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Socio-demographic determinants and health related behaviors associated with sustainable food related choices

A quantitative, cross-sectional study of sustainable food and dietary choices among parents of elementary school children in Norway

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This master's thesis is carried out as a part of the education at the University of Agder and is therefore approved as a part of this education. However, this does not imply that the University answers for the methods that are used or the conclusions that are drawn.

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Abstract

Background and objectives: Creating a sustainable food system is considered a global challenge. Evidence suggests reductions of food waste and animal product consumption are among the most important consumer level changes in a food sustainability perspective. The present study aims to gain more knowledge on who is likely to make sustainable food related choices, focusing on household food waste and consumption of animal products.

Methods: A selection of socio-demographic determinants and health related behaviors were included in the study. Data were obtained from a questionnaire survey from the study "Fruits and Vegetables Make the Marks". All data is self-reported information from parents of elementary school children. To determine the association between the included variables, independent samples t-test and chi square statistics were performed, followed by two separate multivariate logistical regression analyses.

Results: Increasing age and high level of education were significant correlates of low household food waste. High annual income and high consumption of unhealthy snacks were associated with more household food waste. Increasing age, high annual income and high consumption of fruits and vegetables were associated with attempting to reduce consumption of animal products.

Conclusion: Age, socio-economic status (SES) and type of diet seem to be key determinants of sustainable food related choices at consumer level. The effect of SES varied according to food waste and animal product consumption. SES as measured by annual household income or by parent educational level also led to different results. The association between SES and sustainable food related choices should be a topic for further research.

Keywords: Diet sustainability, food waste, animal products, socio-demographic determinants, health related behaviors

Sammendrag

Bakgrunn og hensikt: Å skape et bærekraftig matsystem ses som en global utfordring. Tidligere forskning viser at reduksjon i matsvinn og redusert forbruk av animalske produkter, er blant de viktigste forbrukerendringene i et bærekraftperspektiv. Målet med denne studien er å gi økt kunnskap om hvem som ønsker å ta bærekraftige matrelaterte valg, med fokus på matsvinn og forbruk av animalske produkter i husholdninger.

Metode: Utvalgte sosio-demografiske determinanter og helserelaterte atferder ble undersøkt ved hjelp av data fra spørreskjemaet benyttet i studien "Fruits and Vegetables Make the Marks". Alle data er selvrapportert informasjon fra foreldre til skolebarn. For å undersøke de utvalgte variablenes betydning for å gjøre bærekraftige matrelaterte valg, ble uavhengige T-tester og chi-kvadratstester utført, etterfulgt av to separate multivariate logistiske regresjonsanalyser.

Resultater: Økende alder og høy utdannelse var signifikante korrelater for å redusere kasting av mat. Høy årlig inntekt og høyt inntak av usunn snacks i kostholdet var assosiert med mer matsvinn i husholdningen. Økende alder, høy årlig inntekt og høyt inntak av frukt og grønnsaker i kostholdet var assosiert med å prøve og redusere forbruket av animalske produkter.

Konklusjon: Alder, sosioøkonomisk status og type kosthold virker å være viktige determinanter for å ta bærekraftige matrelaterte valg. Effekten av sosioøkonomisk status varierte i henhold til matsvinn og forbruk av animalske produkter. Sosioøkonomisk status målt ved husholdningens årlige inntekt eller forelderens utdanningsnivå ga også ulike resultater. Assosiasjonen mellom sosioøkonomisk stauts og bærekraftige matrelaterte valg er et område for videre forskning.

Nøkkelord: Bærekraftig kosthold, matsvinn, animalske produkter, sosio-demografiske determinanter, helseatferder

List of abbreviations

BMI – Body mass index
CH_4 – Methane
CO_2 – Carbon dioxide
FAO – Food and Agriculture Organization of the United Nations
FSC – Food supply chain
GHGE – Green house gas emissions
KCAL – Kilocalories
LCA – Life cycle assessments
N_2O – Nitrous oxide
SES – Socio-economic status
WRAP – Waste and Resources Actions Plan

List of figures

List of tables

TABLE OF CONTENTS

1.0 INTRODUCTION

By 2050, world population is expected to have passed nine billion people. In comparison, the global population of 1950 was approximately two and a half billion (U.S Census Bureau 2015). One of the main challenges of this rapid population growth is to ensure adequate food supply to support human life, within the ecological boundaries of our planet. Presently, the agricultural part of our food system accounts for 22% of global green house gas emissions (GHGE) worldwide, making agricultural emissions equivalent to industry emissions, and higher than total global emissions from the transport sector (Lundqvist, de Fraiture & Molden 2008). In addition to the agricultural emissions, emissions arise from activities such as processing, transport, storage and refrigeration throughout the value chain of food.

Because of population growth, consumption growth and the threat of climate change, food production and food security are very likely to become even larger global challenges in future years (Whitmee et al. 2015). As many ecosystems already are under pressure, food security challenges are projected to become more complex than ever (European Commission 2011). In order to produce enough food to feed an expanding global population, it is estimated that current food production must be doubled by 2050, measured by number of calories (United Nations 2009). This estimate is supported by Godfray et al. (2010) and the European Commission (2011), suggesting a 50-70% increase in food production is needed by the middle of the 21st century.

The individual consumer may have a key role to help mitigate the pressure on global food production by choosing to keep a diet that is environmentally sustainable. Although new policies and technologies may facilitate the challenge of increasing the global food production to meet higher demands, such measures are not likely to be sufficient to solve the situation (Garnett 2011). In both developed and developing countries, there is a need to change current food systems towards more sustainable production- and consumption patterns.

The present study deals with food sustainability in relation to the challenges of excessive food waste and high per capita consumption of animal products in developed countries. Both food waste and consumption of animal products constitute great opportunities for improvement in this area (Parfitt, Barthel & Macnaughton 2010, Garnett 2014) To gain more knowledge of determinants and behaviors linked to sustainable food related choices, is likely to be

important to improve both health and sustainability of food consumption patterns. Further, knowledge of relevant determinants may contribute to more successful development and implementation of public health measures (Bartholomew, Parcel, Kok, Gottlieb & Fernández 2011) and the present study may facilitate measures aimed at reducing animal product consumption and food waste among consumers.

1.3 Research question

Recognizing the importance of the environmental impacts of our food system, this study will address the following research question: *"Who is most likely committed to implement a sustainable diet?"* In the present study, sustainable food related choices are indicated by low amount of household food waste and animal product consumption. The research question is examined according to selected socio-demographic determinants and health related behaviors of parents of elementary school children in Norway. Hence, the main aim of the study is to provide extended knowledge of the socio-demographic determinants and health related behaviors possibly influencing sustainable food related choices.

2.0 THEORETICAL FRAMEWORK

2.1 Food related sustainability

The topic of food sustainability is not new. However, the environmental impact of our food system has led to renewed attention to food related sustainability, corresponding to increasing concerns of global climate change. Some of the oldest, yet modern research articles on food sustainability date back to the 1980s and 1990s (Gussow & Clancy 1986, Goodland 1997), but the body of research on food related sustainability has increased a lot in recent years. Recent evidence indicates an increasing consensus that the establishment of a more sustainable food system is necessary both to mitigate climate change, as well as global hunger and malnutrition (Stuart 2009, Carlsson-Kanyama & González 2009). In the present study, the definition of "*sustainable diet*" developed by the Food and Agriculture Organization of the United Nations (FAO) is adopted:

> Sustainable diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources (FAO 2012a, p. 7).

The FAO (2011) definition of a sustainable diet recognizes the complexity of the "sustainability" term, yet in the present study the main focus will be on the *environmental* aspect of food and dietary sustainability. The environmental perspective on food sustainability more specifically concerns the environmental impact of different food products throughout their life cycle. From agricultural production to post-consumer stages, examples include environmental impacts related to food losses and waste, intensive labor-, water- and energy use, excessive land use, deforestation and biodiversity threats, greenhouse gas emissions (GHGE) and contribution to climate change.

Food related sustainability is important, as the present food system involves unsustainable and unfair practices (Godfray et al. 2010). Currently, the global food system puts great pressure on variety of natural resources, which is adversely affecting the environment. Projected

climate change is, in addition to an expanding global population, also expected to adversely affect food production and food security (Parfitt et al. 2010, Whitmee et al. 2015). An important strategy in addressing these challenges is to increase sustainability and efficiency throughout the global food supply chains (FSC). In this context, sustainability is obtained when food production is adequate to achieve food security, in such a way that it does not compromise the availability of food for future generations.

Furthermore, recent research highlights contrasting sustainability challenges in the global food sector. In developing countries, current challenges are resource scarcity, water scarcity, effects of climate change and malnourishment among populations. On the other hand, large amounts of consumer food waste and an epidemic prevalence of overweight and obesity is seen in developed countries (Lundqvist et al. 2008, Tilman & Clark 2014). These contrasts illustrate a problem of low sustainability and efficiency in our food system. Wastage of food surpluses in developed countries is environmentally harmful, causes large financial losses and not least represents a significant humanitarian problem. Furthermore, developed countries have a high total consumption of animal food products, and in developing countries consumption is increasing. Due to the resource- and emission-intensive production of animal products, the high consumption of these products is unfavorable from a sustainability perspective.

Guidelines for food related sustainability

Recent research suggests there is no specific or unique sustainable diet. Instead, there are a number of different consumption patterns that are more sustainable, as measured by the environmental footprint associated to them (Macdiarmid 2013, Riley & Buttniss 2011).

