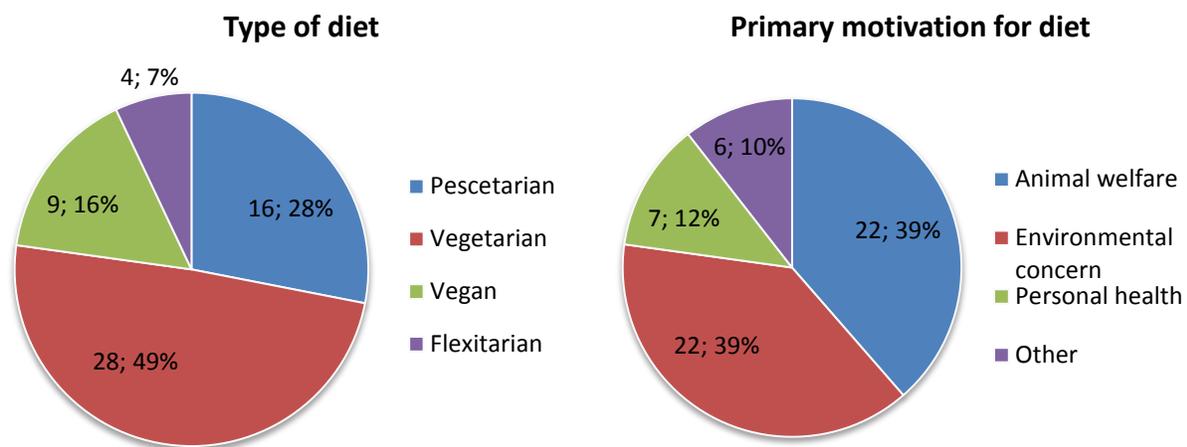


Figure 13: Type of diet and primary motivation of the 57 non-meat consumers.

Noteworthy are the relatively large number of pescetarians in the sample and the few flexitarians that ended up in the group of non-meat consumers. Strictly speaking, they should be considered as meat consumers with a very low level of meat consumption (e.g. consuming meat only a few times a year).

The two main primary motivations for following a meat-free diet are animal welfare and environmental concern, while personal health was less often the primary reason for the diet change. These findings differ from previous studies in which environmental concern was less and health more important as a *primary* motivator to change the diet (Fox & Ward, 2008; Ruby, 2012). Again one can only speculate whether this is a bias in the present sample (e.g. more students with environmental interest filled in the survey) or indeed an indication for a change in non-meat consumers’ motivations. Another possible explanation could be that health is an issue that is less important to young populations like students (El Ansari et al., 2012; Larsson et al., 2002).

The often-made observation that mostly women adopt plant-based diets was also supported in this sample (table 15). Taking a more detailed look at their respective diets also reveals some gender differences most notably that figures differ considerably for pescetarian and vegan diets.

Table 15: Diet types amongst female and male non-meat consumers.

	Pescetarian	Vegetarian	Vegan	Flexitarian	Total
Female	14	18	8	1	41
Male	2	10	1	3	16

Finally, non-meat consumers were also asked how long ago they stopped eating meat. Coding the dates into years showed that the most recent dietary changes occurred in the last six months, while some other students already stopped eating meat in their early childhood (maximum 19 years ago). On average, the 56 non-meat consumers for whom the data is available (one did not report it) stopped eating meat 4.8 years ago. Deducting the vegetarian years from their current age reveals the age of consumers when they made the decision to change their diet. The earliest dietary change among respondents occurred at the age of 4 and the oldest at an age of 29. Most students stopped eating meat around the age of 20 or 21 (seven respondents each), leading to an average age of 19.7 years.

Meat consumers

The 181 meat consumers showed the following frequencies of consumption (figures 14 and 15).

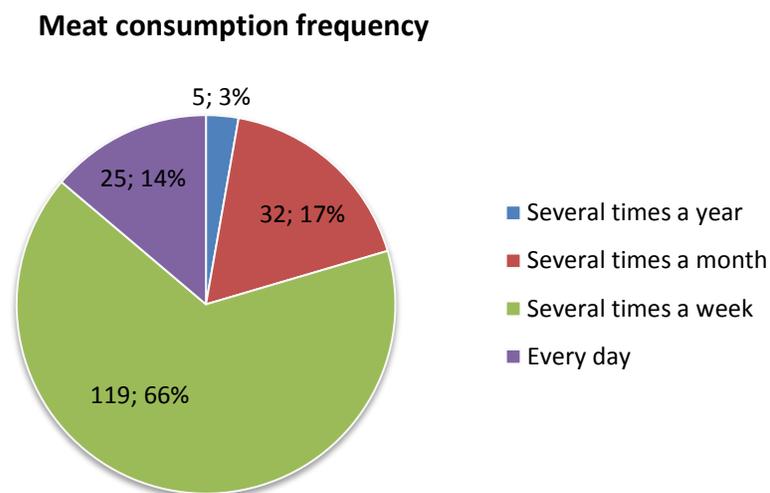


Figure 14: Respondents' frequency of meat consumption.

Generally, the large majority of consumers eat meat on a weekly basis (figure 14) with two to five times a week representing the four most frequent answers (figure 15).

Detailed meat consumption frequency

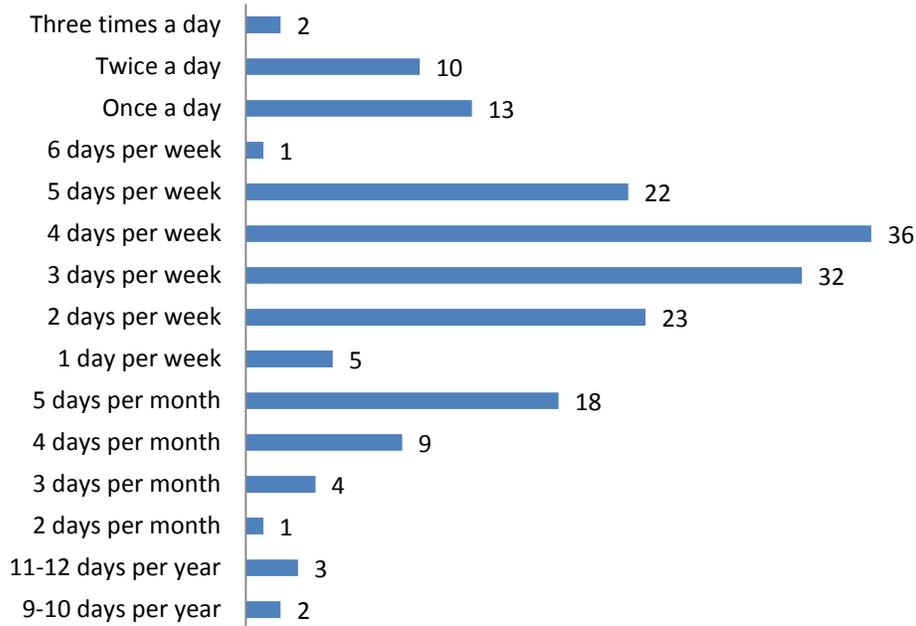


Figure 15: Detailed meat consumption frequency of respondents.

Looking at the numerical variables of meat consumption (corrected for outliers) reveals the following descriptive statistics.

	Mean	Median	Std. Deviation	Minimum	Maximum
Meat consumption frequency (times/year) ⁶⁵	205.17	156	184.31798	10	1095
Meat consumption amount (gram/week)	465.17	380	355.87291	10	2000
Meat intake (gram/meal)	137.80	130	64.44491	50	300

Here, especially the meat consumption amount statistics are interesting. The variable shows considerable range (10-2000) and variance (Std. deviation) with a mean consumption of 465.17 gram per week. Both results, for frequency and amount of meat consumption, are lower than expected from the reported FAO supply data (table 33, Appendix 9). However, for the sample itself, the data seems fairly consistent as both, frequency and amount of consumption are low, leading to a fairly realistic average meat intake per meal (137.80 gram). Thus, there is no reason to assume serious underreporting in the survey.

⁶⁵ Note, that this is essentially the same data as above, only expressed in numerical values and on a yearly basis. The median of 156 for example is equivalent to 3 times a week (3*52 weeks). The minimum 10 stands for the answer 9-10 days a year and the maximum 1095 represents three times a day (3*365 days).

Respondents own perception of their meat consumption levels showed a rather normal distribution around the middle (neither high nor low). The frequency of sustainable meat purchases (e.g. organic, grass-fed or pasture-raised) appeared more balanced with fairly comparable numbers for all frequency options. Only the two extreme options (always and never) received fewer responses (figure 16).

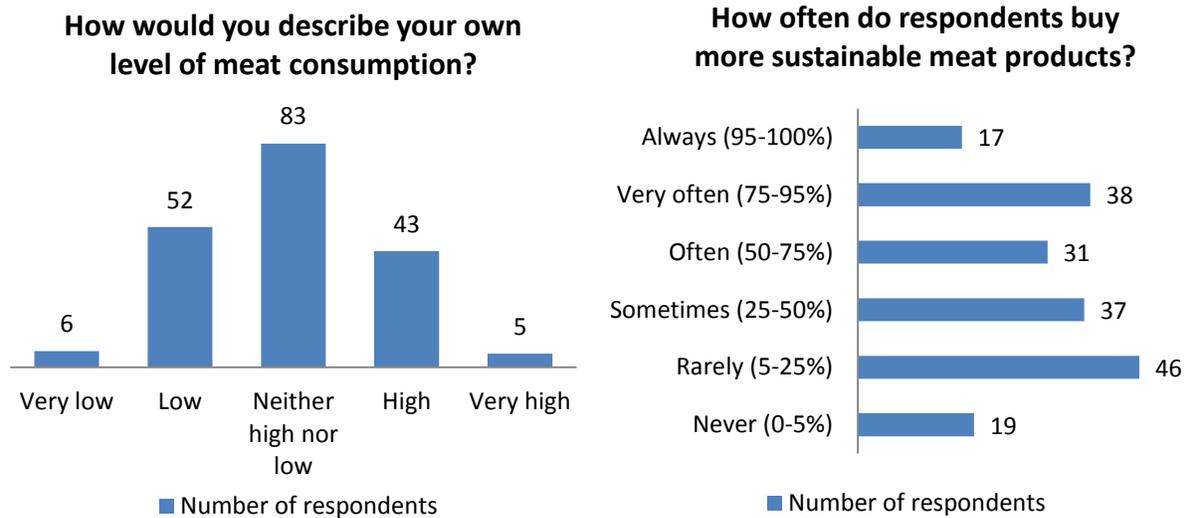


Figure 16: Frequency distributions of respondents' perceived level of meat consumption and sustainable meat purchases.

Regarding respondents' preferences for the different kinds of meat, poultry is clearly students' first choice in the sample, followed by beef and pork with comparable popularity. Sheep and goat or other kinds of meat are mostly considered as fourth or fifth choice meats by respondents (figure 17).

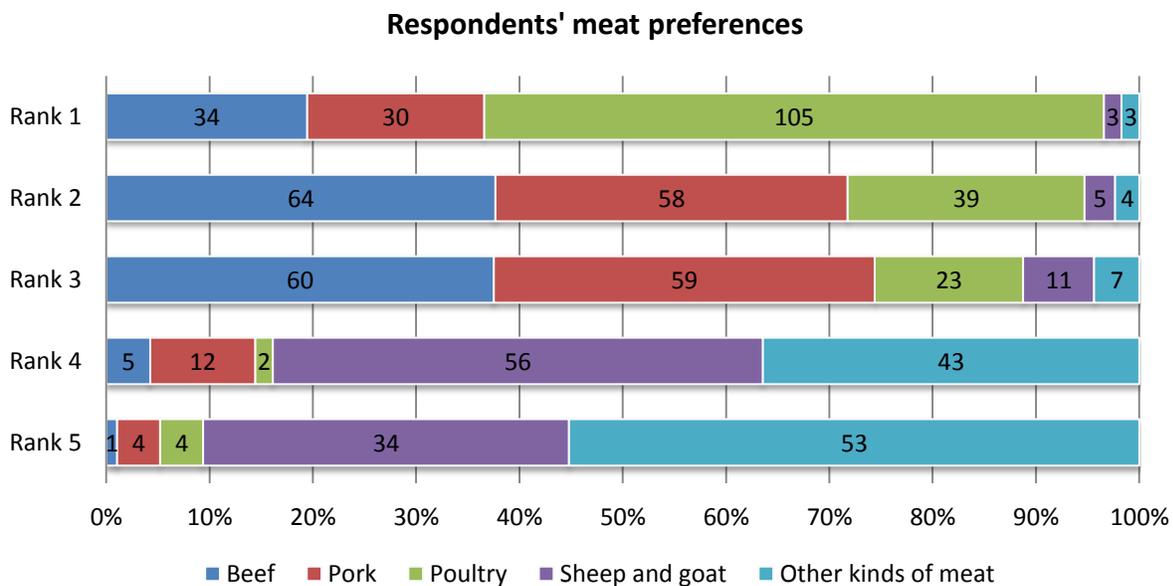


Figure 17: Respondents' ranking of meat preferences. The numbers indicate the number of respondents selecting this option for each rank. The total number of responses decreases with further ranks, as this question was not mandatory and some respondents only indicated the first few preferences.

Finally, respondents were also asked about past and future changes of meat consumption levels and their price sensitivity. The majority of respondents appear stable in their meat consumption while many respondents also reported past decreases or intentions to decrease meat consumption in the future (figure 18).

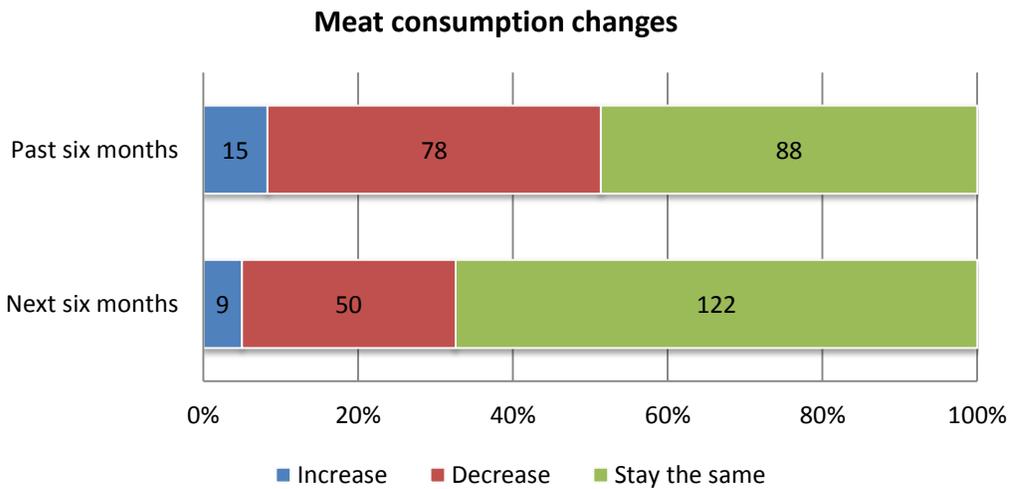


Figure 18: Responses to the question whether respondents' meat consumption did change in the past six months or will change in the next six months.

Also the findings for meat price sensitivity give reason for some optimism (based on the normative assumption that decreasing meat consumption is desirable). Few respondents would increase their meat consumption with lower prices, while many would decrease it if meat would become more expensive (figure 29).

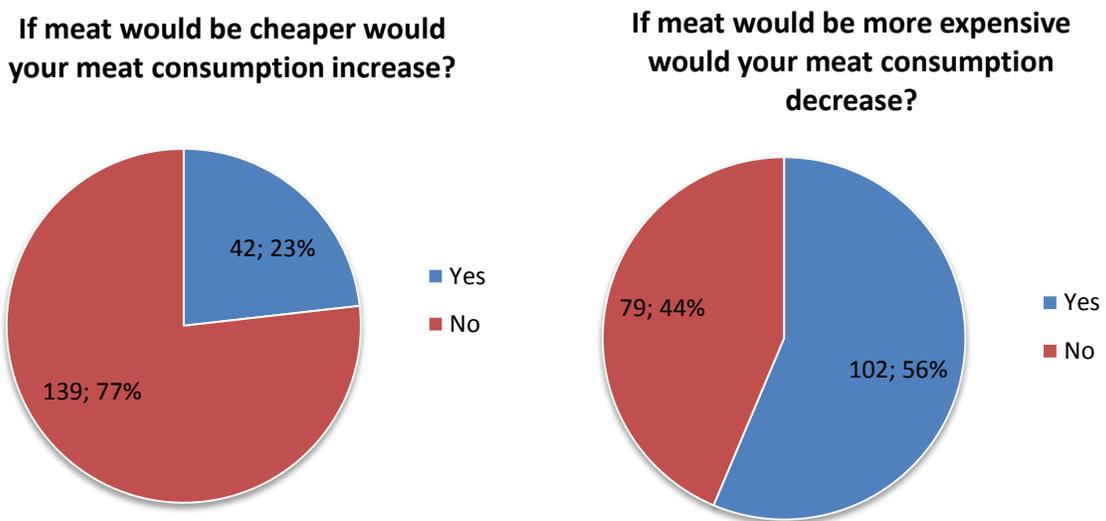


Figure 19: Meat price sensitivity of respondents.