In a sustainable diet, both health- and environmental considerations should be integrated. A healthy diet in terms of nutrition may not be environmentally friendly in terms of the associated environmental impacts. Likewise, a sustainable diet may not meet nutritional needs, if carried out with insufficient knowledge. Previous research reviews this challenge of diet, health and environmental sustainability as “the nutritional dilemma” or “the nutritional challenge” (Millward & Garnett 2010, Macdiarmid 2013, Tilman & Clark 2014). This challenge reflects the need to cover all necessary nutrients in a satisfactory manner, while simultaneously maintaining sustainability considerations. Presently, there is a growing interest to promote diet recommendations that meet both nutritional and environmental

requirements. Some pioneer countries; the UK, Australia, the Netherlands and Sweden, have already developed national dietary recommendations that integrate both health and sustainability advice to the population (Sustainable Development Commission 2009).
In these recommendations, priority areas are to increase consumption of plant-based and local food, reduce food waste, eat only sustainably produced fish products, reduce consumption of meat and processed food products and reduce consumption of beverages rich in sugar.

In accordance with existing food and dietary sustainability recommendations, a number of consumer-level measures are relevant. Examples include reducing overconsumption of food in developed countries (cf. the obesity epidemic), eating local, seasonal food, choosing organic food and drinking less bottled beverages. Reducing "unnecessary" food items with low nutritional value, such as alcohol, caffeine drinks, tea and sweets is another sustainable measure, albeit with a lesser beneficial impact (Garnett 2009). Overconsumption of food is by some considered the same as food waste (Gussow & Clancy 1986), and should be reduced in order to alleviate the pressure on food production and have food distributed more evenly. Consumption of local and seasonal food is considered feasible consumer measures, as it requires only small dietary changes (Tobler, Visschers & Siegrist 2011). Thus, transport related emissions could be largely reduced. In terms of organic food production, the evidence of associated environmental benefits is unclear. A European meta-analysis (Tuomisto, Hodge, Riordan & Macdonald 2012) suggests there is uncertainty in the environmental benefits of organic agriculture compared to conventional production. Organic agriculture displayed better results in terms of soil quality, fertilizer and pesticide use. However, when measured by amount of product, the lower yield of organic agriculture made land use considerably higher than in conventional agriculture.

Despite all the above-mentioned consumer-level measures, there are two aspects of food related sustainability that are consistently highlighted as high-priority in existing literature: reducing food waste and reducing consumption of animal products (Stuart 2009, Carlsson Kanyama & González 2009, Godfray et al. 2010, Parfitt et al. 2010, WRAP 2012, Macdiarmid et al. 2012). These factors are currently among the *main* contributors to the lack of sustainability in the global food system. Additionally, these factors are both directly related to consumer behavior. Thus, reductions in food waste and animal product consumption are expected to have large, instant impacts both in regard to public health and a more sustainable food system (Sustainable Development Commission 2009).

2.2 Food waste

Global estimations of food waste suggest that, on average, 25 – 50 % of all food is wasted along the supply chain (Gjerris & Gaiani 2013, Parfitt et al. 2010). FAO (2011) estimated that according to weight, 1.3 billion tonnes of food is wasted annually. Calculated by kilocalories (kcal), ¼ of produced food is lost or wasted along the value chain (Kummu, de Moel, Porkka, Siebert, Varis & Ward 2012). Furthermore, Stuart (2009) estimated that food waste derived from Europe and North America alone equals 30-50% of food supplies, which in comparison would be enough to feed the global population living in hunger three times over. Despite some variation, all these figures illustrate what is a serious problem of inefficiency and low food related sustainability in our food system.

In the present study, the food waste definition presented by The Waste and Resources Action Plan (WRAP 2009), Stuart (2009) and other recent research (Gjerris & Gaiani 2013, Parfitt et.al. 2010) is adopted. In this three-part definition of household food waste, the term is divided into categories of "avoidable"-, "potentially avoidable"- and "unavoidable" food waste (Figure 1). Avoidable food waste refers to all food products that at some point have been fully fit for consumption. "Potentially avoidable" food waste, such as potato peelings and crusts of bread, relates more to varying consumer culture and food habits. Unavoidable food waste is considered inedible matter, such as bones and used teabags. The present study deals with the *avoidable and potentially avoidable* food waste happening at the consumption stage of the supply chain.

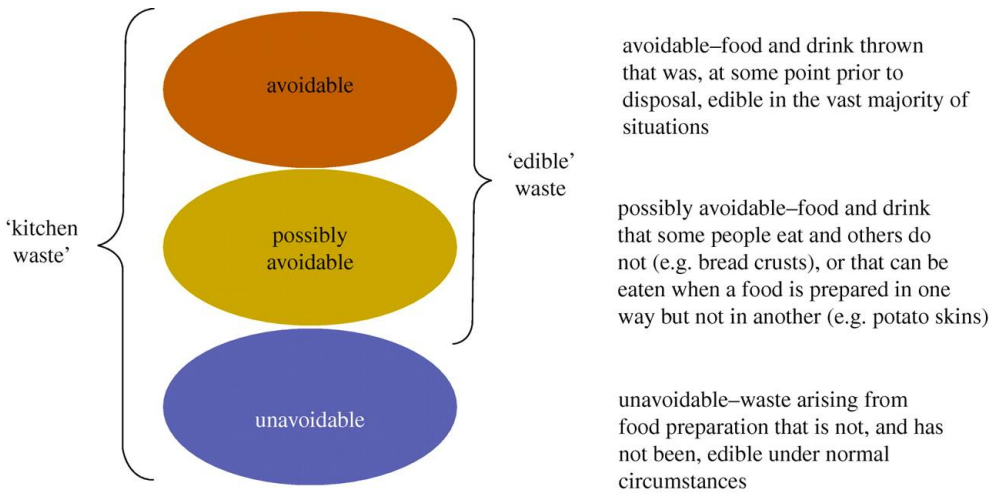

Figure 1 Illustration of the household food waste definition (WRAP 2009)

Although the present study deals with household food waste, avoidable food waste represents a needless waste of resources happening in every step of the FSC. There is a broad literary consensus that current total levels of food waste represent significant challenges.

Some of the largest contributors working to estimate global food waste are the Waste and Resources Action Programme (WRAP), EU FUSIONS and FAO. Additionally, a number of national initiatives and other research articles constitute a growing evidential base regarding food waste and its overall consequences. Norwegian examples include the ForMat project and Matvett A/S, aiming to help both businesses and consumers reduce their food waste.

In recent research, food waste is linked to negative environmental, social and economic implications, mainly due to overconsumption in developed countries (Stuart 2009, WRAP 2013a). The environmental implications of food waste mainly relates to excessive and inexpedient use of natural resources. More specifically, global agriculture is closely connected to the use of resources such as land, labor, nutrients, water and energy. These resources are not unlimited; therefore food wastage is often referred to as use of valuable resources for no reason. Moreover, wasting food contributes to increase food demand and add pressure on global food production. Thus, production challenges are reinforced. The resource use related to food waste is linked to unsustainable energy and water consumption, land use, deforestation and threats towards biodiversity. In addition to environmental impacts of the agricultural sector, GHGE and use of resources are significant in all subsequent stages in the life cycle of food products. Processing, manufacturing, storing, transporting and refrigerating require large amounts of energy and are therefore emission intensive stages. After the final life cycle stage of consumption, a common practice in a majority of countries is disposal of food in landfills. In landfills, the natural decomposition of food generates GHGE in the form of carbon dioxide (CO_2) and methane (CH_4). Furthermore, landfills require land use and cause general pollution (Lundqvist et al. 2008, Papargyropoulou, Lozano, Steinberger & Wright 2014).

Social and economic implications of food waste

Social and economic implications of food waste are somewhat beyond the scope of this thesis, however these implications will be mentioned to illustrate the breadth of food waste related challenges. Social implications relate to ethical and moral dimensions of food waste behavior.

These dimensions emphasize how food choices in high-income countries affect the access to food around the world. During several decades, developed countries have purchased more food than is being consumed. Developed countries are removing large amounts of food from the global market, which in turn affects food prices and hampers the food access of developing countries. Furthermore, unequal distribution of food and avoidable waste of food surpluses is unethical in the perspective of global hunger and malnutrition. On this basis, recent studies claim that efficiency measures in our food system constitute a significant opportunity to address hunger (Stuart 2009, Godfray et al. 2010, Papargyropoulou et al. 2014). However, approximately 795 million people around the world are still living in hunger and undernourishment, lacking sufficient access to food to lead healthy lives. Another 35 % of the global population are experiencing water shortages (World Food Programme 2015, Kummu, Ward, de Moel & Varis 2010, Kummu et al. 2012). Furthermore, food shortages and malnutrition are not merely foreign concerns in developing countries, but also a great social problem in many developed countries.

In terms of economy, food waste contributes to significant monetary losses in all parts of the FSC, indicating low cost-efficiency in the food system. Baker et al. (2009) suggest the economic implications of food waste in Australia equals a loss of 5.2 billion dollars annually, $616 per average household. Similarly WRAP (2013a) indicates British households throw away food worth £470 per year, which is estimated to be approximately 14 % of an average family's shopping budget. Thus, the potential savings in regular households, if successfully reducing food waste, are large.

On the basis of environmental, social and economic implications, minimizing food waste at a global scale is considered one of the most promising strategies towards future food security (Kummu et al. 2012).

2.2.1 Food waste at the production stage

Production stage food losses are related to agricultural and postharvest losses – such as losses during storage, transport and distribution of food. Food losses may be due to crops not being harvested, damage occurring at harvesting, poor timing, desiccation of crops, contamination by animals and insects or other types of food quality considerations. *Food losses* happening before or during harvesting are the main challenges in developing countries, whereas *food*

waste is the main challenge in developed countries throughout the whole FSC (Lundqvist et al. 2008, Whitmee et al. 2015). In developing countries, FSC losses are mainly related to structural causes and lack of functioning systems related to agriculture and harvesting (Figure 2). Limited access to useful technology as well as climate change, weather extremes, poor infrastructure and lack of transport and storage facilities are the most common causes of food losses in these countries (Parfitt et al. 2010).

Accurate data on post-harvest food losses are very limited. Several studies are too old to be relevant, conducted in the 1970s and -80s, while others only provide rough estimates. The lack of such knowledge has much to do with the difficulties of accurate measurement (Parfitt et al. 2010). However, some evidence exists. In developing countries, starchy foods such as grain and rice account for the highest food losses at the production stage. In Asia, estimations suggest that 15% of all rice is lost at production stage. In contrast, perishable foods such as fresh fruits and vegetables account for the greatest food losses at production stage in developed countries. E.g. in the USA, estimates suggest that 2-23 % of fresh fruits and vegetables are wasted, which leads to an average of approximately 12% waste. Accordingly, estimates from the UK suggest 10% fruit and vegetable food losses (Parfitt et al. 2010). Even so, overall pre-retail food losses are less significant in developed countries compared to later stages in the FSC. On the other hand, due to high cosmetic and quality standards, supermarkets may reject up to 25-40% of food from production stage in developed countries, thereby causing an increase in food waste at production stage (Stuart 2009, Godfray et al. 2010).

2.2.2 Food waste throughout supply chains

Increasing FSC efficiency by reducing food waste levels is considered a leading strategy towards sustainable resource use and a more sustainable and equitable food system. FSCs refer to all the stages which food may undergo from end of production to end of life at the consumer and post-consumer stages (Figure 2). Recent research includes food processing, manufacturing, retail and consumption as main FSC stages in developed countries. In developed countries, urbanization requires more complex and extended FSCs to provide food for densely populated areas, while in developing countries FSCs tend to be significantly shorter. Thus, there is considerable variation in the complexity of FSCs according to the

degree of development and industrialization of different countries (Lundqvist et al. 2008, Parfitt et al. 2010).

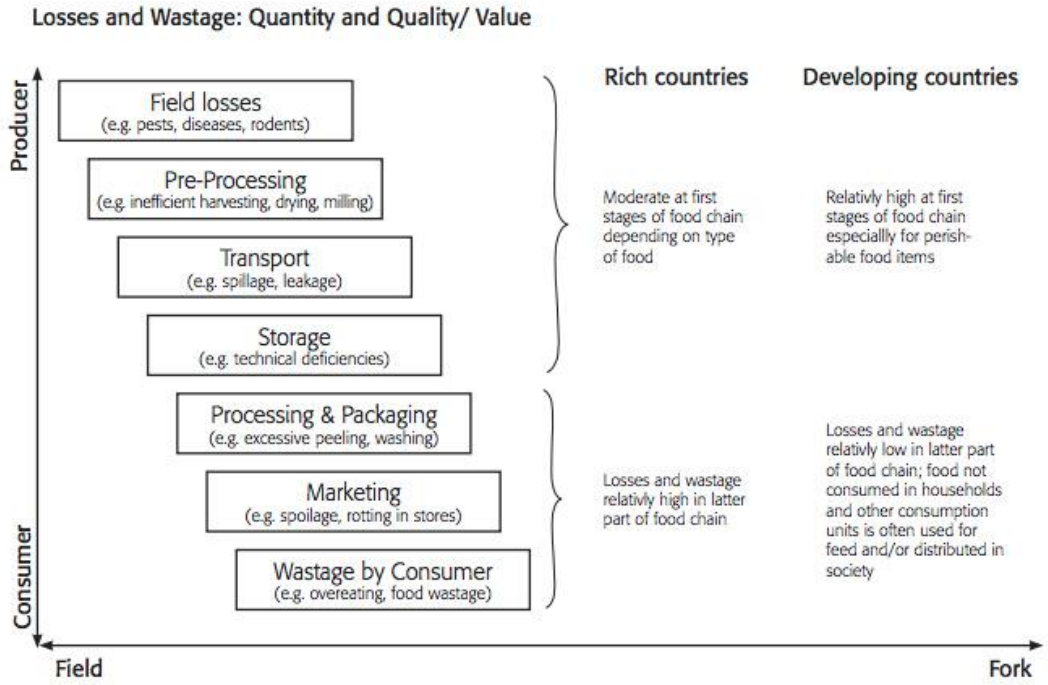

Figure 2 Examples of a FSC and associated food losses and food waste (Lundqvist et al. 2008)

Food waste by manufacturers

Onwards, the main focus will be on food waste throughout FSCs in developed countries. In modern, complex FSCs, food is often processed and prepared by manufacturers before further being resold to large retailers. According to Stuart (2009), there is a lack of knowledge of how much food is wasted on the manufacturer level, due to lack of data collection and lack of transparency in this industry. However, more recent research indicates a shift in this trend, consistent with the increasing awareness of food waste as multi-level problem.

Norwegian estimates (Stensgård & Hanssen 2015) suggest food waste at manufacturer level is 0.24 %, thus being the FSC level with the least waste. This waste consisted mostly of fresh fruit and vegetables, dairy products, bakery products and fresh fish. Results from the UK (WRAP 2013b) are highly contrasting. According to WRAP, British manufacturing food waste amounts to 3.900.000 tonnes. In the USA, the Food Waste Reduction Alliance (2013) found approximately 743.6 million lbs. of food was wasted by manufacturers annually. However, they stressed results were uncertain as only 17% of the US industry participated in

the survey study. In total, results indicate manufacturer food waste amounts vary in between countries. No further data quantifying food waste at manufacturer level were identified.

Manufacturer wastage is often related to frequent changes of production lines, leftovers and food by-products. However, Stuart (2009) claims one of the largest waste related challenges of manufacturers' is unfavorable business agreements with retailers. Retailers, such as large supermarkets, maintain strict food quality requirements and aesthetic standards for food products. Furthermore, demand is often unpredictable and forecast orders from retailers may be inaccurate. Examples from the UK suggest retailers have the power to reduce or cancel orders on very short notice, should it be necessary. Consequentially, a large amount of over-production waste is generated at the manufacturing stage of the FSC (Stuart 2009). Parfitt et al. (2010) and Godfray et al. (2010) support these findings and claim commercial pressures are accountable for large amounts of food waste.

Retailers, wholesalers and marketing

Supermarkets are the most common intermediate between food producers and consumers, yet retailers also include smaller markets, grocers and bakers (Parfitt et al. 2010, Papargyropoulou et al. 2014). In Norway, figures from 2015 suggest that food waste from the retail sector has been stable at 3.4% of sales value the last five years (Stensgård & Hanssen 2015). Figures from WRAP (2013b) indicate retailer food waste in the UK amounts to 400.000 tonnes annually.

In Norway, the largest proportion of retailer food waste consists of fresh bakery products, in particular bread (Stensgård & Hanssen 2015). Studies from other European countries emphasize fresh fruits and vegetables as the largest proportion of waste. Fruit and vegetable waste is followed by categories such as bakery products, dairy products and relatively smaller quantities for meat waste. An important consideration when comparing the limited amount of studies on retailer food waste, is varying methodology. Methods of measurements are crucial in determining which food groups generate the most waste – e.g. weighing, calculation of sales value or measurements of product specific carbon footprints. Different methods generate different results (Scholz, Eriksson & Strid 2015, Lebersborger & Schneider 2014, Stensgård & Hanssen 2015).

There are both natural causes of food waste as well as management related causes at the retail stage. A qualitative, exploratory study on the causes of retail food waste in the UK and Spain, found a number of influencing factors (Mena, Adenso-Diaz & Yurt 2011). Natural causes of food waste in the retail sector includes short shelf life of fresh food and date expiry, which corresponds to the fact that fruit and vegetables constitute a large proportion of food waste at this stage. However, many areas of improvement were also found on the management level. These included poor forecasting ability, poor information sharing, lack of cooperation with suppliers, poor cold storage management as well as insufficient training of employees on waste-reduction measures. Although necessary, strict food quality and safety standards were further mentioned as likely contributors to food waste.

Another main driver of food waste in the retail sector is the conflict between retailer's commercial interests and the overall need to lower food waste levels. The most common example to illustrate this in literature is "two for one" or "buy one get one for free" quantity discounts. Such discounts by all means convince consumers to buy more than needed to generate sales (WRAP 2007, Godfray et al. 2010, Mena et al. 2011, Gjerris & Gaiani 2013). Such discounts are associated with higher levels of avoidable food waste at consumer level. Retailers have high market influence and therefore a large impact on consumer purchasing patterns. Accordingly, the retail sector is considered to have a great potential to contribute to food waste reductions in many parts of the supply chain.