The first chart gives an indication that price is not really a strong barrier to students' meat consumption. The second one suggests that policy solutions such as eco taxes on meat could at least be partly effective in decreasing overall meat consumption levels.

4.1.4 Group comparisons

After the description of the data in general, this section will compare certain groups within the data on the basis of a few key variables. Most importantly, how do meat eaters and non-meat eaters differ with regard to several of the EVs? Are there significant differences regarding their knowledge, attitudes, or FCMs? What about socio-demographic variables like environmental study background or gender? Do groups formed according to these factors differ significantly on certain variables?

The following table (16) compares means between meat eaters and non-meat eaters for all EVs except the various FCMs.

Table 16: Comparison of means between meat consumers and non-meat consumers including t-test statistics (*, ** and * indicate significance of variance between the two groups on 95, 99 and 99.9% confidence intervals).**

Explanatory variables	Meat consumers	Non-meat consumers	T-test
Environmental system knowledge	5.19	5.77	.020*
Environmental action-related knowledge	4.85	5.56	.003**
Environmental attitude	5.32	5.78	.000***
Animal welfare attitude	5.38	6.14	.000***
Health attitude	4.49	5.03	.001**
Perceived environmental benefit (PEB)	3.87	4.27	.000***
Perceived consumer effectiveness	4.97	5.80	.000***
Perceived behavioral control	4.21	4.95	.002**
Habit	3.71	3.46	.112
Social norm	2.73	2.70	.861
Food involvement	5.91	6.21	.088

Looking at the differences between means and the t-test statistics, significant differences between the two groups can be observed for almost all of the EVs. Most notably, on average non-meat consumers have higher scores in environmental knowledge, all three attitudes and all three types of consumer perceptions. Only with regard to habit, social norm and food involvement, no significant difference in variance and means was found.

With regard to FCMs (table 17), differences between meat consumers and non-meat consumers were considerably smaller (e.g. only marginal differences in means for most FCMs). Interestingly, only the two

ecological FCMs showed highly significant variance. For both motives, non-meat consumers showed much higher agreement with their importance for respondents' food choices.

Table 17: Mean scores and t-test values of FCMs for meat and non-meat consumers (*, ** and * indicate significance of variance between the two groups on 95, 99 and 99.9% confidence intervals).**

Food choice motives	Meat consumers	Non-meat consumers	T-test
...tastes good	6.23	6.44	.053
...is not expensive	5.12	5.09	.893
...keeps me healthy	5.90	6.19	.050*
...is similar to what many of my friends and family eat	2.62	2.26	.105
...is good value for money	5.27	5.37	.609
...is largely free from food safety risks	5.73	6.04	.157
...is high in protein	3.97	4.05	.723
...is in line with what I perceive to be socially acceptable	3.39	3.91	.157
...helps me control my weight	4.20	4.39	.475
...has been produced in an environmentally friendly way	4.89	5.79	.000***
...has been produced in a way that respects animals' rights	4.89	6.33	.000***

Repeating the statistical comparison for the groups of environmental students and non-environmental students produces quite similar results (see tables 39 and 40 in Appendix 13). Comparable to non-meat consumers, environmental students had higher mean scores for environmental knowledge, environmental and animal welfare attitudes and two types of consumer perceptions (PEB and PCE). Environmental students also attached significantly greater importance to the two ecological FCMs than other students.

Given these similarities in findings, a cross tabulation was used to identify potential overlap between the groups of non-meat consumers and environmental students (e.g. are all environmental students non-meat consumers?). The cross tabulation (table 18) does indeed show a slightly higher than expected number of non-meat consumers among the environmental students but the difference is not large enough to expect interdependence.⁶⁶ Running a Pearson-Chi-Square test confirms this intuition with $X^2 = 3,430$ and $p = .064$. Statistical convention is that a p value below 0.05 is required for the differences in the group compositions to be considered significant (Field, 2009).

⁶⁶ While the percentage of non-meat consumers is slightly higher among environmental students (32.31% compared to 20.81% for other students) the clear majority of environmental students (67.69%) still belong to the group of meat consumers. Thus, there is only a difference of about 10% that does not warrant for a significant association, given the relatively small sample size.

Table 18: Cross tabulation of responses to questions about meat consumption and studying an environmental program. Counts are in bold and expected counts in parentheses.

Cross tabulation		Do you study an environmental program?				Total sum
		No		Yes		
Do you eat meat?	No	36	63.16%	21	36.84%	57
		20.81%	(41.4)	32.31%	(15.6)	
	Yes	137	75.69%	44	24.31%	181
		79.19%	(131.6)	67.69%	(49.4)	
Total sum		173		65		238

Moreover, to explore the often reported influence of gender on certain characteristics another comparison between male and female respondents regarding the EVs and FCMs was made (see tables 41 and 42 in Appendix 13). In line with previous research, also this sample found significantly more positive attitudes towards health, animal welfare and the environment among female respondents. Similarly, their perceptions of consumer effectiveness and PEB were also higher than among male respondents. However, regarding the PEB of consuming less animal products, no significant gender differences were found in the present sample.

Likewise, for FCMs the results also show considerable consistency. Significant differences in answers between male and female respondents were found for health-related FCMs (“...keeps me healthy”, “...is largely free from food safety risks” and “...helps me control my weight”) and again the two ecological FCMs. As expected from the more positive attitudes towards these issues, female respondents also found the respective FCMs to be of higher importance.⁶⁷

Finally, the average meat consumption of groups ordered by *gender, study program, study country and nationality* was compared (table 19).

Table 19: Means of meat consumption frequency, amount and intake for various socio-demographic groups.

	Group	N	Mean frequency	Mean amount	Mean intake
Gender	Male	77	236.62	576.43	146.94
	Female	104	181.88	382.79	131.03
Study background	Environmental students	44	181	436.82	146.17
	Other students	137	212.93	474.27	135.12
Study	Northern Europe	31	334.26	704.19	127.00
	Western Europe	107	169.32	409.11	136.69

⁶⁷ These results confirm the findings from previous studies on FCMs (e.g. Renner et al., 2012; Steptoe et al., 1995).

country	Eastern Europe	22	221.05	460.91	147.07
	Southern Europe	19	166.68	381.58	154.09
Nationality	Northern European	22	348.32	690	122.79
	Western European	93	178.44	411.67	135.47
	Eastern European	32	210.59	505.63	150.28
	Southern European	26	143.92	438.46	164.43
	Non-European	8	299.5	393.75	70.03

The mean meat consumption frequency, amount and intake show considerable variation between the various groups. For instance, males, Northern Europeans and people studying in Northern Europe⁶⁸ all show fairly high meat consumption levels compared to the other groups. In terms of frequency and amounts, females, and the regions Western Europe and Southern Europe (both in terms of study country and nationality) are on the lower end of meat consumption levels. Non-European students seem particularly low in their meat intake (per meal), although one should note the rather small N for this particular group.

4.2 Analytical statistics

After the sample has been described in its most important variables, this chapter will explore the relations between the independent and DVs. As outlined in the methodology (3.4) this analysis will rely on correlations and regressions (multiple linear and binary logistic).

4.2.1 Correlations

Table 20 reports the correlations between the main EVs and the three DVs (the dummy variable of meat consumption, frequency and amount in gram) in a matrix. Variables not reported in the table are *food involvement* and *social norms*. Both did not correlate significantly with any of the three meat consumption variables and also hardly correlated with any of the other variables. The categorical control variables of nationality and study country were also not considered here.

In order to improve lucidity the various FCMs were also not incorporated in the first table. Their correlations with the three meat consumption variables (and each other) are reported in a second correlation matrix (table 21). The reported coefficients are Pearson's product-moment correlation coefficients, a standardized measure with a value range between -1 (perfectly negative correlation) and +1 (perfectly positive correlation).

⁶⁸ The two latter groups have some overlap in their respondent composition as many but not all students studying in Northern Europe are also of Northern European nationality.

Table 20: Correlation matrix for the three dependent and several EVs (correlation is significant at the 0.01 level; *correlation is significant at the 0.05 level).**

Variables	MC	MF	MA	EA	AWA	HA	ESK	EAK	PEB	PCE	PBC	HAB
Meat consumption (MC)	1											
Meat consumption frequency (MF)	.479**	1										
Meat consumption amount (MA)	.540**	.803**	1									
Environmental attitudes (EA)	-.263**	-.299**	-.361**	1								
Animal welfare attitudes (AWA)	-.315**	-.300**	-.367**	.612**	1							
Health attitudes (HA)	-.218**	-.300**	-.346**	.308**	.312**	1						
Environmental system knowledge (ESK)	-.150*	-.154*	-.116	.208**	.210**	.005	1					
Environmental action knowledge (EAK)	-.191**	-.134	-.164*	.312**	.226**	.018	.500**	1				
Perceived environmental benefit (PEB)	-.276**	-.294**	-.265**	.580**	.511**	.313**	.202**	.229**	1			
Perceived consumer effectiveness (PCE)	-.270**	-.342**	-.359**	.577**	.505**	.368**	.340**	.355**	.570**	1		
Perceived behavioral control (PBC)	-.201**	-.257**	-.303**	.213**	.205**	.355**	.083	.143*	.256**	.305**	1	
Habit (HAB)	.103	.185**	.208**	-.078	-.120	.134*	-.011	-.045	-.119	-.202**	-.231**	1
Gender (GEN)	.127	.175**	.269**	-.320**	-.239**	-.250**	.084	.098	-.270**	-.165*	-.088	.026

Table 21: Correlation matrix for the three DVs and eleven FCMs (correlation is significant at the 0.01 level; *correlation is significant at the 0.05 level).**

Variables	MC	MF	MA	TAS	EXP	HEA	SIM	VAL	SAF	PRO	SOC	WEI	ENV
Tastes good (TAS)	-.126	-.013	-.003	1									
Is not expensive (EXP)	.009	.102	.100	-.031	1								
Keeps me healthy (HEA)	-.127*	-.202**	-.219**	.208**	-.001	1							
Is similar to what many of my friends and family eat (SIM)	.105	.125	.125	.112	-.021	-.066	1						
Is good value for money (VAL)	-.033	.027	.006	.040	.393**	.055	.146*	1					
Is largely free from food safety risks (SAF)	-.092	-.164**	-.154*	.166*	-.059	.341**	-.053	.066	1				
Is high in protein (PRO)	-.023	.121	.132*	.128*	.108	.185**	.209**	.087	.168**	1			
Is in line with what I perceive to be socially acceptable (SOC)	-.126	-.131*	-.153*	.099	-.047	-.023	.298**	.161*	.055	.189**	1		
Helps me control my weight (WEI)	-.047	-.047	-.107	.129*	.090	.319**	.072	.088	.212**	.406**	.061	1	
Has been produced in an environmentally friendly way (ENV)	-.284**	-.386**	-.368**	.117	-.191**	.430**	-.152*	-.023	.399**	.080	.084	.183**	1
Has been produced in a way that respects animals' rights (ANR)	-.419**	-.363**	-.430**	.184**	-.150*	.337**	-.107	-.024	.340**	.061	.166*	.164*	.661**

Overall the first matrix (table 20) reports many (highly) significant correlations between variables. In fact, only few variables do not correlate significantly with each other. Looking at the meat consumption variables all EVs do correlate significantly with the two scale measures of meat consumption and they do so in the theoretically expected direction. All types of attitudes, environmental knowledge and all types of consumer perceptions are negatively correlated with the meat consumption variables. Thus, deviations above the means on any of these scales correlate with deviations below the means on the meat consumption variables. Put more simply, there is a correlation between higher environmental attitudes (or any of the other above-mentioned variables) and lower frequencies and amounts of meat consumption in the sample.

For habit and gender a positive correlation coefficient is reported. For habit, no prior expectation was made, but for gender this is as expected from previous research results. As gender was coded as a binary variable (0=female, and 1=male respondents), it can be interpreted that being male correlates with showing higher frequencies and amounts of meat consumption. Hence, the correlations support the results from the group comparison between male and female respondents from before.

However, somewhat problematic is the large number of significant correlations between many of the EVs. Often the correlation is positive and at times with a higher correlation coefficient than between the respective EVs and DVs. PCE, for example, correlates more strongly with most of the EVs than it does with the DVs. Also EA, AWA and PEB, or the two environmental knowledge types show quite strong correlations. A reasonable explanation would be that many of these variables are quite similar and are possible based on deeper underlying variables like values. For instance, one could imagine that certain values lead a person to have positive attitudes towards the environment and animal welfare and at the same time show stronger perceptions regarding the importance of his/her personal consumption behavior. Despite this theoretical explanation such *multicollinearity* still poses dangers for subsequent analyses. When EVs are highly correlated it becomes more difficult to identify the individual contribution of each factor to explaining and predicting the DV in more complex analyses such as multiple regressions. EVs are assumed to be independent and very high correlations tend to violate this assumption to some extent (Landau & Everitt, 2003; Tu et al., 2005).

The second matrix for the FCMs (table 21) reports fewer significant correlations. The health FCM and the two ecological FCMs are the three only ones that correlate significantly with all three dependent meat consumption variables. Again, as expected, the correlation coefficient is negative and particularly strong for the two ecological FCMs (stronger than for all other variables, including the ones in table 20). Furthermore, the FCMs about food safety risks and social norms ('socially acceptable') also correlate

negatively with the two numerical meat consumption variables. Finally, high protein correlates positively with meat consumption amounts. Thus, respondents attaching more importance to this particular FCM seem to consume more grams per week than the average consumer in the sample.

The largest correlation coefficients between EVs and DVs in table 20 are reported for animal welfare attitudes (-.367) and environmental attitudes (-.361) on meat consumption amounts. With values above $\pm .3$ this correlations can be considered of medium sized effect (Field, 2009). Also for the FCMs in table 21 the highest correlations coefficients are found for the animal welfare (-.386 with meat frequency) and environmental (-.430 with meat amounts) FCMs.

R^2 , the square of the standardized correlation coefficient, offers another way of interpretation by indicating the amount of explained variance. Accordingly, the environmental FCM can explain 18.49% ($R^2 = (-.430)^2 = 0.1849$) of the variance observed in meat consumption amounts.

4.2.2 Regression

After finding out that almost all the EVs correlate significantly with the DV(s) it is time to take a further step beyond the collected data by employing regression analyses. First, the results of the multiple linear regression models will be reported, followed by those from the binary logistic regression.

Multiple linear regression

Three multiple regression models have been run to explore how well the collected information about respondents' EVs can predict their meat consumption behavior. As a main objective of this research was to compare the predictive strength of a large number of variables, the first regression model simply uses all available EVs for the regression on meat consumption amounts (gram/week). This model revealed that a large number of predictor variables turned out insignificant and hardly contributed to the prediction of meat consumption behavior. Thus, a second model, excluding these unsatisfactory predictors was run. Further refinement led to a third model that only included the strongest and most significant predictors. The models, their variables and their regression coefficients (unstandardized and standardized), as well as their significance levels, are reported in table 22. In this table the predictors are already sorted according to their predictive strength from model 3 to model 1.