2.2.3 Food waste by consumers

Due to widely varying methodology, it is difficult to present comparable figures of food waste at consumer level. However, work is in progress to create common definitions and methodological approaches to facilitate the attempts to quantify the food waste generated in households (Parfitt et al. 2010). By now, methods include weighing of biological waste (WRAP 2013a, 2012), pick analyses of biological waste (WRAP 2013a, Hanssen, Skogesdal, Møller, Vinju & Syversen 2013), calorie calculations of food waste (Kummu et al. 2012) as well as kitchen diaries and questionnaires (WRAP 2013a). Due to method related challenges, the numbers are associated with uncertainty. Existing studies stress that the figures of household food waste are only estimates and hard to compare.

In recent years, there has been a growing interest to know more about the amount and composition of household food waste. The issue has been an increasing priority on political and international agendas (Gjerris & Gaiani 2013). Although food losses and waste throughout the FSC are significant, post consumer waste is causing the greatest amount of total food waste in developed countries. Furthermore, studies indicate consumers often underestimate their waste and hold little awareness of food waste as a problem and the consequences related to it (Baker et al. 2009). FAO (2011) suggest Europeans and North Americans have a per capita annual food waste of 95-180 kg, versus 6-11 kg in areas such as Sub-Saharan Africa and Southeast Asia.

In the UK, studies undertaken by WRAP from 2008 and onward has set the standard for many other nations, leading to more comprehensive data material on the scope of household food waste. Updated estimates from the UK suggest consumers generate 4.200.000 tonnes of avoidable food waste each year. This equals 160 kg of avoidable food waste annually per household (WRAP 2013a). Hanssen et al. (2013) indicated Norwegian households threw away an average of 46.2 kg of food per capita in 2011, based on weighing of pick-analyses of waste. Baker et al. (2009), on the other hand, made an economical comparison and found Australian households each waste $616 worth of food annually, which is more than the total cost of running the Australian army. However, all numbers are uncertain estimates and do not include waste by the drain or home composting.

In Norway, Stensgård & Hanssen (2015) found fresh fruits and vegetables, fresh baked goods, dairy products, fresh ready meals and casserole leftovers are the food groups most frequently wasted. The main cited causes were food beyond expiry dates, quality decreases and product damages. These findings correspond to the results from WRAP and household food waste in the UK (2012). Baker et al. (2009), found similar tendencies in Australia, however in this study fresh fish and meat constituted a larger fraction of the household food waste.

Many existing studies aim to identify the behavioral causes of household food waste. At the consumer stage of the FSC, food waste is closer related to behavioral factors than at prior stages (Papargyropoulou et al. 2014). The most commonly cited behavioral causes of food waste in households are lack of planning, lack of knowledge, unpredictable shopping routines and misunderstanding of use-by dates.

2.2.4 Determinants of household food waste

The number of studies on behavioral, attitudinal and contextual aspects of consumer food waste is increasing, but knowledge is still scarce on both socio-demographic determinants and health related behaviors associated to household food waste. In existing research, any socio-demographic determinants and health related behaviors are not considered to be *direct* causes of food waste, but they may act as important mediators or moderators of wasteful behavior. Additionally, it is likely that behaviors leading to food waste are a result of complex interactions between socio-demographic determinants and different attitudinal and contextual factors. Thus, knowledge of determinants and behaviors associated with different consumer food waste is an important step towards addressing household food waste (WRAP 2014).

Demographics

The often-used term "Generation food waste" is meant to symbolize post-war generations who have experienced only increasing welfare and food availability, as well as decreasing food prices. In many developed countries, current adult generations have never experienced food shortages related to war or other crises (Gjerris & Gaiani 2013). Recent research supports the concept of "Generation food waste" and find age is significantly associated to household food waste (Baker et al. 2009, WRAP 2014, Stancu, Haugaard & Lähteenmäki 2015, Stensgård & Hanssen 2015). Results from these studies consistently indicate that age is inversely associated to household food waste levels, i.e. older age groups waste less food than younger age groups. Results from WRAP (2014) suggested avoidable food waste levels were lowest in households of older people, while the age group of 18-34 year-olds was the most wasteful on average. This difference was supported by Stensgård & Hanssen (2015), who found age groups ≤25 and 26-39 waste more food than people aged ≥60.

Despite significant age differences, results from WRAP (2014) indicated both younger and older age groups were equally concerned about food waste as a problem. Thus, suggested root causes of the age differences were lack of skills, knowledge and time among younger age groups compared to older. Furthermore, an important factor may be that older generations are more likely to have experienced food shortages from times of war and less prosperity, and therefore are more appreciative of the intrinsic value of food products (Gjerris & Gaiani 2013).

In terms of gender, Koivupuro et al. (2012) is the only identified study to report significant differences. In this study, results indicated more food waste was generated if a female was responsible for household grocery shopping. The same study also found single women showed a weak tendency to waste more food than single men. Thus, there is some evidence indicating that gender may be of importance. However, too few studies have included gender in their analyses to draw any conclusions.

On the other hand, household size and composition is one of few determinants consistently associated to amount of household food waste in prior research. Koivupuro et al. (2012), WRAP (2009, 2014), Baker et al. (2009), Stancu et al. (2015) and Stensgård & Hanssen (2015) all found a clear connection; larger households waste more food in total, compared to smaller households. According to Baker et al. (2009), this pattern turned when reaching households of five or more occupants, however this finding was not supported by any other studies. Even though large households logically waste more food in total, a majority of studies found single person households waste the most food *per capita* (WRAP 2014, Koivupuro et al. 2012, Baker et al. 2009) Furthermore, the results of Baker et al. (2009) indicated people in two-person share households (with no family ties) waste even more per capita than single person households. Presumed causes of the large per capita amount of food waste in single and two-person households are unpredictable lifestyles, planning difficulties and excessive package sizes of food.

Households with children are often associated with more household food waste. However, this assumption may reflect the correlation to the total number of occupants in the household. There has not been found evidence that households with children generate *more* food waste. E.g. Koivupuro et al. (2012) included presence of children in their study and found no association between families with children and more food waste. However, WRAP (2014) found households with children generated at least the same amounts of food waste as similar households without children. Thus, when adjusting for the lower energy needs of children, the results from this study indicate higher food waste in households with children. Additionally, the causes of food waste are likely to vary according to household demographics. In terms of children, causes may be related to rejection of meals, food spilling, excessive portions and higher compliance to food safety. For single person households, “not used in time” was the most frequent cause of avoidable food waste. Other

households more often reported preparation of too much food as a main cause (WRAP 2014).

The relationship between SES and food waste

Income is often considered a key determinant of household food waste, as increased purchasing power can lead to more food bought, allowing for more waste. This connection is contrastingly assessed in the literature, and the association is uncertain. Baker et al. (2009) found a significant connection indicating high-income households waste more food compared to households with lower income. Stefan et al. (2013) also found a small positive correlation in terms of income, but due to weakness of the association this was not included in their final model. On the other hand, Koivupuro et al. (2012) and Williams et al. (2012) found no association between income and amount of food waste. Thus, according to existing evidence, it is difficult to determine the association between income and food waste among consumers.

Few of the identified studies investigating determinants of food waste have included educational level of participants. The majority of studies on socio-demographic characteristics and household food waste include only household income and/or employment status as the main variables to indicate SES (Baker et al. 2009, Stefan et al. 2013, WRAP 2014). Only Koivupuro et al. (2012) included educational level of the participant, however in this study no significant correlation was found between educational level and amount of household food waste. Even so, educational level is a strong determinant to general health related outcomes (Dahl, Bergsli & van der Wel 2014) and the lack of studies investigating educational level and sustainable food related choices illustrate a knowledge gap. Further research on the significance of educational level is needed, as education may be important for consumers' knowledge and interest in sustainable diets.

Both WRAP (2014) and Koivupuro et al. (2012) have assessed consumer food waste in relation to status of employment. In this respect, Koivupuro et al. (2012) found no correlation. On the other hand, WRAP (2014) found participants with employment status "retired" wasted less food than participants in paid work or participants not working for other reasons than retirement. Although retirement status correlates with age group, the association to employment status was still significant when controlling for age. I.e., age and employment status are interrelated determinants, and employment status may account for some of the

effect of age with regard to household food waste. Accordingly, other considerations such as time constraints and busy lifestyles are likely to affect household food waste adversely for employed people. On this basis, the WRAP (2014) study points out a need to customize food waste reduction interventions according to type of employment.

Health related behaviors influencing food waste

Little existing evidence has been identified regarding the associations between health behaviors and food waste. Only the study conducted by WRAP (2014) portrays possible associations between food waste, diet and meat frequency. These food and diet related behaviors are also included in the present study. Despite the difficulties of quantitative measurements of such associations, WRAP (2014) indicated regular meal frequency was positively correlated to food waste levels. In addition, healthy dietary choices were considered to be of importance, yet in a contrasting manner. On one hand, health priorities can overcome food waste considerations and increase food waste. E.g. large purchases of perishable fruits and vegetables and an intention of healthy eating may lead to more food waste. On the other hand, it is also assumed that interest in healthy eating is likely to be correlated to other factors possibly associated to lower food waste, such as cooking skills, planning ability and knowledge. Thus, a variety of confounders may influence the association between diet and food waste behavior.

No evidence on health related behaviors other than diet and meal frequency have been identified. Existing studies mainly focus on contextual factors such as food related knowledge, skills, planning and shopping routines as the most relevant behavioral determinants of food waste (Williams et al. 2012, Baker et al. 2009, Stefan et al. 2013). The influences of these behaviors are supported by WRAP (2014), also finding a moderate correlation between food waste, meal planning and list making for grocery shopping. Furthermore, in the WRAP (2014) study, a correlation was found for both leftover use and use of food beyond expiry date as food waste reducing behaviors.

2.3 Animal food products and sustainability

The rationale for reducing animal product consumption to increase food sustainability is linked to several environmental- and resource related benefits. Compared to production of animal products, production of fruits, vegetables, cereals and legumes is much less resource-intensive and generate significantly lower environmental impacts. Therefore, a diet rich in fruit, vegetables and plant-based proteins is important not only for health, but also for the environment. Thus, there are many advantages related to partly replacing animal products with plant-based foods (Carlsson-Kanyama & González 2009, Whitmee et al. 2015).

Existing literature and research provide consistent results on the environmental footprint of the livestock sector at present. Thus, the need to focus sustainability measures towards the area of food production becomes clear. Improvement in agriculture, especially livestock rearing, is considered a huge opportunity to achieve reductions in GHGE and other environmental benefits. However, this will require both policy changes, increasing efficiency and productivity as well as shifts in human diets (FAO 2006, McMichael, Powles, Butler & Uauy 2007).

In the present study, "animal products" include the products that are most commonly consumed; meat, fish, eggs and dairy products. These products were also included in the questionnaire that was applied during the data collection.

2.3.1 Environmental impact of the livestock sector

The environmental impact of animal product consumption, with special regard to meat products, are intertwined with the environmental impacts of food waste. Their effects on the environment have many commonalities, especially regarding the impacts arising from the agricultural sector. Recent research shows the agricultural sector contributes to approximately one fifth of worldwide GHGE, whereas 80% of these emissions relate to livestock (McMichael et al. 2007). This estimate is supported by FAO (2006), indicating that meat and dairy production cause approximately 18% of global GHGE. According to these numbers, emissions from the global food system are comparable to emissions from industry, and larger than total emissions from the transport sector. Thus, the livestock sector is among top three global contributors to GHGE and subsequent climate change. The environmental

consequences of the food system are also highly relevant because increasing climate change is expected to backfire on the capacity of food production in many regions (Whitmee et al. 2015). As of 2006, FAO claimed the environmental impact from the livestock sector ought to be halved to prevent further environmental damage than that of the contemporary level.

GHGE and pollution

In terms of GHGE, livestock derived emissions are dominated by methane (CH_4) and nitrous oxide (N_2O) emissions. Carbon dioxide (CO_2) emissions are relatively less significant and occur as secondary effects related to agricultural equipment, transport, processing and the further lifecycle stages of produced animal products. CH_4 and N_2O on the other hand, are more powerful greenhouse gases with a global warming potential of respectively 23 and 296 times higher than CO_2 as measured by CO_2 equivalents (FAO 2006). These emissions arise mainly from enteric fermentation, the digestive process of the animals and through management of their waste (FAO 2013).

FAO (2013) recommends separating monogastric animals and ruminants when determining impacts of animal products measured by their environmental footprint. For monogastric animals (poultry and pigs), production of feed crops and managing animal waste are the main causes of GHGE. Ruminants on the other hand (cattle, sheep and goats), are large contributors to CH_4 emissions originating from enteric fermentation, as well as management of manure. From both monogastric animals and ruminants, significant GHGE are further generated by N_20 emissions related to production of feed, use of nitrogenous fertilizers and use of energy. Furthermore, the livestock sector generates significant amounts of ammonia emissions, causing acid pollution to water, soil and ecosystems (FAO 2006).

Unsustainable resource use

From a sustainability perspective, livestock rearing and meat production in industrialized agriculture represent significant losses of energy. Lundqvist et al. (2008) indicate conversion rates are 8 kg of animal feed and 5-10 tonnes of water for 1 kg of beef. For poultry meat, conversion rates are at 2 kg of animal feed to produce 1 kg meat. Accordingly, it is estimated that 40 % of the global cereal production becomes animal feed. These grains could to a far greater degree have been used for human consumption, and by some it is therefore considered to be food losses (Stuart 2009).

Further, the livestock sector is the main user of anthropogenic areas. Agricultural land accounts for 30 % of land areas globally, and of this area livestock occupies 70 % (FAO 2006). In addition, dietary changes cause increasing demand for animal products and adds even more pressure on livestock production. Consequentially, the need for more land and production of more feed entails deforestation, especially in vulnerable areas such as Latin America and the Amazon forest.

In addition to excessive land use, production of animal products contributes largely to water consumption and water pollution. Agriculture accounts for approximately 70% of total water consumption. Furthermore, water pollution arises from animal waste, use of fertilizers, antibiotics, pesticides and other chemicals. Livestock related water consumption and water pollution are considered serious global challenges, as about one fifth of the human population are experiencing water shortages to a lesser or greater extent (FAO 2006, FAO 2012b, United Nations 2013).

Secondary environmental impacts

A broad perspective on the environmental impacts of animal food products must also include the many ”indirect” or second-order effects occurring during their life cycle (Garnett 2009). Subsequent to deforestation for land use, come threats to biodiversity as a secondary environmental impact. Loss of species due to habitat destruction is both harmful to ecosystems and impairs diversity of plants and animals.

Research also shows that the energy consumption in order to keep the living conditions in farms and animal housing satisfactory can be intensive, e.g. for chicken. Fisheries are also significantly energy- and GHG-intensive by refrigeration systems and CO_2 emissions from fuel use, causing high climate impacts (FAO 2013).

Further, all food items, including animal products, generate environmental footprints throughout their consecutive life cycle stages. Although environmental impacts are smaller than at the agricultural stage, food processing, manufacturing, distribution and retail are also energy consuming stages containing use of fossil fuels – with special attention to air freighted products (Carlsson-Kanayama & González 2009).

Comparison of environmental impacts of animal food products

Within animal food products, there are significant differences with regard to the environmental footprint of different products. The most GHGE intensive products include red and processed processed meats. In comparison, poultry meat, eggs and dairy products are relatively more environmentally friendly animal products (Riley & Buttniss 2011, Carlsson-Kanyama & González 2009).

Two studies aiming to compare the environmental impact of livestock products were identified. Both are systematic reviews based on life cycle assessments (LCA) of different animal food products (De Vries & De Boer 2010, Nijdam, Rood & Westhoek 2012). LCAs provide detailed information about environmental impacts of different food products according to land use, resource use and GHGE throughout the life cycle of each product. There are significant natural differences between animal food products' environmental impact, yet in many cases production methods also have a strong influence on the sustainability of each product. Furthermore, the given environmental impact of a product depends on the method of measurement. Common methods of measurement are by weight ofproduct, kg of protein, land use, resource use, energy use and GHGE. Herein, the main focus will be on comparing production-related environmental impacts of animal food products.

Both studies (De Vries & De Boer 2010, Nijdam et al. 2012) conclude that red meat from ruminants, especially beef products, has the largest environmental impact according to all methods of measurement. Emissions of methane, extensive land use (27-49m^2 per kg of beef) and lower efficiency both in reproduction and feed convertion are main causes of the environmental burden of red meat products (De Vries & De Boer 2010). However, the environmental footprint of red meat products also depends on the production method. Production methods are usually divided into intensive and extensive agricultural systems, which contribute to varying environmental impacts. Intensively produced beef products are more resource-efficient, generating 3-4 times less GHGE in production.

In terms of pork and poultry meat, research suggests environmental impacts are smaller, and significantly lower than that of ruminant meat products. Pork is considered mid-range in environmental impact, while poultry meat is associated to a smaller environmental impact in comparison both to ruminant and pork meat. Pork meat had an average of 8.9-12.1 m^2 in land

use and 3.9-10 CO_2 equivalents per kg of product. Whereas poultry meat accounted for the lowest environmental impacts among all meat products, both measured in land use and GHGE. Land use per kg of poultry production was 8.1-9.9 m^2 and average 3-7 kg CO_2 equivalents were produced per kg poultry meat (De Vries & De Boer 2010, Nijdam et al. 2012).

Evidence suggests fish and seafood are difficult to place when trying to rank animal food products according to sustainability. According to Carlsson-Kanyama & González (2009), seafood is considered mid-range in environmental impact, depending on production methods and fossil fuel use in the production process. Production methods range from wild-caught fish, aquaculture, fisheries and trawling. According to Nijdam et al. (2012) the variation in GHGE are 1-86 CO_2 equivalents according to production method. In aquaculture, environmental impacts arise from feed production and waste management. In fisheries and during trawling, environmental impacts relate to fossil fuel use. For the latter, destruction of seabeds is another consequence. On this basis, wild-caught fish and fish from aquaculture is the most low-impact products and thus constitute the most sustainable choices of fish.

Milk and dairy products were found to have environmental impacts similar to poultry meat. In terms of CO^2 equivalents, emissions per kg of milk were 0.84-1.3. However, milk and dairy products were associated with less land use than meat products, about 1-6 m^2 per kg (De Vries & De Boer 2010). The main environmental impacts of dairy products were linked to feed production and CH_4 emissions from the cows' enteric fermentation, while the processing of milk was less significant (Nijdam et al. 2012). Further, it was emphasized that, if measured by weight, the environmental impact of milk and dairy products become greatly reduced due to the high water content and heavy weight. Thus, it is important to stress that the environmental impact of milk and dairy products should be measured e.g. by kg of protein, or on the basis of daily intakes. Accordingly, the environmental impact becomes more realistic and similar to that of poultry (De Vries & De Boer 2010).