Table 22: Results of the three regression models for explaining respondents' weekly amount of meat consumption (b=regression coefficients, β =standardized regression coefficients, *= $p<0.05$, **= $p<0.01$, *= $p<0.001$). Predictors are sorted by β -values from Model 3 to 1, starting with the predictor with the highest β in Model 3.**

#	Predictor variables	Model 1		Model 2		Model 3	
		b	β	b	β	b	β
	Constant	1076.478		1088.063		850.730	
1	Ecological FCMs	-72.772	-.255**	-70.538	-.247**	-101.834	-.357***
2	Study country: Northern Europe	160.697	.167	156.967	.163**	206.247	.214***
3	Perceived behavioral control	-30.993	-.131*	-34.440	-.146*	-44.730	-.189**
4	Gender	107.222	.142*	101.194	.134*	136.018	.180**
5	Protein FCM	44.207	.179**	40.036	.162**	33.978	.137*
6	Study country: Southern Europe	-244.797	-.193*	-217.412	-.172*		
7	Environmental attitudes	-62.852	-.128	-76.214	-.155*		
8	PEB less animal products	-36.427	-.111	-45.498	-.139*		
9	Perceived environmental benefit	81.756	.135	81.892	.135		
10	Nationality: Southern European	156.607	.140	149.516	.133		
11	Health attitudes	-50.174	-.144	-45.785	-.131*		
12	Social norm FCMs	-25.889	-.092	-26.921	-.095		
13	Habit	35.722	.102	31.754	.091		
14	Nationality: Eastern European	93.852	.092				
15	Study country: Eastern Europe	-86.555	-.075				
16	Animal welfare attitudes	-24.989	-.070				
17	Environmental action knowledge	-15.867	-.068				
18	Price FCMs	-22.481	-.067				
19	Eating enjoyment and FCM taste	21.057	0.47				
20	Perceived consumer effectiveness	12.859	.046				
21	Nationality: Outside of Europe	-58.664	-.031				
22	Social norm	7.418	.025				
23	Nationality: Northern European	26.069	.024				
24	Environmental system knowledge	-1.308	-.006				
25	Health FCMs	1.188	.003				

According to these three regression models, ecological FCMs, studying in Northern Europe, PBC, gender and the protein FCM are the strongest predictors for respondents' amount of meat consumption. Also studying in Southern Europe, environmental attitudes, PEB of consuming less animal products and health attitudes were significant in model 2. For respondents studying in Northern Europe, being male, and rating high protein content as a more important FCM, the regression model predicts higher meat consumption levels (positive coefficients). Respondents who attach greater importance to ecological FCMs, have higher PBC, higher environmental attitudes, study in Southern Europe or consider consuming less animal products to be more beneficial for the environment are predicted to consume less meat by the models (negative coefficients). Interpreting the standardized regression coefficient for ecological

FCMs one can say that a one standard deviation change in ecological FCM is associated with a -.357 standard deviation change in the outcome variable (meat consumption amounts).

Most of the remaining variables added little to the prediction of meat consumption behavior. This finding is confirmed when comparing the R^2 , adjusted R^2 and Durbin-Watson values⁶⁹ of the three models (table 23).

Table 23: Comparison of the three regression models.

	Number of predictors	R^2	Adjusted R^2	Std. error of the estimate	Durbin-Watson
Model 1	25	.402	.330	301.81359	1.899
Model 2	13	.387	.351	297.21700	1.907
Model 3	5	.326	.311	306.07158	1.962

The first model obviously shows the highest R^2 as it includes the largest number of predictors. However, its adjusted R^2 , a more conservative measure of the variance explained by the model, the value is actually lower than in the second model.⁷⁰ Also R^2 did not decrease much, considering that almost half the predictors were dropped from the first to the second model. Model 2 can only explain 1.5% less of the variance in respondents' meat consumption behavior. Even model 3 with only five predictors still manages to explain 32.6% of the variance, showing the great predictive strength of these five variables compared to the other 20.

Their individual contributions are revealed when running a stepwise linear regression with the five predictors entered according to their regression coefficients in model 3 (table 24). Furthermore, using stepwise regression none of the remaining predictors is allowed into the model, showing that it does not provide a significant improvement over model 3 with its five predictors.

Table 24: Stepwise regression of model 3 to identify the individual contributions (R^2 change) of the five predictors.

Predictors in the model	R^2	Adjusted R^2	R^2 change	Sig. F change
1 Ecological FCMs	.191	.187	.191	.000
2 Study country: Northern Europe	.245	.239	.055	.000
3 Perceived behavioral control	.279	.270	.034	.001
4 Gender	.308	.296	.029	.002
5 Protein FCM	.326	.311	.018	.013

⁶⁹ The Durbin-Watson value indicates whether the residuals of the model are correlated. A value of 2 indicates that residuals are independent; values below 2 indicate that residuals are positively correlated. But as the value here is still close to 2 it is not a reason for concern. The value is closest to two for Model 3, another indication of its better quality compared to the other two models.

⁷⁰ A smaller difference between R^2 and adjusted R^2 indicates the cross-validity of the model (Field, 2009).

Evidently, ecological FCMs alone can already explain 19.1% of the variance in meat consumption behavior. 5.5% are added by *study country: Northern Europe*, 3.4% by *PBC*, 2.9% by *gender* and 1.8% by the *protein FCM*.

Binary logistic regression

Running a binary logistic regression to predict whether respondents consume meat or not, revealed that only two predictors were significant when using all of the variables as in the regression above. These two predictors are the *PEB of consuming less animal products* and *ecological FCMs*. Also using forward and backward predictor selection techniques resulted in the same model with only these two variables.

However, seeing that *health attitudes* was the predictor closest to being significant in the first regression model with all variables (model 1; not reported), adding this as a third predictor (model 3) slightly improved the model 2 (see table 25).

Table 25: Results of the binary logistic regression models 2 and 3 for the prediction of meat consumption (yes/no).
B=regression coefficient, Wald=Wald Chi-square statistic, Exp(B)=odds ratio, **= $p < 0.01$, ***= $p < 0.001$.

Predictors	Model 2			Model 3		
	B	Wald	Exp(B)	B	Wald	Exp(B)
Constant	11,634	39,923	112903,208	12,468	38,603	259987,220
PEB less animal products	-1,366	19,578***	,255	-1,368	19,503***	,255
Ecological FCMs	-,807	14,630***	,446	-,756	12,284***	,470
Health attitudes				-,229	1,523**	,796

The Wald Chi-square statistic, as the equivalent of the standardized regression coefficient in a linear regression, indicates the unique contribution of each predictor to the model, when holding all other factors constant (Field, 2009). Thus, *PEB less animal products* is the strongest predictor in the binary logistic regressions, followed by *ecological FCMs*. Compared to that, the unique contribution of *health attitudes* in predicting meat consumption is fairly small and less significant. The relationships for all three predictors with the outcome variable meat consumption are negative. Therefore, the model predicts that respondents' with higher values for these three variables are more likely to be among the group of non-meat consumers. For the interpretation of logistic regressions, the odds ratio (Exp(B)) is sometimes preferred to Wald because it does not require logarithmic transformation. The odds ratio "is an indicator of the change in odds resulting from a unit change in the predictor" (Field, 2009: 270). A value smaller than one (as is the case here) "indicates that as the predictor increases, the odds of the outcome occurring decrease" (ibid: 271). Here, the outcome is being a meat consumer, for which the odds decrease when the predictor variables increase.

Also when comparing all models' predictive strengths to the baseline (model 0) one can see that the two variables of model 2 are accounting for almost all the predictive power (table 26). The baseline model simply assumes that all respondents do eat meat and already leads to a correct prediction of 76.1%. Compared to that, using the two predictors from model 2 improves the overall prediction by 5.4%. Adding health attitudes as a third predictor only adds another 0.4%. Using all other predictors (22) adds only further 0.3%, clearly showing the irrelevance of these variables for the prediction of whether respondents consume meat or not. Looking at the pseudo- R^2 values (Cox & Snell, Nagelkerke)⁷¹ one can again see that more predictors generally lead to higher R^2 values. But comparing it with the much smaller models, it becomes clear that a large amount of the explained variance can be attributed to the two highly significant predictors, *PEB less animal products* and *ecological FCMs*. The -2 log likelihood statistic is another indicator for the predictive power of the model, with lower values indicating a better model fit.

Table 26: Comparison of the binary logistic regression models in terms of R^2 values and % of correct predictions.

	df	-2 Log likelihood	Cox & Snell R^2	Nagelkerke R^2	% correct meat	% correct no meat	% correct overall
Model 0	0				100	0	76.1
Model 1	25	173,778	,309	,462	91.1	54.4	82.2
Model 2	2	186,814	,271	,406	89.5	56.1	81.5
Model 3	3	185,268	,276	,413	91.7	50.9	81.9

This chapter has now presented the most important results of this survey and its statistical analyses. Obviously, much more information is contained in the collected data but all necessary results and statistics for the present research purposes and objectives have now been provided. The following chapter will discuss these findings in light of the stated RQs of this thesis and draw conclusions and recommendations with regard to the research method and research field. It will therefore evaluate the strengths and weaknesses of this research and point out the lessons learned and contributions made by this study.

⁷¹ Contrary to linear regression models, logistic regression models do not allow for the calculation of R^2 as a measure for the proportion of explained variance. However, there are various statistics that aim to calculate a pseudo- R^2 to give some indication about the amount of explained variance. But these need to be interpreted with caution (Field, 2009; Ho, 2006).

5. Discussion

5.1 Answers to the four research questions

The first RQ asked about the EVs associated with sustainable food consumption found in the literature. From the review of major behavioral theories, attitudes, PCE and social norms were identified as the main and reoccurring EVs. These were also often used in many of the empirical studies covered in the literature review. Besides these three variables, values FCMs and other types or variations of consumer perceptions (e.g. PBC, PEB) also appeared in several of the reviewed papers. Food involvement and habit were less prominent amongst the literature but those studies including habit as a factor in their models made some strong claims for its substantial importance in food consumption behavior. Finally, environmental knowledge is yet another variable that the literature associates with pro-environmental behaviors. However, here many of the findings are still rather preliminary and suffer from the weak conceptualization and operationalization of environmental knowledge. A clear definition and strong measures are still lacking for this variable.

In conclusion, the present paper has put together a very comprehensive list of variables, derived from the reviewed literature. Most of the identified variables (except for values, product-related attitudes and some other types of consumer perceptions) were also integrated into this research, though often in less detail (e.g. food involvement), as an attempt to better explain and predict meat consumption behavior. None of the reviewed papers provided such a complete and detailed overview and description of the variables associated with sustainable food or meat consumption behavior or has attempted to integrate as many variables in one empirical study. While the conceptual model to adequately synthesis and integrate the various factors as well as their operationalization and measurement certainly need further refinement, this comprehensive review of EVs and first integrative attempt will prove fruitful for future research in the field.

The second question asked about the level of meat consumption among respondents. In the sample, meat consumption was actually much lower than expected from FAO's general meat *supply* data of Europe and its countries. With an average meat consumption of 465.17 gram per week (24.19 kg per year) the sample population lies clearly below the EU average of 1588 gram per week (82.6 kg per year).⁷² One can only speculate about the reasons for this large difference and it is certainly worth further investigation in future research. However, one can probably dismiss the possibility of considerable underreporting as the frequency of meat consumption was also quite low leading to a very

⁷² While per capita meat consumption and meat supply are not directly comparable, it is still surprising that the figures are deviating so much.

consistent and realistic picture of respondents' meat consumption behavior (e.g. average meat intake of 137.8 gram per meal). Only social-desirability bias may have affected respondents to report a generally lower level of meat consumption but in a web-survey this bias should be relatively small. Furthermore, even though the sample cannot be said to be representative and incorporated some self-selection bias (higher number of environmentally aware students) it still covered the whole range of meat consumption behavior (really low and really high).

Maybe more convincing explanations, besides potential biases or methodological shortcomings, could be that European students simply consume less meat than the general population or that this data reveals a current trend of generally decreasing meat consumption levels (the FAO data is from 2011). This assumption could be tested by running another survey with a larger, general population sample based on randomized selection (to rule out self-selection bias). Finding the results of this sample confirmed and supported, would certainly be desirable and in line with the observable trends of rising awareness about the unsustainability of high meat consumption and the growing popularity of vegan and vegetarian dishes and diets (Ruby, 2012).

The third RQ aimed to explore how reduced consumption of animal products compares to other food-related activities in terms of its PEB. Contrary to the findings by Lea and Worsley (2008), the PEB of reducing animal products consumption was ranked higher than expected in this sample (rank five of eight with a mean of 3.92). Accordingly, most respondents in the sample perceived reduced consumption of animal products as a quite *important* (4) and environmentally beneficial behavior. However, to put this finding in perspective one should also remember that even the lowest rated activity, *consumption of more fair trade instead of conventional products*, still received a mean rating of 3.33 which is above *moderately important* (3). Also the PEB mean of all items combined (3.97) indicates the rather positive perceptions of respondents in this sample and consuming less animal products falls slightly below this average.

Despite these indications of high environmental awareness in the sample, the fact that *avoiding plastic bags and excessive product packaging* (4.42) and *reducing and recycling household food waste* (4.40) were ranked as the most important behaviors still shows some misperception among most consumers regarding the environmental benefits of food-related activities. This observation was made in previous studies as well and is a sign for the imbalance of communications and recommendations regarding pro-environmental behavior (Laestadius et al., 2013; Thøgersen & Crompton, 2009). The strong focus on waste and recycling has clearly increased public awareness on these issues but campaigners and proponents should be careful that this communication does not go at the expense of neglecting other

even more environmentally harmful behaviors such as the consumption of animal products. There is a certain tendency in behavioral change policies towards cherry-picking and proposing the easier behavioral changes instead of really addressing the bigger issues that are likely to face stronger public resistance (Die Zeit, 2013; Power, 2010; The Guardian, 2013).

Another remarkable finding regarding this question was that the perception of the environmental benefit associated with reduced animal products consumption was clearly associated with whether the respondent did consume meat or not. Among non-meat consumers, the item had a mean of 4.75 making it the most environmentally important food-related activity. For meat consumers the mean was 3.65, the third lowest score of all PEB items. Thus, whether a person consumes meat or not, clearly influences his/her perception of how beneficial its reduction is for the environment. Based on the findings that non-meat consumers showed significantly higher environmental knowledge than meat-consumers and many non-meat consumers changed their diet for environmental reasons one can therefore assume that non-meat consumers have thought more about the environmental impacts of their diets than meat consumers. They therefore showed more accurate perceptions of the environmental impact associated with the consumption of meat and other animal products, which in turn affected their dietary behavior. This conclusion is further substantiated by the finding from the binary logistic regression model where the PEB of consuming less animal products turned out as the strongest and most significant predictor of whether respondents consume meat or not.

From a policy-perspective this is a very interesting and important finding as it does suggest that more knowledge and information about the environmental impacts associated with meat consumption can affect people's meat consumption behavior (or vice versa). However, this is certainly a conditional relationship depending on other factors and the right circumstances for the effect to occur. Nonetheless, the effect-size and causality of this relationship is definitely worth further investigating, for example through an experimental study.

With regard to the fourth and final RQ about the respective influence of the EVs on respondents' level of meat consumption no really satisfactory answer can be given. While most of the EVs correlated with the meat consumption variables, only very few evolved as significant predictors in the various regression models. The single most influential predictor for the amount of meat respondents' consumed was the variable *ecological FCMs*. It explained 19.1% of the variance of the sample's meat consumption behavior. Only four other variables, *study country: Northern Europe* (5.5%), *PBC* (3.4%), *gender* (2.9%), and *protein FCM* (1.8%), made significant but much smaller contributions to the final prediction. In total, the regression model including these five predictors was able to explain 32.6% of the variance in

respondents' meat consumption behavior. The R^2 of this model is quite comparable to the models of other studies that tried to explain food or meat consumption behavior.⁷³ However, the result that the complete model with all 25 predictors only resulted in an R^2 of .402 (40.2%) is rather disappointing. One main aim of this study was to improve on previous models by including a larger number of variables but this result seems to suggest that this may not be the right approach to find better explanations for meat consumption behavior. Even with all 25 predictors (many of them being insignificant) 59.8% of the observed variance in respondents' meat consumption behavior still remains unexplained.

Also the binary logistic regression model did not result in a very confident explanation of why respondents consume meat or not (Nagelkerke R^2 : .406; .413; .462). Again the importance attached to *ecological FCMs* certainly plays a role, as well as the *PEB of consuming less animal products* (see above), but except for health attitudes none of the remaining 22 predictors contributed significantly to the prediction.

Considering the findings from the literature review it is certainly surprising that some of the variables did turn out insignificant in the regression models. Especially PCE was a variable that had a solid theoretical foundation and exerted a strong influence on sustainable food consumption behavior in other studies (Roberts, 1996; Vermeir & Verbeke, 2008; Vicente-Molina et al., 2013). Here, while it showed quite high correlations with the meat consumption variables, it turned out as one of the weakest predictors in the regression models. Similarly, also the three attitude variables showed relatively good correlations with meat consumption but fared only slightly better as predictors in the regression models.⁷⁴ Particularly for animal welfare attitudes this finding is quite surprising given that less or no meat consumption is often motivated by animal welfare concerns. Given that animal welfare and environmental attitudes were generally quite high in the sample but only the two respective FCMs turned out as strong predictors one can interpret these findings as follows. Ecological attitudes by themselves do not directly influence behavior; they also need to be considered as important motives in people's food choice.