According to De Vries & De Boer (2010), egg production accounts for 3.9-4.9 CO_2 equivalents per kg of weight, and the associated land use was similar to milk and dairy products. Thus, the environmental impact of eggs is the same as or slightly smaller than milk and dairy products.

The variance in environmental impacts of animal food products illustrate a great potential to increase the sustainability of the food system by choosing the most environmentally sustainable products. Animal food products are associated to larger environmental impacts than all plant-based substitutes, however there are considerable differences in-between animal products as well (Nijdam et al. 2012). In summary, red meat from ruminants, especially beef products, account for the largest environmental impacts from livestock. In descending order, beef products are followed by pork, poultry, eggs and dairy products (De Vries & De Boer 2010). Seafood, including fish, could not be placed due to the large variance according to production method, and therefore such products ought to be assessed individually. In summary, the most sustainable and low-impact products are wild-caught fish and fish derived from sustainable aquaculture.

2.3.2 Consumption of animal food products

A transition towards a more sustainable food system requires a reduction of present animal product consumption, with special regard to meat products. Current research consistently claims that the consumption of meat and dairy products needs to be significantly moderated, both in developed and developing countries, to achieve a more sustainable food system. Especially highlighted are the disadvantages of excessive consumption of red and processed meats both to health and environment (Macdiarmid 2013, Godfray et al. 2010, Sustainable Development Commission 2009).

Consumption in developed countries

During several decades, there has been a consistent increase in consumption of animal products in developed countries (Figure 3). In the USA, the average meat consumption per capita was approximately 91 kg in 2007. The increase in US meat consumption has been continuous ever since the 1960s. Apart from the seafood category, the USA has been one of the largest meat consumers globally, however this trend has gradually evened out according to the increasing consumption in other developed countries, e.g. in Northern and Western Europe and Australia (Daniel, Cross, Koebnick & Sinha 2010)

In EU member countries, per capita consumption of meat products is expected to be 67.6 kg in 2016. This is an increase in comparison to recent years, relating to economical improvements and decreasing food prices (EU Commission 2015). In Norway, the annual

meat consumption per capita has increased from 63 kg in 1999, to 76 kg in 2013. Furthermore, yoghurt consumption has increased about 2 kg and cheese by 3 kg per capita in the same period. On the other hand, all milk products except extra skimmed milk has decreased significantly in recent decades. The consumption of butter and eggs has been stable at respectively 3-4 kg and 12-13 kg per capita per year. In accordance with these figures, a shift from high-fat products to low-fat products has been apparent. Furthermore, there has been a shift from cattle meat consumption to more poultry meat. Even so, the total consumption of red meat in Norway is still at approximately 50 kg per capita, but it is stressed that the number is uncertain due to the omission of food eaten outside the household in the calculations. In terms of fish, numbers are also uncertain, yet estimates suggest that the per capita consumption has been stable at 30-35 kg annually (Helsedirektoratet 2015b).

Consumption in developing and transitional countries

Despite the high consumption of animal products in developed countries, the consumption is highly varying on a global scale (Daniel et al. 2010). In developed countries, animal products constitute a large part of the regular diet on a population basis. However, in recent decades, consumption of animal products has been rapidly increasing in developing and transitional countries, such as China and India. This trend is associated to rapid economic growth in these countries, allowing for higher purchasing power, which leads to increased demand for animal products (Wang, Beydoun, Caballero, Gary & Lawrence 2010). In future years, the meat demand is expected to increase further in developing countries due to both population growth and expected economic growth. From 2015 to 2025, global production of meat is expected to increase by 1.4% annually, similar to one year's meat production within the European Union (EU Commission 2015). According to FAO (2011) livestock production must be increased by 60% to meet the demand, and of this increase 77 % is likely to be in developing countries. Thus, existing research urges the need for a shift in diets in order to feed the global population sustainably in near future (Godfray et al. 2010, Parfitt et al. 2010).

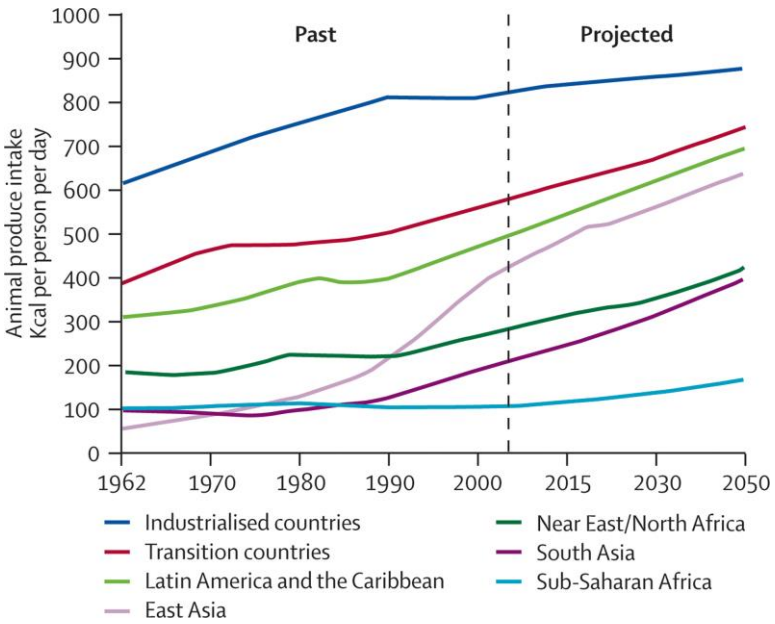

Figure 3 - Illustration of past and projected meat consumption in different continents and countries (McMichael et al. 2007)

2.3.3 Health outcomes related to animal product consumption

Reducing animal product consumption will affect both health outcomes and give environmental benefits. Health outcomes of animal product consumption, with special regard to red and processed meat, have been the subject of numerous research articles in the past decades. Thus, the evidence base in this area is strong and consists of high-quality research such as systematic reviews, meta-analyses and prospective studies. The strongest evidence is linked to cardiovascular disease and increasing cancer risk associated with high intake of processed meat, however other non-communicable diseases and overall mortality risks are also likely to be relevant (Daniel et al. 2010). Despite these adverse risks, animal products are important sources of vital nutrients in a majority of populations. Furthermore, animal products are well-established cultural components of most diets, which may impede dietary changes (Macdiarmid et al. 2012).

Health benefits of animal product consumption

The Norwegian Directorate of Health recommends including lean meat and fish, but limited quantities of red and processed meat in our diets. Furthermore, the recommendations suggest dairy products should be part of the daily diet (Helsedirektoratet 2015a). When reviewing existing literature on animal product consumption and health, most studies do acknowledge the nutritional benefits provided by animal products. The high nutritional value of meat is

related to high content of quality protein, iron, zinc and vitamins A and B. Additionally, the bioavailability of iron and folate is better in meat than in plant-based sources according to the European Prospective Investigation into cancer and nutrition (Rohrman et al. 2013). Fish products are also well known for their health benefits from high protein content, favorable composition of fats and the necessary omega 3 fatty acids. Additionally, dairy products and eggs are rich in quality protein, fat, and micronutrients such as calcium and vitamins (Sjøen & Thoresen 2012).

Animal product consumption and cardiovascular risk

A meta-analysis by Micha, Wallace & Mozaffarian (2010) has examined meat consumption, coronary heart disease and diabetes mellitus risk. Links between morbidity and meat consumption was expected to be significant, due to the high content of saturated fat, low-density lipoprotein and total cholesterol in red and processed meats. Both high consumption of saturated fatty acids and dietary cholesterol are well known risk factors of cardiovascular diseases, and animal products are some of our largest dietary sources of these nutritional components (Rohrman et al. 2013).

According to Micha et al. (2010), red meat was not consistently associated to coronary heart disease. On the other hand, processed meats were strongly associated to coronary heart disease, as results indicated that each daily serving (50g) of processed meat products represented a risk increase of 42%. The dietary meat intake also reflected a trend towards higher risk of coronary heart disease, but results varied significantly among the included studies. Another meta-analysis of prospective cohort studies regarding dairy products, cardiovascular disease and overall mortality (Soedamah-Muthu et al. 2011) found a small association between overall dairy product intake and cardiovascular risk, although the number of studies was limited. No association was found on dairy product intake and overall mortality.

Animal product consumption and cancer

In recent years, excessive meat consumption has been increasingly linked to a number of cancers. In 2015, WHO made a public statement that red and processed meats were both convincingly associated to a higher cancer risk (WHO 2015). Red and processed meat is possibly associated to a higher risk of pancreatic-, lung-, uterus-, prostate- and esophageal cancer (Helsedirektoratet 2011b). In terms of total dairy product consumption, and more

specifically milk consumption, observations have been opposite. Dairy products were not associated to cancer, and may have a protective effect against colorectal cancer, likely due to the calcium content of these products (Helsedirektoratet 2011b, Aune et al. 2012).

Other health outcomes

Although cardiovascular diseases and cancer are the main negative health outcomes of animal product consumption, high consumption of red and processed meat has also been linked to increasing risk of developing obesity and diabetes mellitus type 2 (Micha et al. 2010).