Thus, no strong claims about what variables do explain and predict meat consumption behavior can be made. But despite the unsatisfactory performance of many EVs in the regression models and their low explanatory power overall, it should not be forgotten that almost all of the EVs correlated significantly with the DVs and in the theoretically expected directions. Thus, it would not be fair to dismiss any association between the various examined personality factors and meat consumption behavior.

⁷³ Many of the reviewed studies also produced regression models with R^2 s between 0.10 and 0.50. See table 43 in Appendix 14 for more detail.

⁷⁴ Animal welfare attitudes did not turn out as a significant predictor in any of the regression models, environmental attitudes (model 2 of the multiple linear regression) only in one and health attitudes in two (model 2 of the multiple linear regression and model 3 of the binary logistic regression) of the models.

However, the strong correlations between many of the EVs may simply suggest that the relationships and dependencies between all variables within the model are simply too complex and inconsistent among individuals to really find clear and strong relations through survey-based analyses. Maybe an even larger N would have improved the model and helped to identify clearer relations between the EVs and meat consumption behavior that hold for a majority of respondents, but among the sample of 238 European students only few patterns could be established with certain confidence.

5.1.1 Concluding answer to the main research question

Considering all that has preceded, what is the answer to the main RQ: *What are the main explanatory variables of sustainable food consumption and to what extent do they influence respondents' meat consumption behavior?*

Based on the data and its analyses the answer must be that the different variables identified from the literature influence the level of meat consumption only to some extent. There is still a large amount of unexplained variance left in all regression models and considerable noise within the collected data so that it is hard to draw any definite conclusions. Many of the predictor variables do correlate significantly with meat consumption in the expected direction. But when running the regressions these relations are not strong and consistent enough to allow for a precise explanation and prediction of respondents' meat consumption behavior.

To a large extent this rather unsatisfying result must be attributed to the complexity and variability of human behavior in general (Phipps et al., 2013). As outlined in the theoretical section of the literature review, social psychology offers various diverse theories of human behavior. But despite years of extensive research, the empirical evidence to substantially support any of the presented theories remains rather weak (Kollmuss & Agyeman, 2002). This is probably even more the case for meat consumption behavior in particular. As the literature review has shown, there are numerous factors that can potentially influence meat consumption behavior and for each individual another combination of factors may be relevant and influential to his/her meat consumption behavior. Thus, in order to still find clear linear relations in the data, probably a very large number of respondents would be needed so that the individual variance matters less and behavioral patterns that hold for a majority of respondents become observable.

Furthermore, there are also methodological limitations, applying to surveys in general and this study in particular that have weakened the results and the ability to draw explicit conclusions. These will be discussed in the following subchapter.

5.2 Methodological limitations of survey research and the present study

“Sample surveys rely on two types of inference – from the questions to constructs, and from the sample statistic to the population statistic. The inference involves two coordinated sets of steps – obtaining answers to questions constructed to mirror the constructs, and identifying and measuring sample units that form a microcosm of the target population. Despite all efforts, each of the steps is subject to imperfections, producing statistical errors in survey statistics” (Groves et al., 2004: 62).

Already with regard to the first step there are several problems involved, first of all, the issue of validity. No matter how well-defined and well-tested the employed items are of a survey are, they can seldom be considered exact measures of the constructs that the researcher is actually interested in. Especially in social science research there are many latent constructs that are very difficult to define and even harder to operationalize and measure. This problem has also become evident from the conducted literature review. The best example for this problem in the current survey is environmental knowledge. There is no clear definition of environmental knowledge, and within the body of knowledge that can be referred to as environmental, there are endless questions imaginable that can be used for its measurement. Depending on what questions are used and in what format the outcomes may vary considerably even when asking the same group of respondents.

Furthermore, the researcher often has to impose certain regulations and limitations for the answers that can be given to the questionnaire items. In a closed format the researcher will predefine a set of answers or present a scale to the respondent that allows the standardization of responses. However, this process is also likely to simplify the answers and goes at the expense of more detailed information. Open questions are the other alternative but in large scale surveys with many constructs, and questions this quickly becomes inoperable. Thus, most measures must be considered approximations to the real constructs they aim to assess.

Besides these conceptual design problems, also respondents themselves can add up to the inaccuracy of measurements through response bias (intended and unintended). Respondents are social beings and as such, they are easily influenced by their surroundings, the setting, wording and framing of the survey, etc. Respondents can understand questions differently, misinterpret them or encounter difficulties in retrieving the necessary knowledge to accurately answer the posed questions (Groves et al., 2004). As pointed out before, this was particularly problematic for the measures of the DV as it is probably quite difficult for respondents to estimate the frequency and amount of their meat consumption. Furthermore, responses need to be willing to actually take the effort of thinking about the questions in order to give the most accurate answer possible. There is a body of research showing that respondents

sometimes develop certain habits or strategies (e.g. satisficing, response order effects, acquiescence, endorsing the status quo, or nondifferentiation⁷⁵) in answering questions and can easily be influenced by the design of the survey or other influencing factors (Bethlehem & Biffignandi, 2012). Another often cited problem is the so-called social desirability bias. While admittedly being less of an issue in web-surveys due to the more anonymous setting, it still remains a problem. In this survey especially animal welfare and environmental attitudes (and the according FCMs) may have suffered from this bias, leading to stronger agreement with the respective items. Even in the absence of an interviewer to exert such social pressure, it suffices that respondents are aware of certain social norms and would like to think of themselves as adhering to them (given they consider these norms as important and worth respecting). Further issues are unit and item nonresponse. Several contacted individuals may refuse to participate in the survey (unit nonresponse⁷⁶), refuse to answer some of the questions or abort the survey at one point (item nonresponse⁷⁷). It can seldom be assumed that these nonresponses occur randomly and without a reason. One must consider the possibility that respondents unwilling to respond to the survey or certain questions differ from the participants who completed the whole survey. These differences can also affect the validity of the results and their statistical inferences.

The last problem already touches upon the second step of inference from the survey population to the target population. Based on the sampling procedure the sample may suffer from coverage and sampling errors. Coverage error occurs when either ineligible units not part of the target population enter the sample, or when parts of the target population are not represented in the sample (undercoverage). Sampling errors occur when parts of the target population are given no or reduced chance of selection. Finally, most surveys depend on voluntary participation and are thus susceptible to self-selection bias. Participants are likely to differ from non-participants (see unit nonresponse above) and as no information is collected about non-participants it is impossible to determine and correct the bias in the present sample (Bethlehem & Biffignandi, 2012).

All of these potential biases can apply to the present survey and many have affected its results. The survey was simply hosted on a website and distributed by the author through various forms of online communication. Thus, not all European students had the chance to participate in the survey and only some of those who received the invitation agreed to participate. Moreover, the present sample is also

⁷⁵ See Appendix 15 for a short explanation of these response strategies and habits.

⁷⁶ Besides refusal, also failures of making contact with the respondent or inability of the respondent to participate (e.g. language issues, software issues) may also lead to unit nonresponse.

⁷⁷ Besides refusal to respond, the participant may also be unable to understand the question or lack the knowledge to provide an adequate answer.

not a random probability sample but a convenience sample. Hence, even without considerable bias in the sample, no valid inferences about the target population (European students) can be made from the present survey sample (Czaja & Blair, 1996).

This array of potential errors and biases combined with the complexities of analyzing human behavior shall put the limited findings of this research regarding the explanation and prediction of meat consumption behavior into the right context.

5.3 Contributions of this research and lessons learned

This thesis has contributed to the body of research on meat consumption as a particular type of sustainable food consumption behavior. It is still a rather new approach to conceptualize reduced meat consumption as a pro-environmental behavior and very few studies have engaged in analyses to explore, explain and predict it. By reviewing the relevant literature including studies on other types of sustainable food consumption, this thesis has provided an extensive overview of underlying theories, the associated EVs and their operationalizations. The review has shown that strong empirical evidence is still rather scarce and at times contradictory. There is no clear consensus on which variables are relevant and need to be considered, how they can best be defined and measured and what theoretical models are best suited to conceptualize meat consumption behavior. The lack of clearly defined and well-tested measures has been most evident for environmental knowledge. Here only a few extensive and well-developed measures were found in the literature. Many studies used rather debatable instruments or failed to report their measures. The environmental knowledge measure developed here therefore offers a valuable addition. With many items specifically designed for the environmental problems associated with agriculture and livestock this measure is particularly suitable for the context of sustainable food consumption. In this first test, the quality of the measure proved quite satisfactory with environmental students scoring significantly higher and a Cronbach's alpha of 0.674 for the internal consistency of the scale. Nonetheless, as for most of the other measures used here and in other studies, further refinement of the measurement scales will improve the quality of future research.

Gathering all this information from the review demonstrated the current status of this research field and helped identify its strengths and weaknesses. Sustainable food consumption is a multidisciplinary research field and as such still lacking in structure and consistency. The various disciplines (e.g. psychology, sociology, environmental and nutritional sciences) need to find better ways to integrate their findings in order to improve explanatory models for meat consumption behavior. This thesis has attempted such a step forward by combining the various identified variables in one model to be tested in

this empirical study. Using such a large number of EVs is a distinctly new approach compared to the previous studies in the field. While the model did not deliver the desired results and failed to produce any clear recommendations about which variables are more or less useful in explaining and predicting meat consumption behavior, it has nonetheless provided useful information that will add to the current scientific debate.

First of all, based on the findings of this study it appears that simply adding all EVs into the model proved as a too naïve approach and did not really lead to a better prediction of meat consumption behavior. Nonetheless, as almost all of the EVs correlated significantly with meat consumption and in the theoretically expected direction the insignificant predictors of the general regression model should not simply be dismissed. Instead, it seems mandatory to improve on the theoretical side and come up with better models that allow for a more adequate integration of the various EVs and their relationships. The fact that many of the EVs also strongly correlated with each other seems to suggest mediating and moderating effects in the model that could have obscured the influence of these factors in the regressions.

Also the descriptive findings support many of the more general theoretical assumptions made in the literature and this study. Clear differences between meat consumers and non-meat consumers were observable in this sample. Non-meat consumers had on average more positive environmental, animal welfare and health attitudes, greater environmental knowledge and more confidence in their power as consumers (higher PBC, PCE and PEB). Also gender (being female) and environmental background had a positive reducing effect on the level of meat consumption. However, without stronger empirical evidence, these findings must be interpreted as general tendencies and do not allow to make any inferences or generalizations on how meat consumption behavior can be explained.

Therefore, more research is certainly required and the use of various empirical methods is strongly encouraged. The present and several reviewed studies have clearly demonstrated the limitations surveys face in their explanation of food consumption behavior. More qualitative studies that employ direct observations and in-depth interviews may prove a valuable addition to the quantitatively collected data and its analyses. Nonetheless, even with such a triangulation of research it remains questionable whether something as complex and variable as human food consumption behavior can ever be sufficiently explained and accurately predicted. There may simply be too much variation and no clear consistency in how people make their food choices to allow for a valid explanation that is replicable for different samples. However, this should also not be the demand put towards scientific research. Instead,

what is important is to focus on the role of factors that can act as leverage points to make consumers change their food consumption habits towards greater sustainability. Here, the author has focused on environmental knowledge, ecological attitudes and FCMs and consumer perceptions of environmental benefit. While knowledge and attitudes disappointed, ecological FCMs turned out as a quite strong predictor and PEB of consuming less animal products clearly differed between meat and non-meat consumers. These are findings that future research can build on, for example, by further testing these relationships in an experimental setting. Does it affect participants' meat consumption behavior if they are informed about the large environmental impact and the poor animal welfare conditions of livestock production? Exposing a treatment group to this kind of information and comparing their meat consumption levels to a control group in the following weeks or months could maybe bring a more definite answer to this question, than a survey is able to deliver.

Finally, the large number of respondents for this survey (web-based without professional assistance or research funds to offer compensation for participation) proves that environmental issues are becoming more and more important. Also with regard to food consumption, the majority of respondents indicated to be interested in its environmental impacts. Some participants provided similar feedback (e.g. on the Blog and through personal communication) showing that this is an issue that concerns many students. Paired with the large benefits of reduced meat consumption from a holistic sustainability perspective, this should encourage further research in this area.

5.4 Recommendations

To make any real recommendations on how to reduce meat consumption in Europe, the research probably suffers from too many limitations. But if the low level of meat consumption found among respondents is not completely assignable to measurement errors and response biases it gives reason for some optimism. That environmental and animal welfare attitudes, as well as the respective FCMs were rated rather high by many respondents may indicate an increased awareness that reached a level where it actually does impact on students' behavior (contrary to the assumptions of the attitude-behavior gap). However, the environmental knowledge test and the perceptions of the environmental benefit of several food-related activities also revealed that there is still a lack of knowledge among many respondents, especially with regard to the environmental impact of meat production and consumption. This is even more worrying considering that this sample consisted of students (several of them, studying an environmental program) who can be expected to be more knowledgeable than the average population. Although knowledge did not turn out as a significant predictor for meat consumption behavior,

increasing awareness and knowledge about the environmental impact of meat products could still help reducing or changing consumption towards greater sustainability. This hopeful assumption is also supported by the finding that PEB of consuming less animal products differed considerably between meat consumers and non-consumers and turned out as the strongest predictor of whether respondents consume meat or not. But further research is required to test this assumption in an experimental study before counting on it as a formula for success.

As years of NGO campaigning have shown, raising awareness is a difficult endeavor and does not always lead to the substantial changes necessary (Laestadius et al., 2013). A combination of efforts is much more likely to make a difference (Thøgersen & Crompton, 2009). Here the important role of governments should not be forgotten. While this research and survey focused on the role of consumers, governments have much more concentrated power to affect the market immediately. While it is beyond the scope of this paper to review the current role of governments in the meat production industry, there is some indication that many governments and multi-governmental organizations like the EU, FAO or UN are currently still largely neglecting the unsustainability of current meat production and consumption (EC, 2004; FAO, 2012; Lang & Barling, 2013; Tukker et al., 2009).

A relatively simple and rather straightforward measure would be to add an Eco tax on any animal products or food products in general according to their environmental and societal impacts and costs (Goodland, 1997; Vinnari & Tapio, 2012). This would make meat and other animal products more expensive and hopefully thereby reduce consumption. In this survey price did not turn out as a significant predictor for meat consumption but the majority of respondents (55.32%) indicated that they would reduce their meat consumption if prices for meat would increase. Other more indirect ways for governments to bring meat prices closer to their real prices would be by taking away subsidies, by putting tariffs on imported animal feed, or by forcing producers to internalize some of the environmental and social costs caused by livestock (Garnett, 2009; Laestadius, et al., 2013; Vinnari & Tapio, 2012). However, while probably largely effective, none of the suggested measures seem very likely under the current political and economic conditions (Fuchs & Lorek, 2005; Mont & Plepys, 2008). Additionally, due to the globalization of markets an international or at least EU-wide effort would be required for most of these measures to be truly effective. Thus, for now, trying to convince consumers to reduce their meat consumption voluntarily may still be the best and most realistic option (Garnett, 2011).

6. Conclusion

Based on the notion that current meat production and consumption in Europe is largely unsustainable and has many negative impacts for animals, the environment and the people, this research paper aimed to explore, explain and predict meat consumption behavior of European students, by means of a literature review and a survey.

The comprehensive literature review identified four major behavioral theories and several EVs associated with sustainable food consumption behavior. However, consistency in models, measures and findings was lacking and empirical evidence available is still rather weak. This study, therefore proposed a distinctively new approach to explore meat consumption behavior by integrating a large number of EVs in one research model. Largely based on previous research in the field, a survey was designed to measure these personality-related EVs and European students' meat consumption behavior. An important innovation here was the newly developed set of questions to assess respondents' environmental system and action-related knowledge. While this scale requires further refinement it appears very suitable for research in the context of sustainable food consumption and student population samples.

238 complete responses from European students were collected and data analyses led to the following main results. Generally, ecological awareness and consumer perceptions were quite high in this sample while meat consumption frequency and weekly amounts were much lower than expected. All employed EVs correlated significantly with meat consumption and in the expected theoretical direction. However, only few of these variables turned out as significant predictors in the regression models. The single most important variable was *ecological FCMs*. It was the strongest predictor in the regression model to explain weekly meat consumption amounts and also contributed significantly to the prediction of whether consumers eat meat or not. The strongest prediction of whether respondents consume meat was based on respondents' *PEB of consuming less animal products*. Non-meat consumers considered it to be much more important for the environment than meat consumers.