2.3.4 Determinants of animal product consumption

Previous research on diet sustainability, such as Johnston et al. (2014) mainly focuses on systemic factors as general determinants of sustainable diets. To date, there are only a few existing studies dealing with the individual determinants of making sustainable food related choices at the consumer level. This illustrates the need for extended knowledge on this topic. Macdiarmid et al. (2012) also suggest that there is inadequate public knowledge of sustainable diets. There are many misunderstandings and knowledge gaps, which may give rise to barriers to make sustainable food choices. E.g., in a number of studies, consumers report packaging as most environmentally harmful food related choices, whereas animal product consumption to a great extent is considered less significant (Vanhonacker, Van Loo, Gellynck & Verbeke 2013, Latvala et al. 2012, Tobler et al. 2011). Thus, increasing the public awareness and gaining knowledge of determinants, motivators and barriers towards choosing a sustainable diet is crucial to implement efficient policies (Baker et al. 2009).

In the context of animal product consumption, some studies dealing with individual determinants have been identified. However, the majority of these studies only emphasize meat. Thus, knowledge is scarce both of determinants and health related behaviors associated to reducing animal product consumption, and especially to other animal products than meat. In this section, it should be stressed that no studies dealing with socio-demographic determinants or health related behaviors linked to egg consumption were identified. For fish and dairy consumption, evidence was only identified for some determinants (see below).

Demographics

According to existing research, there are strong indications that age affects people's consumption of meat and fish. Evidence from the USA (Daniel et al. 2010, Wang et al. 2010) found age was a significant determinant of meat consumption, where age groups 20-49 were the highest consumers of meat in total, and had the highest consumption of red meat. This finding was significant both compared to older and younger age groups. However, it should be mentioned that results from previous research have not been completely consistent, as research from Germany (Kayser, Nitzko & Spiller 2013) found no significant correlation between age and meat consumption.

In contrast, fish consumption was positively associated with higher age in European countries according to Pienak, Verbeke & Scholderer (2010). Possible causes of the significance of age to meat and fish consumption, relates to how age is connected to making more conscious and active food choices (Vanhonacker et al. 2013). Similarly, age is associated with having a growing interest in and knowledge aout nutrition and health outcomes (Pienak et al. 2010). Thus, it is conceivable that increasing age affects both total meat consumption and choice of meat type.

The majority of existing research finds gender as a significant determinant of meat consumption (Guenther, Jensen, Batres-Marques & Chen 2005, Daniel et al. 2010, Wang et al. 2010, Cross et al. 2011). All identified studies found men had a larger total meat consumption of all meat products. One study found females more often *choose* poultry meat products, however the overall poultry meat intake in women was still lower than that of men (Daniel et al. (2010). Additionally, Beydoun et al. (2008) found men had a larger overall consumption of dairy products than women. Other than differing calorific needs, a potential cause of gender differences may be linked to the misconception and overestimation of protein needed to maintain a healthy diet. This belief is most common among men, and may be part of the reason why men consume larger quantities of meat (Macdiarmid et al. 2012). Furthermore, research suggests differing health beliefs, environmental awareness and animal welfare concerns among men and women as possible cause of gender inequality in meat consumption (Wang et al. 2010).

Further, culture is believed to have a strong impact on dietary choices (Stuart 2009), and results from Daniel et al. (2010) indicate race and ethnicity is linked to animal product

consumption. In this study, no significant differences were found on red meat consumption, however African Americans ate more poultry meat than Caucasians and Hispanics, while Hispanics had a lower consumption of processed meats. Ethnicity differences were also apparent for dairy product consumption in the US, where Africn American people and females of minority backgrounds consumed significantly less dairy products than other ethnicities (Beydoun et al. 2008). Such results indicate there are cultural differences in diets and thereby animal product consumption.

No studies regarding household demographics as a determinant of animal product consumption were identified.

SES and animal product consumption

SES as a determinant of animal product consumption is uncertain. No previous studies dealing with income as a determinant of overall animal product consumption at the consumer level were identified. On a population basis, meat consumption is undeniably connected to increasing wealth and standard of living. However, this trend may not necessarily apply to individual consumption patterns. The existing evidence on income and meat consumption only suggests income is associated to *choice* of meat type. People with high incomes are more likely to consume poultry meat, whereas people with less income are more likely to consume beef and processed pork products compared to the average consumption (Guenther et al. 2005). The different meat choices according to income may also be linked to more knowledge and higher access to healthy meat products among high-income households.

In contrast to income, there is strong evidence that education seems to be relevant to animal product consumption. Higher educational level is connected to increasing intake of fish, poultry and dairy products (Beydoun et al. 2010, Daniel et al. 2010, Pienak et al. 2010) Yet, among the highest educated (college and university level), total meat consumption seemed to be declining according to Daniel et al. (2010), which again may reflect upon increasing awareness of health and/or environmental impacts of excessive meat consumption. Furthermore, results from Cross et al. (2011) suggested people with no university education and physically demanding work had a higher total meat intake, with the exception of poultry. According to these findings, educational level is likely to affect both general meat consumption and the specific choices of meat and other animal products.

Health behaviors related to animal product consumption

Research on the scope of health related behaviors and animal product consumption suggests that, in terms of diet, "high meat consumers" have a significantly lower intake of fruit and vegetables. High total consumption of meat was also correlated to an increase in body mass index (BMI) and total energy intake. Furthermore, results indicated less leisure time physical activity among "high meat consumers" (Cross et al. 2011).

Significant associations have also been found between both smoking and high meat consumption, as well as alcohol consumption and high total meat consumption (Cross et al. 2011). However, according to Rohrman et al. (2013), the association to alcohol consumption was only apparent in men.

Other than dietary choices, smoking and alcohol consumption, evidence of other health behaviors related to animal product consumption is scarce. No studies examining health behaviors such as physical activity, exercise and commuting method against sustainable food related choices have been identified. Thus, the present study is probably among the first to examine possible relationships between diet sustainability considerations, lifestyle and health behaviors.

3.0 METHOD

3.1 Study design

The present study is a quantitative, cross-sectional study aiming to examine socio-demographic determinants and a selection of health related behaviors' association to make sustainable food related choices. The study has been conducted with the use of selected data material from the "Fruits and Vegetables Make the Marks" (FVMM) research project (Bere, Hilsen & Klepp 2010).

FVMM (Bere et al. 2010) is a cohort study, which was initiated in 2001 during the development of a nationwide school fruit scheme for elementary school children in Norway. Accordingly, a subscription program for the school fruit scheme was implemented in 2003. This subscription program was followed by a free school fruit scheme (with no parental payment), which was implemented 2007. The main aim of the FVMM study was to evaluate the effect of the school fruit scheme on adolescents' overall fruits and vegetables consumption. To implement this cohort study, the first data collection was completed in 2001, by distribution of a comprehensive questionnaire survey. Both children aged 10-12 years old (6^{th} and 7^{th} graders) and their parents completed separate questionnaires regarding diet, lifestyle, commuting methods and environmental considerations. The final data collection of FVMM was conducted in September 2008. At this time, new and similar questionnaires were distributed to 10-12 year old children (6^{th} and 7^{th} graders). Parents also received a new, separate questionnaire. Data material derived from the parent questionnaire in the final FVMM follow-up study is used in the present study (Appendix 1). Hence, all data used in the present study is self-reported data by parents and 6^{th} and 7^{th} graders participating in the FVMM study from 2008.

Ethical considerations

The FVMM cohort study (Bere et al. 2010) was conducted according to the ethical guidelines in the declaration of Helsinki. All participants of FVMM submitted a written, informed consent to participate in the study. FVMM was also approved by the Norwegian Social Sciences data Services.

3.2 Study sample

During the completion of FVMM (Bere et al. 2010) in 2008, 27 randomly selected elementary schools in the Norwegian counties Hedmark and Telemark constituted the study sample. Hedmark and Telemark are two similar and rural counties in East Norway. The selection of these specific counties was made in 2001, due to the imminent start-up of the school fruit subscription program in these counties. All 27 elementary schools participating in 2008 were also a part of the initial study conducted in 2001.

A total of 1712 questionnaires were distributed to parents of elementary school children. 1012 parent questionnaires were returned successfully, representing a response rate of 59.1%. The mean age of the participants' was 41.1 years of age, and the age interval ranged from 28 to 60. Among the participating parents, 78.4% (n=773) were female and 21.6% (n=213) were male.

No exclusion criteria have been constructed for the present study, as this was not found necessary to obtain quality results. By any missing values in the data set, as participants may have forgotten or failed to answer, these have been excluded case-by-case in the statistical analyses.