Further significant but less powerful predictors were *study country: Northern Europe*, *PBC*, *gender*, *protein FCM* and *health attitudes*. Studying in *Northern Europe*, being *male* and attaching greater importance to high *protein* content as an *FCM* predicted higher meat consumption levels, whereas being *female* and higher *PBC* and *health attitudes* predicted lower levels.

However, due to the methodological limitations of the present study and the apparent complexity of meat consumption behavior and its predictors it is difficult to draw any direct conclusions from these

findings. Further research is required to validate or disconfirm the present results. Nonetheless, in line with previous research some general differences between meat and non-meat consumers were clearly observable in the data. But due to considerable variance of how these factors impact upon individual respondents, few really clear and strong patterns are discernible.

As this study has shown a survey as a method faces several limitations and barriers in the analysis of human behavior. Other methods can therefore prove a valuable addition for exploring meat consumption behavior. In-depth qualitative interviews with different types of consumers can help to get a better understanding of the various EVs and how they relate to each other. What determines which attitudes, perceptions or motives will prevail in a consumers' decision for or against buying more or less meat? Such interviews could be combined with a survey to test the validity and reliability of certain survey measures and see where they are particularly lacking. Also more rigorous attempts to establish random samples and an increased pressure on respondents' to participate (e.g. complete population surveys, student courses) could help counter some of the methodological shortcomings and improve the quality of the collected data, its analyses and its findings. However, such an approach would require the active assistance and support from universities or experienced and accepted research institutes. Finally, more costly and labor-intensive research methods such as observations (of actual meat purchase and consumption behavior) and experiments⁷⁸ provide further avenues for future studies.

This outlook shows that there is still much more research required to improve the understanding of meat consumption behavior and find leverage points to reduce meat consumption levels in the European Union for the benefit of the planet and its residents (human and non-human). Less meat consumption would allow for more animal friendly production and reduce the burdens of livestock imposed on the environment. If compensated through higher prices, reduced livestock production does not necessarily need to cause economic losses. Finally, the health component (while still contested) should not be forgotten. High meat consumption and obesity and other health problems often go hand in hand. Reducing meat consumption to a healthy level, in line with dietary guidelines would thus also contribute to improving public health and reducing the costs for health care.

⁷⁸ E.g. exposing a treatment group to information about the ecological impacts of meat consumption and compare its post-experiment levels of consumption with a control group

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Appendices

Appendix 1: Literature search

The literature research to identify scientific studies about sustainable food consumption and comparable behaviors was conducted with SCOPUS and Google Scholar and mainly employed the following keywords:

“sustainable (food) consumption”, “sustainable (food) consumption behavior”, “meat consumption (behavior)”, “green consumption”, “dietary change”, “plant-based diet”; “survey food/meat consumption”⁷⁹

Additional search terms that came up in latter stages included the already identified EVs, namely:

“(environmental/universalistic) values”, “(environmental/animal welfare) attitudes”, “health attitudes/consciousness”, “(food choice/consumer) motives”, “social/societal/subjective/moral norms”, “(perceived) behavioral control”, “(perceived) consumer effectiveness”, “(perceived) responsibility”, “(perceived) costs/barriers”

These terms have mostly been used in combination with the search terms above in order to identify further studies researching sustainable (food) consumption behavior, specifically focusing on some of these EVs.

Only studies from peer-reviewed journals were considered for the identification of EVs and well-cited studies have received greater attention. But as the topic is only recently receiving greater academic attention, also studies with very few citations have been reviewed. Furthermore, snow-balling techniques like following suggestions for further articles from the employed search engines, as well as checking references and citations in the reviewed articles, have been employed to arrive at a comprehensive body of literature as a basis for this review.

Appendix 2: A practical example for the functionality of DT

Here is an example to clarify the necessity of the three conditions of DT (volition, irrevocable commitment and importance of the choice) for the creation of dissonance. Imagine you tell your friends that you will from now on, stop eating meat. This decision is also very important for yourself because

⁷⁹ Search terms including parenthesized words have been used once with and once without the parenthesized word. A “/” within search terms means that both terms have once been employed in the search.

you care about the environment and the welfare of animals. So you have made this decision independently without any pressure from others trying to convince you to become a vegetarian. But then a few days later you are invited to a barbecue with some of your friends that you have told about your decision. Suddenly, the smell from the grill reminds you how tasty meat can be and you begin to somewhat regret your decision. But as you have clearly committed yourself to stop eating meat and consider this a very important choice you are unlikely to give up now and will try your best to enjoy your grilled vegetables. In this situation you are probably experiencing dissonance as your rejected alternative (continuing to eat meat) suddenly seems way more attractive causing you to doubt your previous decision. Another possibility is that you actually allow yourself to eat some meat and will then suffer from dissonance as you have broken with your previous decision of becoming a vegetarian.

On the other hand imagine you would not have made the choice yourself but your parents or partner kind of forced you into becoming a vegetarian, you did not tell anyone about your intention to stop eating meat or you do not really consider it such an important issue whether you follow a strict vegetarian diet or not. Any one of these three situations would violate one of the necessary conditions and could serve as an excuse for eating meat without experiencing dissonance.

Appendix 3: The cognitive belief hierarchy as a theoretical distinction between values and attitudes

According to the cognitive belief hierarchy, values also represent a more general cognition than attitudes. The hierarchy starts with *global values* at the top, as the broadest belief structure (Vinson et al., 1977). They resemble the type of values described and researched by Rokeach (1973) and Schwartz (1992) and can be understood as “enduring beliefs concerning desired states of existence or modes of behaviour” (Honkanen et al., 2006: 422). Global values are rather abstract personal beliefs and it is therefore often difficult to establish a direct influence onto behavior. *Domain-specific values* form the second level of the hierarchy. Sometimes these values are also described as value orientations or lifestyles due to their stronger relation to and influence on behavior. Furthermore, domain-specific values are more numerous and more specific than global values (Honkanen et al., 2006; Vinson et al., 1977). The third and final level of the hierarchy is then represented by *attitudes*. They are the most specific type of belief and can best be understood as “evaluative responses to stimuli” (Honkanen et al., 2006: 422). Three classes of such attitudinal responses can be differentiated: “cognitive (thoughts), affective (feelings) and conative (or behavioural)” (Honkanen et al., 2006: 423).

Appendix 4: Dimensions and items of the NEP scale as a measure of environmental attitudes

The following table (27) lists all dimensions and items of the NEP scale as a measure of environmental attitudes.

Table 27: New Ecological Paradigm (NEP) scale by Dunlap et al. (2000: 433). (+) indicates items representing pro-environmental attitudes while (-) stands for reversed items.

NEPS dimension	NEPS dimension items
Limits to Growth	<ul style="list-style-type: none"> ▪ We are approaching the limit of the number of people the earth can support (+) ▪ The earth has plenty of natural resources if we just learn how to develop them (-) ▪ The earth is like a spaceship with very limited room and resources (+)
Anti-anthropocentrism	<ul style="list-style-type: none"> ▪ Humans have the right to modify the natural environment to suit their needs (-) ▪ Plants and animals have as much rights as humans to exist (+) ▪ Humans were meant to rule over the rest of nature (-)
The fragility of nature's balance	<ul style="list-style-type: none"> ▪ When humans interfere with nature it often produces disastrous consequences (+) ▪ The balance of nature is strong enough to cope with the impacts of modern industrial nations (-) ▪ The balance of nature is very delicate and easily upset (+)
Rejection of exceptionalism	<ul style="list-style-type: none"> ▪ Humans ingenuity will insure that we do Not make the earth unlivable (-) ▪ Despite our special abilities humans are still subject to the laws of nature (+) ▪ Humans will eventually learn enough about how nature works to be able to control it (-)
Possibility of an ecocrisis	<ul style="list-style-type: none"> ▪ Humans are severely abusing the environment (+) ▪ The so-called "ecological crisis" facing humankind has been greatly exaggerated (-) ▪ If things continue in their present course, we will soon experience a major ecological catastrophe (+)

Appendix 5: Measures and findings for product-related attitudes and their influence on sustainable food consumption behavior

As mentioned in the text, it seems rather obvious to establish a relation between attitudes to a product and its consumption. A person that likes a product is logically more inclined to consume it. This relation is very intuitive but by itself not really useful in drawing further conclusions. Also many of the measures appear rather crude compared to FCMs.

Saba and di Natale (1999), for instance, assessed attitudes towards red, white and preserved meat by letting respondents rate their agreement (seven-point scale) with the two statements that eating red/white/preserved meat is good/beneficial. However, the distinction between good and beneficial is not entirely clear. Maybe *good* is meant to refer to taste and pleasure derived from eating while *beneficial* could be understood in terms of healthiness. Thus, the finding that the attitude *good* had a stronger effect on consumption of meat types than *beneficial* could mean that taste trumps health (attitudes) in meat choice.

Only a slight improvement was made by McCarthy et al. (2003; 2004) that added “pleasant” as a third adjective for respondents’ to indicate their attitudes towards eating beef (ibid, 2003), pork and poultry (ibid, 2004). However, they supplemented their model by adding six ‘behavior belief and outcome evaluation constructs’ as determinants of consumers’ attitudes towards the three meat types. So what people thought about beef, pork and poultry in terms of health, safety, environmental impact, animal welfare, eating enjoyment and price determined their attitudes towards the three meat types which then influenced consumption intentions. Interestingly, health, eating enjoyment and safety evolved as the most important determinants of attitude towards all three types of meat, while price was also quite relevant for poultry and animal welfare important for attitudes towards pork. Environmental concerns were least important in determining attitudes towards any of the three types of meat (McCarthy et al., 2003; 2004).

More elaborate measures for product-related attitudes were created by five- (Vanhonacker et al., 2013) to seven-point (Honkanen et al., 2006; Vermeir & Verbeke, 2006; 2008) semantic differential scales using several bipolar adjectives (see table 28).

Table 28: Overview of scales used to measure attitudes towards the respective products in the three studies.

Study	Honkanen et al. (2006)	Vanhonacker et al. (2013)	Vermeir & Verbeke (2006; 2008)
Product	Organic food	Potential meat alternatives ⁸⁰	(Fictional) sustainable dairy product
Scale	Seven-point	Five-point	Seven-point
Bipolar adjectives	Bad – Good	Bad – Good	Good – Bad
	Unpleasant – Pleasant	Unrealistic – Unrealistic	Good – Bad quality
	Unsatisfying – Satisfying	Unacceptable – Acceptable to me	Attractive – Unattractive
	-	Not effective – Effective	Ethical – Unethical
	-	Short term solution – Long term solution	Good – Bad price-quality ratio
	-	-	Respecting – Not respecting humans and animals

The great variation in number and types of adjectives chosen can partly be attributed to the different reference products but may also indicate certain arbitrariness among the researchers.

Somewhat unsurprisingly, Honkanen et al. (2006) and Vermeir & Verbeke (2006; 2008) both managed to establish positive and significant effects of their product-related attitudes on behavioral intention to consume the products (organic food and sustainable dairy). However, in Honkanen et al. (2006) “positive attitudes towards consumption of organic food [explained only 13 percent of the variance] to form intentions to consume such food” (ibid: 427). Also Vermeir & Verbeke were rather cautious in their conclusions. Despite the fact that attitudes prevailed as the most important predictor of behavioral intention in their model (ibid: 2008), they still stated that this apparent relation from specific attitudes to specific behavior cannot always be taken for granted, given the numerous other potential factors impacting on this relation (ibid: 2006).

⁸⁰ Namely, hybrid meat products, meat types with lower environmental impact, plant-based meat substitutes, sustainable farmed fish, organic meat, proteins from insects and reduced meat consumption (Vanhonacker et al., 2013).

Appendix 6: FCQ and TEMS as measures for FCMs

Table 29 lists the nine factors of the FCQ and gives a short explanation and two item examples for each to clarify the measure.

Table 29: Factors, explanations and two example items for each factor covered in the FCQ. For the complete list of items see Steptoe et al. (1995: 272).

Factor	Short explanation	Two item examples
Health	Health-related statements	<ol style="list-style-type: none"> 1. Contains a lot of vitamins and minerals 2. Is nutritious
Mood	Concerns stress, coping and mood	<ol style="list-style-type: none"> 1. Helps me cope with stress 2. Makes me feel good
Convenience	Ease of food purchase and preparation	<ol style="list-style-type: none"> 1. Is easy to prepare 2. Is easily available in shops and supermarkets
Sensory appeal	Appearance, smell and taste	<ol style="list-style-type: none"> 1. Looks nice 2. Tastes good
Natural Content	Use of additives and natural ingredients	<ol style="list-style-type: none"> 1. Contains no additives 2. Contains natural ingredients
Price	Cost of food	<ol style="list-style-type: none"> 1. Is not expensive 2. Is good value for money
Weight control	Consumption of low calorie food	<ol style="list-style-type: none"> 1. Is low in calories 2. Helps me control my weight
Familiarity	Familiarity of food	<ol style="list-style-type: none"> 1. Is what I usually eat 2. Is familiar
Ethical concern	Environmental and political considerations	<ol style="list-style-type: none"> 1. Comes from countries I approve of politically 2. Is packaged in an environmentally friendly way

The following table (30) demonstrates the fifteen factors and two item examples employed in the TEMs as an instrument to measure FCMs.

Table 30: TEMS factors and examples of two items (Renner et al., 2012: 120f).

Factor	Item example 1	Item example 2
1. Liking	“because I have an appetite for it”	“because it tastes good”
2. Habits	“because I usually eat it”	“because I am familiar with it”
3. Need and hunger	“because I need energy”	“because I am hungry”
4. Health	“because it is healthy”	“because it keeps me in shape”
5. Convenience	“because it is quick to prepare”	“because it is most convenient”
6. Pleasure	“because I enjoy it”	“in order to reward myself”
7. Traditional eating	“because it belongs to certain situations”	“out of traditions”
8. Natural concerns	“because it is natural”	“because it contains no harmful substances”
9. Sociability	“because it is social”	“so that I can spend time with other people”
10. Price	“because it is inexpensive”	“because I don’t want to spend any more money”
11. Visual Appeal	“because the presentation is appealing”	“because I recognize it from advertisements or have seen it on TV”
12. Weight Control	“because it is low in calories”	“because I watch my weight”
13. Affect Regulation	“because I am sad”	“because I am frustrated”
14. Social Norms	“because it would be impolite not to eat it”	“because I am supposed to eat it”
15. Social Image	“because it is trendy”	“because others like it”

Appendix 7: Overview of environmental knowledge measures employed in the reviewed studies

Table 31 gives an overview of how environmental knowledge has been operationalized and measured in the reviewed studies.

Table 31: Overview of environmental knowledge measures found in the reviewed literature.

Study	Type of knowledge	Number and type of question	Example questions / statements
Bradley et al. (1999)	Not further specified	18 multiple choice (MC) questions	<ul style="list-style-type: none"> The atmospheric level nearest the earth's surface? The factor that refers to organisms, their parts, and their interactions within a system? An organism that feeds on both plants and animals?
Ellen (1994)	Objective knowledge	9 MC questions	Not reported
	Subjective knowledge	4 items asking for perceived knowledge	<ul style="list-style-type: none"> I know more about recycling than the average person Every time I turn around, the "experts" are changing their minds about what are the "best" products or packages to buy (Reversed)
Fryxell & Lo (2003)	General environmental knowledge with some country-specific (China) and business-related (CSR) questions	30 / 40 MC questions	<ul style="list-style-type: none"> The concept of ecological footprints refers to a measure of...? What is Agenda 21? The main aim of environmental benchmarking is to...? What is the major toxic metal found in local rivers?
Haron et al. (2005)	General knowledge about ecosystems and environmental issues globally and in Malaysia	14 statements (true / false / do not know)	<ul style="list-style-type: none"> Natural resources should be conserved for future generations Destruction of forests will cause biological imbalances Most rivers in Malaysia are polluted The natural environment should be sacrificed in the name of development
Kaiser & Frick (2002); Frick et al. (2004) ⁸¹	System knowledge	15 MC questions (3-4 answers)	<ul style="list-style-type: none"> Where does groundwater come from? Why is ozone a problem?
		Six true/false statements	<ul style="list-style-type: none"> In principle, today there is enough food available worldwide to feed all people on earth
	Action-related knowledge	15 MC questions (3-4 answers)	<ul style="list-style-type: none"> How can soil erosion be prevented? Asparagus from California is environmentally harmful because...?

⁸¹ The questions are not reported in the studies but have been obtained directly from the authors via email contact.

		5 true/false statements	<ul style="list-style-type: none"> In recycling, no energy is lost
	Effectiveness knowledge	14 MC questions (3-4 answers)	<ul style="list-style-type: none"> Recycling which of the following materials saves the most energy as compared to producing new material? Energy-saving lamps consume about how much less energy than conventional lights bulbs for the same amount of light?
		5 true/false statements	<ul style="list-style-type: none"> It takes only half the energy to produce recycled paper than it takes to produce conventional paper
Morone et al. (2001)	Ecological knowledge (based on eight principles)	24 (MC questions (3 answers)	<ul style="list-style-type: none"> For a person to get the most food energy out of 100 lbs. of vegetables and grain the person should...? The need for pesticide on a farm using crop rotation will...? What happens when phosphorous washes into a lake?
		8 true/false statements	<ul style="list-style-type: none"> There is a limit to how many people the world can support Flooding on a river renews and replenishes the environment
Vicente-Molina et al. (2013)	Objective (actual) knowledge	Ten questions	Not reported
	Subjective (perceived) knowledge	Two self-report items (before and after objective knowledge test)	Not reported

Appendix 8: Three measures of perceived consumer effectiveness

The following table (32) presents a few item examples for the measurement of PCE, found in the reviewed literature.

Table 32: Examples of PCE measures and their items (Ellen et al., 1991: 107; Ellen, 1994: 47; Roberts, 1996: 229).

Study	Items to measure PCE
Ellen et al. 1991	<ul style="list-style-type: none"> ▪ There is not much that any one individual can do about the environment ▪ The conservation efforts of one person are useless as long as other people refuse to conserve
Ellen 1994	<ul style="list-style-type: none"> ▪ The recycling efforts of one person do make a difference ▪ Each consumer's behavior can have an effect on reducing landfill problems ▪ There is not much that any one individual can do about environmental problems (Reversed) ▪ What I purchase as a consumer does have an effect on the nation's landfill problems
Roberts 1996	<ul style="list-style-type: none"> ▪ It is worthless for the individual consumer to do anything about pollution ▪ When I buy products, I try to consider how my use of them will affect the environment and other consumers ▪ Since one person cannot have any effect upon pollution and natural resource problems, it doesn't make a difference what I do ▪ Each consumers' behavior can have a positive effect on society by purchasing products sold by socially responsible companies

Appendix 9: National differences in meat consumption in Europe

The variance in meat consumption levels for various European countries can be ascribed to different historical and cultural routes dating back to ancient times. Within the Greek and Roman empires agriculture was the major source of food production leading to a diet largely based on grains, fruits and vegetables. Contrary to that, many northern tribes were mainly gatherers and hunters and held more livestock to ensure their food supply. Thus, in Southern Europe diets were less meat and protein intensive than in Northern Europe. Of course, over the centuries these historical roots have weakened in their influence but some historic consistency is still observable (de Boer et al., 2006). The data presented below (table 33) still shows that in the early 1960s many Northern and Central European countries (e.g. Austria, Denmark, France, Germany, Hungary, Ireland, Sweden, United Kingdom) had considerably higher levels of meat consumption compared to the Southern European countries (Cyprus, Greece, Italy, Malta, Portugal, Spain). However, in the following decades Southern European countries quickly caught up with their northern neighbors and now have rather similar levels of meat consumption. Only some newer members of the European Union from the Baltic (Estonia, Latvia, Lithuania), the Balkan (Croatia) and Eastern Europe (Bulgaria, Romania, Slovakia) are still behind in terms of annual per capita meat consumption. But even among these countries some considerable increases are observable for the last decade (e.g. Croatia +26.5 kg, Latvia +29.8 kg, Lithuania +31 kg between 2001 and 2011). This progression also seems to indicate a considerable economic influence as for many of the countries meat consumption levels appear to rise with economic growth and development (York & Gossard, 2004).

Looking at the European average the general trend is that meat consumption has increased considerably between 1961 and 1981/1991. Since then, consumption levels have somewhat stabilized in most countries. New member countries often joined with a lower than average meat consumption level but most of them also seem to gradually align with the EU average. Nonetheless there is still considerable variance in per capita meat consumption between the various European countries.

Table 33: Meat supply quantity (kg/capita/year) in the European Union, Norway and Switzerland (FAO, 2014).⁸²

Country / Year	1961	1971	1981	1991	2001	2006	2011
Austria	65.7	78.1	100.3	106.8	110.6	107.5	106.4
Belgium-Luxembourg	60.9	77.8	87.30	95.3			
Belgium					86.3	78.4	76.8
Bulgaria	32.4	43.1	64.6	54.2	55.8	47.9	57.1
Croatia					35.5	57.8	62.0
Cyprus	27.8	56.4	52.3	75.4	85.3	80.2	79.7
Czechoslovakia	62.6	77.8	93.6	85.6			
Czech Republic					76.7	84.7	80.4
Denmark	60.9	56.1	74.9	100.7	72.6	79.0	75.2
Estonia					61.2	58.4	60.3
Finland	34.5	46.5	56.0	61.9	66.5	71.0	74.4
France	77.0	88.9	98.4	100.9	101.6	83.4	88.7
Germany	63.8	80.4	95.4	87.7	81.3	82.4	87.9
Greece	21.0	50.9	61.2	70.7	88.8	82.0	80.6
Hungary	77.9	93.7	111.5	104.9	88.7	84.7	73.7
Ireland	57.3	75.4	82.0	93.3	98.6	101.0	80.5
Italy	31.0	56.8	75.4	86.4	90.1	85.0	86.7
Latvia					39.7	61.5	68.5
Lithuania					41.9	79.9	72.9
Luxembourg					106.8	105.2	98.8
Malta	32.0	52.5	53.7	81.6	75.8	83.9	84.5
Netherlands	45.3	62.6	71.0	86.2	90.2	80.4	72.7
Poland	46.6	56.6	67.0	78.0	70.8	76.0	75.6
Portugal	20.0	34.0	46.7	63.5	87.0	87.4	90.3
Romania	28.1	40.5	60.2	64.5	48.3	61.6	53.4
Slovakia					54.8	62.1	58.6
Slovenia					86.4	87.1	82.0
Spain	21.8	46.0	75.6	96.7	114.9	106.0	93.1
Sweden	50.6	51.9	63.0	59.1	70.2	77.2	81.9
United Kingdom	69.3	74.3	69.3	72.5	78.5	85.7	82.5
European Union	51.9	66.8	79.4	84.6	84.2	83.2	82.6
Norway	37.9	41.2	49.8	51.2	61.8	65.1	65.9
Switzerland	56.9	73.1	84.4	83.4	72.4	72.3	74.4

⁸² 1961 was the first and 2011 the last year for which data was available at the FAO. For many newer European member countries, no data was available for 1961-1991. Belgium and Luxembourg as well as the Czech Republic and Slovakia have aggregated figures for 1961-1991. All data needs to be treated with care, the stark fluctuations between years could indicate certain difficulties and inconsistencies in accurately measuring meat consumption per capita and year.

Appendix 10: Measurement items used in this study

Appendix 10 describes the measurement items of the explanatory variables used in this study. It starts with a description of the environmental knowledge questions and its sources (table 34).

Table 34: Environmental knowledge questions to measure system and action-related knowledge and their sources (if no source is indicated, the question has mainly been developed by the author).

#	Environmental system knowledge	Action-related environmental knowledge
1	What is the major source of global human land use?	Which of the following represents the greatest threat to wild species populations?
2	The world population today is about 7 billion people. According to UN estimates, what will the world population be in the year 2050 (approximately)? (Source: Frick et al., 2004; with modifications)	What is the major driver for the deforestation of the Amazonian rainforest in South America?
3	The concept of ecological footprints refers to a measure of? (Source: Fryxell & Lo, 2003; with modifications)	If everyone in the world would consume as many natural resources and produce as much waste as the average European, we would need ___ planet(s) to sustain our lifestyle.
4	Which of the following sources is the largest contributor to global water pollution? (Source: Murphy, 2004; with modifications to question and answers)	Many lawn fertilizers and dishwashing detergents contain phosphorus which can be damaging to the environment. Which of the following is the major environmental impact of phosphorus? (Source: Murphy, 2004: 62)
5	Since the 1970s our planet is experiencing an “ecological overshoot”. What does that mean?	For a person to get the most food energy out of 50 kg of vegetables and grain the person should... (Source: Morrone et al., 2001; with modifications)
6	The international community considers global warming a serious threat. Therefore the United Nations Framework Convention on Climate Change (UNFCCC) has set the goal to keep the global temperature rise compared to pre-industrial levels below...	Food packaging materials are a major source of household waste. To minimize the volumes many materials are being recycled. However, materials differ in their recycling efficiency. Which of the following packaging materials is least suitable for recycling?
7	Climate experts warn that global warming will have severe consequences for the planet. Which of the following environmental problems are such expected consequences of global warming?	Ecologically speaking, which of the following types of water use are harmless? (Source: Frick et al., 2004)
8	Besides CO ₂ there are also other so-called greenhouse gases that contribute to global warming. Which of the following gases are considered greenhouse gases?	What are characteristics of certified organic farming in the European Union?
9	Why are many food policy experts concerned about future global food security?	Generally speaking, new purchases tend to cause environmental harm. However, in some cases it can also bring environmental benefits to purchase a new product. One possible example is replacing an old car with a new one. Why could it be good for the environment?

For the measurement of environmental attitudes, all 12 EAI dimensions, except “Support for population growth policies”, were incorporated in this study. This dimension proved to be rather problematic in the pretest and not necessarily consistent with the other environmental attitude dimensions. However, for most dimensions only one instead of two items was used. The reason was again the often found redundancy in statements. Milfont and Duckitt’s 24 suggested items often included a statement and a rather similar reversed statement. Here, the focus was on creating a good variety of statements in general while keeping the overall number of positive and negative statements in balance (see table 35).

Table 35: Measurement of environmental attitudes (Milfont & Duckitt, 2010: 91f). (+) indicates pro-environmental statements and (-) reversed statements.

#	Item	Dimension
1	I really like spending time in nature. (+)	Enjoyment of nature
2	Controls should be placed on industry to protect the environment from pollution, even if it means things will cost more. (+)	Support for interventionist conservation policies
3	I would not want to donate money to support an environmentalist cause. (-)	Environmental movement activism
4	[Nature] ⁸³ conservation is important even if it lowers peoples' standard of living. (+)	Conservation motivated by anthropocentric concern
5	Science and technology will eventually solve our problems with pollution, overpopulation, and diminishing resources. (-)	Confidence in science and technology
6	When humans interfere with nature it often produces disastrous consequences. (+)	Environmental threat
7	The idea that the balance of nature is terribly delicate and easily upset is much too pessimistic. (-)	
8	Turning new unused land over to cultivation and agricultural development should be stopped. (+)	Altering nature
9	When nature is uncomfortable and inconvenient for humans we should change and remake it to suit ourselves. (-)	
10	I am not the kind of person who makes efforts to conserve natural resources. (-)	Personal conservation behavior
11	Plants and animals have as much right as humans to exist. (+)	Human dominance over nature
12	Nature exists primarily for human use. (-)	
13	Protecting peoples' jobs is more important than protecting the environment. (-)	Human utilization of nature
14	Nature is valuable for its own sake. (+)	Ecocentric concern

⁸³ The original item only spoke of *conservation* but some pretesters found that a bit confusing, thus adding *nature* seemed like a good clarification.

The statements to measure animal welfare and health attitudes can be found in table 36.

Table 36: Measurement of animal welfare and health attitudes (mainly based on Cerak et al., 2011; de Barcellos et al., 2011 and Hoek et al., 2004).

#	Animal welfare attitudes	Health attitudes
1	The welfare of animals on farms does not matter to me. (-)	I consider myself to be very health conscious. (+)
2	Intensive animal farming causes stress and harm to farm animals and should be avoided. (+)	I don't like to ask myself all the time whether the things I eat are good for me. (-)
3	There is no alternative to intensive animal farming if we want to feed world population. (-)	My health is so important to me, that I am prepared to sacrifice many things for it. (+)
4	I support ethical animal farming, even if it means the supply of meat will decrease and its price increase. (+)	I exercise regularly to stay healthy. (+)
5	Thinking about the origin of meat does not trouble my conscience. (-)	I don't reflect a lot about my health. (-)
6	Animals are living beings that can suffer or be happy too. I therefore care about their treatment on farms. (+)	I have the impression that people around me pay more attention to their health than I do. (-)

Table 37 describes the FCM items used in this study. They are mainly based on the FCQ (Steptoe et al., 1995), but also include items from Lindeman & Väänänen (2000) and the TEMS (Renner et al., 2012).

Table 37: Measurement of FCMs (mainly based on Lindeman & Väänänen, 2000; Renner et al., 2012 and Steptoe et al., 1995).

#	Item: <i>It is important to me that the food I eat on a typical day...</i>	Food choice motive
1	...tastes good.	Sensory appeal
2	...is not expensive.	Price
3	...is good value for money.	Price
4	...keeps me healthy.	Health
5	...is high in protein.	Health
6	...helps me control my weight.	Weight control
7	...is largely free from food safety risks (e.g. food poisoning).	Food safety
8	...has been produced in a way that respects animals' rights.	Animal welfare concern
9	...has been produced in an environmentally friendly way.	Environmental concern
10	...is similar to what many of my friends and family eat.	Social norms
11	...is in line with what I perceive to be socially acceptable.	Social norms

The measurement of the remaining explanatory variables is explained in table 38. Again the formulation of some items was influenced by previous work (e.g. Ellen et al., 1991; Ellen, 1994; Roberts, 1996).

Table 38: Measures of food involvement, PCE, PBC, social norms and habit

Variable	Item(s)
Food involvement	<ul style="list-style-type: none"> ▪ Eating is a source of enjoyment for me. (+)
Perceived consumer effectiveness	<ul style="list-style-type: none"> ▪ When I buy products I tend to consider the consequences of my purchase decision for the environment and others. (+) ▪ There is not much I as a consumer can do to protect the environment. (-)
Perceived behavioral control	<ul style="list-style-type: none"> ▪ I find it difficult to change my diet. (-)
Social norms	<ul style="list-style-type: none"> ▪ I am very independent in my food choice. (-)
Habit	<ul style="list-style-type: none"> ▪ I am rather stable in the food I buy and eat. (+) ▪ I like to have great variation in my diet and try out new food products and meals. (-)

Appendix 11: Control for outliers in meat consumption behavior

Having two measures of meat consumption behavior, frequency and amounts allowed checking the consistency of responses. Therefore average meat intake per meal was calculated by dividing gram/frequency (on the basis of years). This value was then corrected for respondents' who reported to eat less than 50 or more than 300g per meal. While these intakes are certainly possible, they seem a bit odd for averages and often did not fit into the impression gained from reported frequencies of consumption.⁸⁴ Thus, the gram value was corrected to 50 or 300 for respondents lying below or above these values. This can still be considered a rather conservative correction of outliers (compared to, for example, replacing outliers with the mean value). As there were some outliers on both ends (13 respondents below 50 gram/meal and 9 respondents above 300 gram/meal) this correction also did not really change the overall descriptive statistics of the meat gram variable (e.g. a mean difference of less than 2 gram) but would improve subsequent statistical analyses that are vulnerable to extreme outliers.

⁸⁴ E.g. the lowest reported meat intake was five gram per meal and the highest 866,67 gram per meal.

Appendix 12: Multiple linear regression assumptions and diagnostics

For multiple linear regressions, the most important assumptions are an approximately normal distribution of all variables (or at least the residuals) involved and homogeneity of their variances. Additionally, there should be an approximate linear relationship between the EVs (individually and grouped) and the DV. There are also several assumptions regarding the residuals of the regression.⁸⁵ Finally, regression analysis is vulnerable to heteroskedasticity, multicollinearity and extreme outliers, so that these need to be checked and controlled for.

However, due to this rather long list of assumptions, Gorard (2003) concludes that “[i]n any real research project involving multiple regression, some of the assumptions underlying it are likely to be violated. This, in itself may not be fatal to the validity of the work, and even where the regression is flawed it is sometimes only the intercept (the constant b_0 in our first equation) that is affected, and the derived coefficients may still be used with care” (210). Therefore, “if you obtain a significant result it is still relatively safe even when some of these assumptions are not met” (ibid: 214).

The present data is no exception here. While most of the assumptions are met, several of the variables used for the regression are not exactly normally distributed. Especially for the DV, because of the large number of non-meat consumers a skewed distribution occurs (with many cases of zero consumption). But also some of the EVs such as animal welfare or environmental attitudes are not normally distributed as most respondents are found on the agreement side of the seven-point scale. However, as the residuals of the DV are normally distributed this should not concern too much (see figure 20).

⁸⁵ The residuals should also be approximately normally distributed, have constant and equal variance, be not correlated with the EVs. Further correlations between residuals of two cases should be zero and the residuals of the DV should have a mean of zero for each value of the EVs or should at least be linearly related (Gorard, 2003; Ho, 2006).

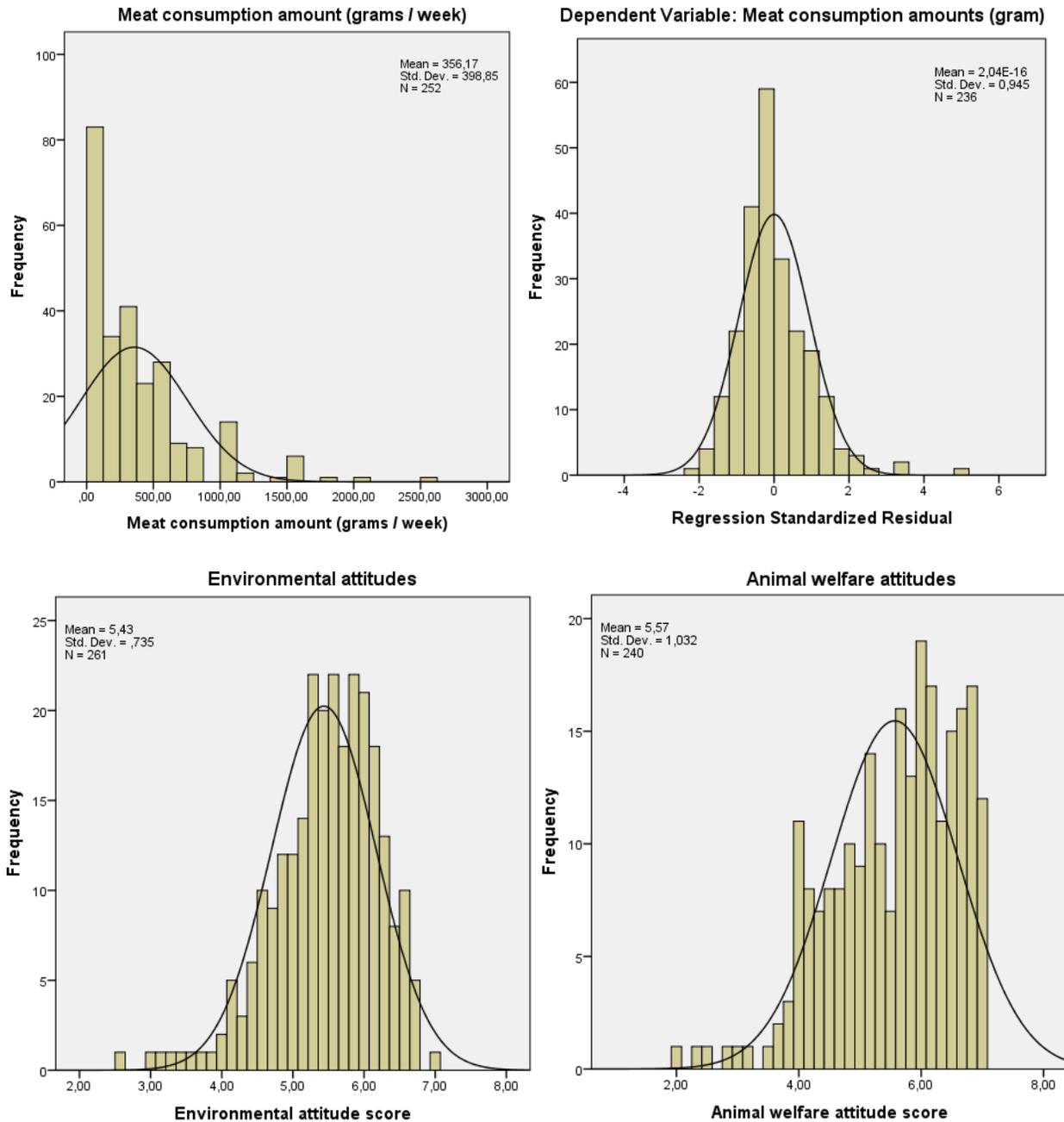


Figure 20: Four histograms showing the frequencies of the DV (meat consumption amounts) its residuals and two EVs (environmental and animal welfare attitudes) compared to a normal distribution curve.

Appendix 13: Additional results

The following section provides some additional results from the statistical analyses of the collected data. First of all, the differences between environmental and other students regarding the various EVs (table 39) and FCMs (table 40)

Table 39: EVs mean comparisons and t-test statistics for the groups of environmental and other students (*, ** and * indicate significance of variance between the two groups on 95, 99 and 99.9% confidence intervals).**

Explanatory variables	Environmental		T-test
	Other students	students	
Environmental system knowledge	4.97	6.30	.000***
Environmental action-related knowledge	4.75	5.73	.000***
Environmental attitude	5.33	5.69	.001**
Animal welfare attitude	5.44	5.88	.003**
Health attitude	4.60	4.67	.637
Perceived environmental benefit	3.89	4.17	.002**
Perceived consumer effectiveness	4.90	5.87	.000***
Perceived behavioral control	4.45	4.22	.304
Habit	3.64	3.68	.803
Social norm	2.65	2.92	.135
Food involvement	5.93	6.11	.301

Table 40: FCMs mean comparisons and t-test statistics for the groups of environmental and other students (*, ** and * indicate significance of variance between the two groups on 95, 99 and 99.9% confidence intervals).**

Food choice motives	Other	Environmental	T-test
	students	students	
...tastes good	6.24	6.37	.230
...is not expensive	5.21	4.83	.056
...keeps me healthy	5.97	5.97	.990
...is similar to what many of my friends and family eat	2.58	2.42	.440
...is good value for money	5.32	5.22	.554
...is largely free from food safety risks	5.71	6.08	.067
...is high in protein	3.99	4.00	.957
...is in line with what I perceive to be socially acceptable	3.35	3.94	.023*
...helps me control my weight	4.27	4.18	.746
...has been produced in an environmentally friendly way	4.90	5.66	.000***
...has been produced in a way that respects animals' rights	5.12	5.55	.041*

Table 41 and 42 provide the same statistics regarding the groups of male and female respondents.

Table 41: EVs mean comparisons and t-test statistics for male and female respondents (*, ** and * indicate significance of variance between the two groups on 95, 99 and 99.9% confidence intervals).**

Explanatory variables	Male	Female	T-test
Environmental system knowledge	5.51	5.22	.195
Environmental action-related knowledge	5.21	4.89	.130
Environmental attitude	5.13	5.62	.000***
Animal welfare attitude	5.26	5.76	.000***
Health attitude	4.29	4.83	.000***
Perceived environmental benefit	3.76	4.10	.000***
Perceived consumer effectiveness	4.90	5.34	.011*
Perceived behavioral control	4.22	4.50	.178
Habit	3.68	3.63	.694
Social norm	2.75	2.71	.798
Food involvement	5.89	6.03	.364

Table 42: FCMs mean comparisons and t-test statistics for male and female respondents (*, ** and * indicate significance of variance between the two groups on 95, 99 and 99.9% confidence intervals).**

Food choice motives	Male	Female	T-test
...tastes good	6.18	6.34	.106
...is not expensive	5.19	5.06	.451
...keeps me healthy	5.66	6.17	.000***
...is similar to what many of my friends and family eat	2.47	2.57	.605
...is good value for money	5.28	5.30	.886
...is largely free from food safety risks	5.51	6.00	.007**
...is high in protein	3.90	4.05	.463
...is in line with what I perceive to be socially acceptable	3.29	3.66	.123
...helps me control my weight	3.58	4.67	.000***
...has been produced in an environmentally friendly way	4.82	5.29	.008**
...has been produced in a way that respects animals' rights	4.78	5.52	.000***

Appendix 14: Regression models and R^2 s of other studies on sustainable food consumption

To put the moderate predictive strength of the regression models from this study into perspective a comparison with some other studies in the research field of sustainable food consumption is made. Therefore, the following table (43) describes other regression models and their R^2 s.

Table 43: Regression models and R^2 s and Pseudo- R^2 s of some of the reviewed studies on sustainable (food) consumption.

Author	Study / model description	R^2 (s)
De Boer et al. (2007)	Regression of FCMs and attitudes on values and personal characteristics; and food choices on attitudes, motives, values and personal characteristics.	Between 0.07 and 0.30
De Boer et al. (2009)	Motivational associations' influence on choosing free range or less meat.	Between 0.07 and 0.25
De Boer et al. (2013)	Familiarity with meat-free meals, frequency of meat consumption, value of care for nature, skepticism about climate change, gender, age and level of education as predictors for reception of a meat-free meal idea.	0.36 (Nagelkerke R^2)
Haron et al. (2005)	Participation in environmental activities and two educational level variables as predictors of environmental knowledge.	0.415
Hoek et al. (2011)	Used food neophobia, 11 FCMs, 13 product-related attitudes and beliefs and five socio-demographic variables to explain meat substitute consumption.	0.47 (adjusted)
Honkanen et al. (2006)	FCMs and attitudes towards organic food as predictors for the intention to consume organic food.	0.13 and 0.15
Saba & di Natale (1999)	Behavioral intention, habit and attitudes as predictors for meat consumption behavior.	Model A: 0.10, Model B: 0.22, Model C: 0.14
Tanner & Kast (2003)	Used six predictors (including environmental knowledge and attitudes) to explain green purchases	0.42
Tobler et al. (2011)	Multinomial regression for willingness to reduce meat consumption using different (food choice) motives and food-related attitudes as predictors.	0.35 (Nagelkerke R^2)
Tobler et al. (2012)	Consumer perceptions (perceived responsibility, PEB), political affiliation and several other variables as predictors for willingness to act or support climate policy measures.	0.42 and 0.61
Vermeir & Verbeke (2008)	Personal attitudes, social influences, PCE and perceived availability as predictors of <i>intention</i> to consume sustainable dairy products.	0.50
Welsch & Kühling (2009)	Demographic characteristics, environmental attitudes, economic and cognitive factors, consumption patterns of reference persons and own consumption patterns in the past as determinants of three sustainable consumption behaviors: installing solar energy equipment, subscribe to green-electricity and buying organic food.	Pseudo- R^2 s between 0.139 and 0.467. Pseudo- R^2 s for organic food: 0.139, 0.230 and 0.285

Appendix 15: Explanations of possible response strategies used by survey respondents

Bethlehem and Biffignandi (2012) mention the following response strategies that respondents sometimes follow to get through a survey. These can diminish the quality of the collected data.

- Satisficing: While progressing through the survey many respondents get tired or lose interest leading to less time and effort spent to give accurate answers
- Response order effects: Respondents choose the first answer that sounds acceptable to them, without actually reading the whole list of answers.
- Acquiescence: Respondents show a general tendency to agree with questions irrespective of their content.
- Endorsing the status quo: When asked about their opinions regarding change, many respondents endorse the status quo (no change) as they consider it the easiest answer. This may, for example, have biased responses to the questions whether respondents would change their meat consumption levels in reaction to price changes
- Nondifferentiation: If similar scales are used for several questions, respondents tend to use the same answers (e.g. mostly choosing 'somewhat agree' for many questions, irrespective of their content).

Appendix 16: Complete survey questionnaire

The final pages give the exact order and wording of the questionnaire as it was hosted on the website and appeared to respondents.

PART 1: Introduction

Page 1

*Hello and welcome to our survey: *

"Environmental awareness among European students"

In the last two decades, environmental issues have become more and more popular. But does this trend really have an impact on people's lives? Many environmental problems are rather abstract, complex and involve a lot of uncertainty. It is therefore often difficult for people to stay informed and really relate to these issues in their daily lives.

The purpose of this survey is to explore environmental awareness among European students. What does this upcoming generation know about the environment, what are their perceptions and opinions on environmental issues and does it have an impact on their daily lives?

The survey has been developed by Mr. Nils Heuer (MSc. Sustainable Development, Utrecht University) and will be used to complete his Master thesis. The project is supervised by Dr. Mendel Giezen (Utrecht University).

The success of every survey largely depends on a sufficient number of responses. We therefore used various means to distribute this survey to a large number of European students and are glad that our invitation has reached you. We hereby, kindly ask you to contribute to our research by participating in this survey. It will take about 30 minutes.

All your responses will be kept confidential, remain anonymous and only serve the stated research purposes. Your participation is entirely voluntary and you are free to withdraw from the survey at any time.

If you have any questions or comments about the survey and research please contact Mr. Nils Heuer (n.heuer@students.uu.nl).

Thank you!

PART 2: Environmental Knowledge

Page 2

We start this survey with an assessment of your environmental knowledge. We therefore developed a couple of Multiple-Choice questions that we would like you to answer. The questions offer three to six answers and in most cases (unless indicated otherwise) only one of the answers is correct. Please select for each question the one answer that is most logical to you!

Additionally, we added "I have no idea" as an answer option of last resort, in case you have absolutely no idea about the question and its correct answer.

Good luck!

S1 What is the major source of global human land use?

- Agriculture**⁸⁶
- Infrastructure
- Industry
- Human settlements
- I have no idea

S2 The world population today is about 7 billion people. According to UN estimates, what will the world population be in the year 2050 (approximately)?

- 6.5 billion
- 8 billion
- 9.5 billion**
- 11 billion
- I have no idea

S3 The concept of ecological footprints refers to a measure of?

- The earth's biological capacity
- A person's contribution to sustainable development
- The amount of CO2 emissions per unit of analysis
- The amount of biologically productive land and water needed to support a unit of analysis**
- I have no idea

Page 3

Q04 Which of the following sources is the largest contributor to global water pollution?

- Mining
- Livestock**
- Household waste
- Radioactive waste
- Oil and gas production
- I have no idea

⁸⁶ * Correct answer(s) are indicated in **bold**.

- S5** Since the 1970s our planet is experiencing an "ecological overshoot". What does that mean?
- The natural balance of the planet has been disturbed and some ecosystems and species are dramatically expanding while others diminish
 - Thanks to the green revolution in agriculture the amount of biological matter on earth is increasing
 - On a global scale afforestation rates have surpassed deforestation rates, which means that global forest coverage is increasing
 - Every year humanity is using up more natural resources and producing more waste than nature can regenerate and absorb**
 - I have no idea

- A6** Which of the following represents the greatest threat to wild species populations?
- Pollution
 - Habitat loss**
 - Genetic engineering
 - Hunting and poaching
 - Competition with invasive species
 - I have no idea

Page 4

- S7** The international community considers global warming a serious threat. Therefore the United Nations Framework Convention on Climate Change (UNFCCC) has set the goal to keep the global temperature rise compared to pre-industrial levels below...
- 1°C
 - 2°C**
 - 3°C
 - 4°C
 - 5°C
 - I have no idea

- A8** What is the major driver for the deforestation of the Amazonian rainforest in South America?
- Biofuel production
 - Wood and timber production
 - Slash-and-burn agriculture
 - Cattle ranching**
 - Human settlements
 - Infrastructure projects (dams, roads, railways,...)
 - I have no idea

- A9** If everyone in the world would consume as many natural resources and produce as much waste as the average European, we would need ___ planet(s) to sustain our lifestyle.
- 1
 - 2
 - 3**
 - 4
 - 5
 - I have no idea

Page 5

Hang in there, you are already half-way through the knowledge test!

A10 Many lawn fertilizers and dishwashing detergents contain phosphorus which can be damaging to the environment. Which of the following is the major environmental impact of phosphorus?

- It has an unpleasant smell
- It is poisonous to fish
- It pollutes groundwater
- It promotes excessive plant and algae growth in lakes and rivers**
- I have no idea

A11 For a person to get the most food energy out of 50 kg of vegetables and grain the person should...

- Eat the vegetables and grain**
- Feed the vegetables and grain to an animal and eat the meat
- Feed the vegetables and grain to chickens and eat their eggs and meat
- Feed the vegetables and grain to a cow to produce milk, feed the milk to a calf and later eat its meat
- I have no idea

A12 Food packaging materials are a major source of household waste. To minimize the volumes many materials are being recycled. However, materials differ in their recycling efficiency. Which of the following packaging materials is least suitable for recycling?

- Glass (e.g. for bottles or jars)
- Paper (e.g. for carton boxes)
- Plastic (e.g. for bottles)**
- Aluminum (e.g. for cans)
- Steel (e.g. for cans)
- I have no idea

Page 6

From now on, one or more answers can be correct! Please select all answers that you think are correct.

A13 Ecologically speaking, which of the following types of water use are harmless?

Please choose **all** that apply:

- Use of lake water as drinking water**
- Use of ground water as drinking water
- Use of water power to produce energy
- I have no idea

S14 Climate experts warn that global warming will have severe consequences for the planet. Which of the following environmental problems are such expected consequences of global warming?

- Globally increased rainfall
- Rising sea levels**
- More extreme weather events**
- Ozone depletion
- Species extinctions**
- I have no idea

S15 Besides CO₂ there are also other so-called greenhouse gases that contribute to global warming. Which of the following gases are considered greenhouse gases?

- Nitrogen (N₂)
- Nitrous Oxide (N₂O)**
- Argon (Ar)
- Helium (He)
- Methane (CH₄)**
- I have no idea

Page 7

Again the reminder that one or more answers can be correct for the following questions!

S16 Why are many food policy experts concerned about future global food security?

- Because the population is growing**
- Because agricultural productivity is decreasing
- Because meat consumption levels are rising**
- Because freshwater is running out**
- I have no idea

A17 What are characteristics of certified organic farming in the European Union?

- No other inputs than from the farm itself are used
- The use of chemical pesticides, fertilizers and antibiotics is strictly limited**
- Principles of holistic agriculture are applied to restore and support natural cycles
- Farm animals are treated according to enhanced animal welfare conditions (e.g. free-grazing in open air)**
- I have no idea

A18 Generally speaking, new purchases tend to cause environmental harm. However, in some cases it can also bring environmental benefits to purchase a new product. One possible example is replacing an old car with a new one. Why could it be good for the environment?

- New cars have more fuel efficient engines**
- New cars do not emit CO₂
- Old cars emit more pollutants**
- Old cars can completely be recycled
- Car production is not really resource intensive
- I have no idea

Pages 8

Congratulations!

You have successfully completed the knowledge test. If you are interested in your results, the correct answers will be given at the end of the survey.

PART 3: Environmental Attitudes

We now continue with some general statements about the environment and would like to hear your opinion on that.

Q19 Please indicate your level of agreement/disagreement with the following statements.

	Strongly disagree	disagree	Somewhat disagree	undecided	Somewhat agree	agree	Strongly agree
I really like spending time in nature.							
When nature is uncomfortable and inconvenient for humans we should change and remake it to suit ourselves.							
Protecting peoples' jobs is more important than protecting the environment.							
Plants and animals have as much right as humans to exist.							
I am not the kind of person who makes efforts to conserve natural resources.							
When humans interfere with nature it often produces disastrous consequences.							
Nature is valuable for its own sake.							

Page 9

Q20 Please indicate your level of agreement/disagreement with the following statements.

	Strongly disagree	disagree	Somewhat disagree	undecided	Somewhat agree	agree	Strongly agree
Nature exists primarily for human use.							
Controls should be placed on industry to protect the environment from pollution, even if it means things will cost more.							
I would not want to donate money to support an environmentalist cause.							
Turning new unused land over to cultivation and agricultural development should be stopped.							
Nature conservation is important even if it lowers peoples' standard of living.							
The idea that the balance of nature is terribly delicate and easily upset is much too pessimistic.							
Science and technology will eventually solve our problems with pollution, overpopulation, and diminishing resources.							

PART 4: Perceived Environmental Benefit

Page 10

Environmentalists say there are many things consumers can do to help protecting the environment. However it is not always clear whether these behaviors are really beneficial for the environment and to what extent. What is your opinion?

Q21 How important is it for the environment that consumers ...

	Unimportant	of little importance	moderately important	important	very important
avoid plastic bags and excessive product packaging.					
avoid regular car usage and long trips for grocery shopping.					
drink tap water instead of buying bottled water.					
consume less animal products (meat, eggs, dairy).					
consume mainly local and seasonal food products.					
consume more fair trade instead of conventional products.					
consume more organic instead of conventional products.					
reduce and recycle household food waste.					

PART 5: Consumer behavior and opinion

Page 11

With these last questions we have already turned our attention to food consumption and would like to continue. After all, food is a fundamental part of our life and every day we make decisions about the products we buy and the food we eat.

Q22 How would you describe your food purchase and consumption behavior? Most of the time ...

- I shop, cook and eat alone
- I shop, cook and eat together with others (e.g. family, partner, friends, flat mates)
- I eat outside (e.g. canteen, cafeteria, restaurants)
- Someone else (e.g. family, partner, friends) shops and cooks for me
- Someone else shops for me but I decide what of it I cook and eat
- Other

Q23 How would you describe your personal interest in food consumption and its environmental impacts?

- Very high
- High
- Neither high nor low
- Low
- Uninterested

Q24 Do you eat meat?

- Yes
- No

With meat we mean all types of meat products (including processed meat, sausages and other types of cold meat) derived from land animals (e.g. cows, pigs) and birds (e.g. chicken, duck, turkey). Fish and other types of seafood are not considered as meat in this survey.

PART 6: Assessment of food consumption related explanatory variables

What is your opinion regarding the following statements about food purchase and consumption?

Q25 Please indicate your level of agreement/disagreement with the following statements.

	Strongly disagree	disagree	Somewhat disagree	undecided	Somewhat agree	agree	Strongly agree
Eating is a source of enjoyment for me.							
I like to have great variation in my diet and try out new food products and meals.	Habit						
When I buy products I tend to consider the consequences of my purchase decision for the environment and others.	PCE						
I am very independent in my food choice.	Norm						
I find it difficult to change my diet.	PBC						
There is not much I as a consumer can do to protect the environment.	PCE						
I am rather stable in the food I buy and eat.	Habit						

Q26 Please indicate your level of agreement/disagreement with the following statements.

[Only answer this question if the following conditions are met: Answer was 'Yes' at question '24 [Q24]' (Do you eat meat?)]

	Strongly disagree	disagree	Somewhat disagree	undecided	Somewhat agree	agree	Strongly agree
I really like to eat meat.							
I am very conscious about the amount and type of meat I buy.							
I have little knowledge about and experience with vegetarian diets and meat alternatives.	PBC						
Sometimes eating meat makes me feel uneasy.							
When I buy meat I choose whatever I want and can afford.							

Q27 Does your religion influence your meat consumption?

[Only answer this question if the following conditions are met: Answer was 'Yes' at question '24 [Q24]' (Do you eat meat?)]

- Yes
- No

If you are not religious simply choose "No".

PART 7: Food Choice Motives

Our food choice can be influenced by a variety of motives. Please indicate your level of agreement or disagreement on the importance of the following aspects for your own personal food choice.

Q28 It is important to me that the food I eat on a typical day ...

	Strongly disagree	disagree	Somewhat disagree	undecided	Somewhat agree	agree	Strongly agree
tastes good.							
is not expensive.							
keeps me healthy.							
is similar to what many of my friends and family eat.							
is good value for money.							
is largely free from food safety risks (e.g. food poisoning).							
is high in protein.							
is in line with what I perceive to be socially acceptable.							
helps me control my weight.							
has been produced in an environmentally friendly way.							
has been produced in a way that respects animals' rights.							

PART 8: Meat consumption

Now we have some more specific questions about your meat consumption habits.

[Only answer the following questions if the following conditions are met: Answer was 'Yes' at question '24 [Q24]' (Do you eat meat?)]

Q29 On average, how often do you consume meat products?

- Every day
- Several times a week
- Several times a month
- Several times a year

Q30a On average, how many times a day do you consume meat?

[Only answer this question if the following conditions are met: Answer was 'Every day' at question '29 [Q00029]' (On average, how often do you consume meat products?)]

- Once a day (e.g. lunch or dinner)
- Twice a day (e.g. lunch and dinner)
- Three times a day (e.g. breakfast, lunch and dinner)

Q30b On average, how many days per week do you consume meat products?

[Only answer this question if the following conditions are met: Answer was 'Several times a week' at question '29 [Q00029]' (On average, how often do you consume meat products?)]

- 1 day per week
- 2 days per week
- 3 days per week
- 4 days per week

- 5 days per week
- 6 days per week

Q30c On average, how many days per month do you consume meat?

[Only answer this question if the following conditions are met: Answer was 'Several times a month' at question '29 [Q00029]' (On average, how often do you consume meat products?)]

- 1 day per month
- 2 days per month
- 3 days per month
- 4 days per month
- 5 days per month

Q30d On average, how many days per year do you eat meat?

[Only answer this question if the following conditions are met: Answer was 'Several times a year' at question '29 [Q00029]' (On average, how often do you consume meat products?)]

- 1-2 day(s) per year
- 3-4 days per year
- 5-6 days per year
- 7-8 days per year
- 9-10 days per year
- 11-12 days per year

Q31 On average, how many grams of meat do you consume in a week?

[Only numbers may be entered in this field.]

Previous studies have shown that many consumers have difficulties to accurately estimate their consumption levels. So we encourage you to take the time and think back about how much meat you bought and ate in the last seven days. Additionally, we provide a couple of meat product averages below to further help you with your calculation:

- * 1 piece of steak: 150-200g
- * 1 slice of sausage to put on bread: 10-15g
- * 1 chicken breast: ~100g
- * 1 meat ball: ~30g
- * 1 fried sausage: 80-100g
- * 1 hamburger: 100-120g
- * 1 pizza salami: 40g (of salami)
- * Many meat dishes (e.g. spaghetti bolognese, gyros with rice, chili con carne, curry chicken with vegetables and rice, lasagne,...) suggest between 100-150g of meat per person.
- * Many sausage packages (for bread) sold in supermarkets contain between 80-200g.
- * Many meat packages sold in supermarkets contain between 250-500g.

Q32 Please order the following types of meat by your amount of consumption, beginning with the one you consume the most.

- Beef
- Pork
- Poultry (e.g. chicken, turkey)
- Sheep and goat
- Other kinds of meat (e.g. rabbit, deer)



Box for ranking (drag & drop)

Only rank the types of meat you are actually consuming and leave the one's you never eat on the left side.

Q33 How would you describe your own level of meat consumption?

- Very high
- High
- Neither high nor low
- Low
- Very low

Based on your own perception of what you consider to be a high or low level of meat consumption.

Q34 In the past six months, would you say your meat consumption did ...

- Increase
- Decrease
- Stay the same

Q35 In the next six months, do you think your meat consumption will ...

- Increase
- Decrease
- Stay the same

Q36 If meat would be cheaper, do you think your meat consumption would increase?

- Yes
- No

Q37 If meat would be more expensive, do you think your meat consumption would decrease?

- Yes
- No

Q38 When you buy meat, how often do you opt for a more sustainable alternative like "grass-fed", "pasture-raised" or "organic"?

- Always (95-100%)
- Very often (75-95%)
- Often (50-75%)
- Sometimes (25-50%)
- Rarely (5-25%)
- Never (0-5%)

"Grass-fed" states that ruminants like cows have been fed with grass instead of heavy-grain animal feed like corn and soy (often supplemented with synthetic hormones, antibiotics or animal byproducts) that is used in industrial farming. Ruminants' stomachs evolved to digest grass and cows can suffer digestive problems from grain feed.

"Pasture-raised" means that farm animals are raised in more traditional and humane conditions. Animals are raised outdoors and stay on a more natural diet instead of being fattened in a feedlot or confined facility.

"Organic" means that the animals have been fed with organic grown feed and there are very strict limitations regarding the use of hormones and antibiotics. Additionally, certain animal welfare standards have to be fulfilled (free-range, open-air, farming practices appropriate to the livestock species).

PART 8.1 Religion

Page 18

Q39 In what way does your religion influence your meat consumption?

[Only answer this question if the following conditions are met: Answer was 'Yes' at question '27 [Q27]' (Does your religion influence your meat consumption?)]

Please choose ***all*** that apply:

- I eat less meat in total
- I don't eat specific types of meat
- Other:

Q40 Which types of meat are you not eating?

[Only answer this question if the following conditions are met: Answer was 'I don't eat specific types of meat' at question '39 [Q39]' (In what way does your religion influence your meat consumption?)]

Please choose ***all*** that apply:

- Beef
- Pork
- Poultry
- Sheep
- Goat
- Other:

Page 19

PART 8.2 Non-meat consumption

Q41 How would you describe your diet?

[Only answer the following questions if the following conditions are met: Answer was 'No' at question '24 [Q24]' (Do you eat meat?)]

- Pescetarian
- Vegetarian
- Vegan
- Other

Definitions (used for this study):

A pescetarian diet is a diet that includes fish and seafood but not the flesh of other animals.

A vegetarian diet is a diet that does not contain any types of meat products from any type of living animal (including poultry and fish).

A vegan diet is a diet that does not contain any animal products including eggs, dairy products and other animal derived substances (animal fats, gelatin, etc.).

Q42 When did you stop eating meat?

Please write your answer here:

Please name the year and month (approximately) that you stopped eating meat.

Q43 If asked about your motivation, what would you say was your primary reason to stop eating meat?

- * Animal welfare
- * Personal health
- * Environmental concern
- * Other

PART 9: Animal welfare and health attitudes

Once again, we prepared some more statements to find out more about your attitudes. This last time we would like to know your opinion on animal welfare and personal health (next page).

Q44 Please indicate your level of agreement/disagreement with the following statements.

	Strongly disagree	disagree	Somewhat disagree	undecided	Somewhat agree	agree	Strongly agree
The welfare of animals on farms does not matter to me.							
Intensive animal farming causes stress and harm to farm animals and should be avoided.							
There is no alternative to intensive animal farming if we want to feed world population.							
I support ethical animal farming, even if it means the supply of meat will decrease and its price increase.							
Thinking about the origin of meat does not trouble my conscience.							
Animals are living beings that can suffer or be happy too. I therefore care about their treatment on farms.							

Q45 Please indicate your level of agreement/disagreement with the following statements.

	Strongly disagree	disagree	Somewhat disagree	undecided	Somewhat agree	agree	Strongly agree
I consider myself to be very health conscious.							
I don't like to ask myself all the time whether the things I eat are good for me.							
My health is so important to me, that I am prepared to sacrifice many things for it.							
I exercise regularly to stay healthy.							
I don't reflect a lot about my health.							
I have the impression that people around me pay more attention to their health than I do.							

PART 10: Student information

Finally, we would like you to provide some general information about yourself and your studies (next page). We again assure you that this survey is completely anonymous, all information is kept confidential and will only be used for the stated research purposes.

Q46 What is your nationality?

According to your passport. If you have two nationalities, pick the one you feel more belonging to.

Q47 What is your age?

Only numbers may be entered in this field.

Q48 What is your gender?

- Female
- Male

Last questions!

Q49 In which European country do you study?

Q50 To which academic discipline does your study program belong?

- Arts and humanities (e.g. art, history, languages, literature, philosophy, theology)
- Biological sciences (e.g. agriculture, biology, environmental science, life science)
- Business (e.g. business administration, finance, management, marketing)
- Education (all kinds)
- Engineering (e.g. civil, electrical, industrial, mechanical)
- Medical and health sciences (e.g. medicine, pharmacy, therapy)
- Physical sciences (e.g. chemistry, earth science, mathematics, physics)
- Social sciences (e.g. economics, geography, sociology)
- Other

Q51 Do you study an environmental program?

- Yes
- No

Examples are: Environmental Science, Environmental Studies or Sustainable Development.

Q52a What is the name of your study program?

[Only answer this question if the following conditions are met: Answer was 'Yes' at question '51 [Q51]' (Do you study an environmental program?)]

Please write your answer here:

Q52b How often are environmental issues and problems a topic of your study courses?

[Only answer this question if the following conditions are met: Answer was 'No' at question '51 [Q51]'

(Do you study an environmental program?)]

- Never
- Very rarely
- Rarely
- Occasionally
- Frequently
- Very frequently

PART 11: END

Page 24

Well done! You have successfully completed our survey!

Thanks a lot for your participation.

You made a very valuable contribution to our research.

Please share this survey with some of your fellow students if you liked it or want to further support our research!

As promised, you can find the correct answers to the knowledge test by following the provided link below: Answers to environmental knowledge questions
(<http://nilspilsblog.wordpress.com/2014/04/06/answers-to-survey-questions-about-environmental-knowledge/>)

Thank you for completing this survey.