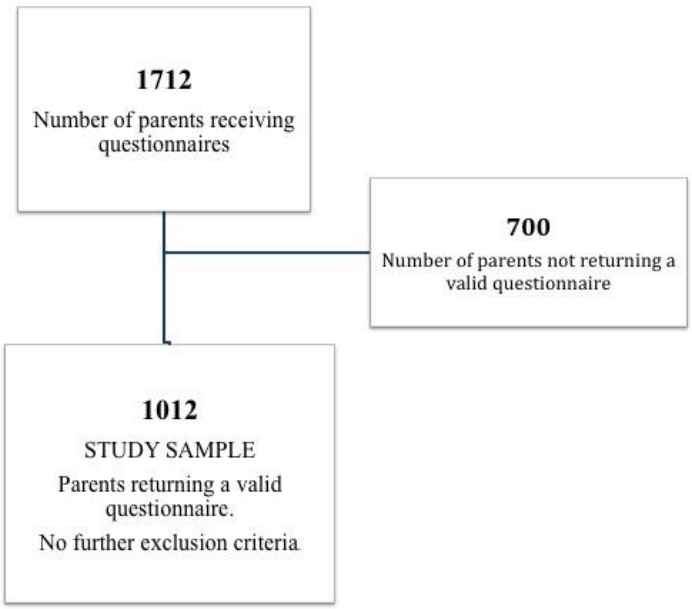

Figure 4 Description of study sample

3.3 Data collection

The completion of the FVMM data collection (Bere et al. 2010) was conducted in the following manner; each child completed a questionnaire and brought a separate questionnaire home to be completed by *one* parent or guardian. These questionnaires were later returned to the respective schools and contact teachers with the children. Further, the teachers returned all questionnaires to the researchers responsible.

Questionnaire

The parent questionnaire applied in the present study was sectioned according to different themes (Appendix 1). In several parts of the questionnaire, some socio-demographic questions are included. Except this common feature, the parent questionnaire can be separated into six parts: part A, -B, -C, -D, - E and -F.

Parts A, -B and –C of the questionnaire are mainly diet-related. Part A consists of questions designed as 24-hour recalls regarding the participants' food intake. Answers provide a thorough review of the participants' meal frequency and food and beverage intake at every meal the previous day. Part B addresses the participants' overall opinions on fruit and vegetables. The regular frequency of fruits and vegetables intake in the household is addressed in this section. Part C addresses the participants' overall diet, including consumption of both healthy and unhealthy food and beverages.

Part D addresses other lifestyle- and health related behaviors such as the physical activity level, the amount of screen time, the frequency of outdoor activities, as well as the SES of participants. Part E mainly addresses the participants' commuting behavior to and from work, as well as their child's route and commuting method to school. Part F addresses the participants' environment related attitudes and behaviors, providing extensive information on the participants' propensity to make eco-friendly daily choices. The questionnaire can be reviewed in its entirety in Appendix 1.

3.4 Variables included in the study

Two dependent variables and a total of 19 independent variables were selected in order to measure socio-demographic determinants and health related behaviors associated to making sustainable food related choices.

3.4.1 Dependent variables

The perceived amount of food waste and consumption of animal products in the household, questions F12 and F13 in the questionnaire (Appendix 1), constitute the dependent variables of the present study. In this respect, "household food waste" and "animal product consumption" are chosen as indicators to assess the participants' willingness to make sustainable food related choices.

Household food waste

Information regarding amount of food waste in each household was obtained by the following statement; "I never throw away food". Participants were able to choose from five possible response options; "strongly disagree", "slightly disagree", "neither agree nor disagree", "slightly agree" and "strongly agree". According to these options, the food waste variable was dichotomized into two categories: "high food waste" and "low food waste" for further analyses. Participants responding "strongly disagree", "slightly disagree" and "neither agree nor disagree" were categorized as "high food waste", while participants responding "slightly agree" and "strongly agree" were categorized as "low food waste".

Animal product consumption

Use of animal products in the diet of each household was measured by stating; "I am attempting to eat less animal products (meat, fish, eggs and dairy products) to help spare the environment". Similarly to food waste, this variable was dichotomized. Participants who answered "strongly disagree", "slightly disagree" and "neither agree nor disagree" on this question were grouped as "no reduction of animal products". Participants who answered: "slightly agree" and "strongly agree" on this statement are perceived as they are attempting to reduce their consumption and were thereby grouped as "reducing consumption of animal products".

3.4.2 Independent variables

In order to measure socio-demographic determinants and health related behaviors relevant to sustainable food related choices, a total of 16 relevant independent variables were compiled from the questionnaire. Independent variables have been further grouped as "demographics", "SES" and "health related behaviors".

Demographics

The demographic characteristics included in the present study are age, gender and household composition.

Age was measured by asking for the participants' year of birth in the questionnaire. Further, the participants' birth year was subtracted from the date of completion. No additional changes were made to this variable. Information on participants' gender was obtained by asking: "Are you?" and giving two response options, "male" or "female". No further changes were made to this information.

Information of household composition was measured by a two-part question: "How many people are included in your family (living together on a daily basis)? Participants' were to fill in both number of adults and number of children living in the household on a daily basis in two separate blank spaces. This information resulted in two variables: "number of adults" and "number of children". "Number of adults" was dichotomized into "one" and "two or more" adults living together on a daily basis. "Number of children" was tricothomized into "one or less", "two" and "three or more" children living together in the household on a daily basis.

Indicators of SES

SES of the participants was assessed on the basis of their educational level (only of the participating parent), annual income in the household, number of cars in the household and whether the participants own a bicycle. The latter factors are included as they, in addition to being indicators of SES, may be related to the participants' general attitude with regard to making eco-friendly choices in their daily lives.

Parent educational level was measured by questioning: "How long is your educational background?" Response options were "primary school", "high school (including vocational

school)", "university education (3 years or less)" and "university education (more than 3 years)". This information was dichotomized into "no higher education" and "higher education". Primary school, high school and vocational school educations constitute the group of "no higher education", while a university education of any length is considered "higher education".

To measure the total annual income in the household, participants individually filled in the respective number in the questionnaire, stated in NOK thousands. This continuous variable was split by the median, at 600.000 NOK, and dichotomized into "low annual income" and "high annual income". "Low yearly income" includes all participants' with annual household income up to 600.000 NOK, while "high yearly income" includes all participants with annual household income above 600.000 NOK.

"Number of cars in the household" was measured by having the participant fill in the respective number on a blank space. Further, this information was dichotomized into "one car" and "two or more cars". Information regarding ownership of a bicycle was obtained by asking: "Do you own a bicycle?" as a yes or no question. No further changes were made to this variable.

Health related behaviors

A selection of other relevant health related behaviors were compiled from the data material. The variables chosen are: "commuting method", "smoking", "use of snuff[1]", "screen time" "exercise", fruit and vegetable intake", "unhealthy snacks intake" and "meal frequency". Focusing on participants' lifestyle-related habits, dietary choices and environmental consciousness, these characteristics were included to obtain a broader understanding of which health- and environment related factors can be of importance to make sustainable food related choices.

Commuting method was measured by asking: "How did you get to work yesterday?" Among the response options were "walking", "riding a bicycle", "driving a car", "using public transport" and "did not attend work outside the home yesterday". This variable was further categorized into "active commuting", "passive commuting" and "no commuting". The

[1] Form of tobacco especially common in Scandinavian countries.

response options “walking” and “riding a bicycle” were grouped as active commuting. Driving a car or using public transport is considered passive commuting. “No commuting” equals the participants’ not attending work outside the home the previous day.

Exercise frequency was measured by asking: “Outside of working hours, how many times per week do you play sports or exercise so much that you get a shortness of breath and/or become sweaty?” Answering options were “never”, “less than once a month”, “once a month”, “once a week”, “2-3 times a week”, “4-6 times a week” and “every day”. This information was dichotomized into “rarely exercising” and “regular exercising”. “Rarely exercising” includes participants engaging in sports or exercising once a week or less, while “regular exercising” includes participants engaging in sports or exercise two or more times a week.

In terms of diet, 12 questions from the questionnaire were used as indicators of participants’ diets and meal frequency, resulting in three different variables. These variables are; meal frequency, unhealthy snacks intake and fruit and vegetables intake.

“Meal frequency” information was obtained by four 24-hour recall questions regarding all food and beverage consumption the previous day. Questions on whether the participants had breakfast, lunch, dinner and supper were included in these 24-hour recalls. All four questions were “yes or no” questions, with the code 0 for no and 1 for yes. Further, each participant’s value on all four questions was summed up, resulting in an individual score of 0-4, dependent on the number of meals. This score indicates the participant’s number of meals the previous day. A score of 4 is equivalent to having all four meals, while a lower score equals fewer daily meals. Assuming that participants who had all four meals have a more regular meal frequency, this variable was dichotomized into “four daily meals” and “up to three daily meals”.

“Unhealthy snacks” intake is also a continuous, score based variable in the present study. Three different questions from the questionnaire constitute this score:

- *“How often do you eat potato chips?”*
- *“How often do you eat candy (chocolate, mixed candy etc.)?”*
- *“How often do you eat buns, muffins, cake or other sweet pastries?”*

In these questions, there were ten response options, ranging from “never” to “several times each day” on all three questions. Further, the response information on the questions was

recoded to make the numbers match the frequency of the participant's weekly intake. After recoding, responses to each of these questions were summed up, resulting in another individual score of unhealthy snack intake ranging from 0-19. A low score correlates to low unhealthy snack intake, whereas high scores correlate to higher intake of unhealthy snacks.

"Fruits and vegetables intake" was measured similarly to "unhealthy snacks intake". This variable is derived from five questions from the questionnaire:

- *"How often do you eat vegetables for dinner?"*
- *"How often do you eat vegetables on slices of bread?"*
- *"How often do you eat other vegetables (e.g. a carrot for lunch)?"*
- *"How often do you eat an apple, orange, pear or banana?"*
- *"How often do you eat other fruits and berries (other than apples, oranges, pears and bananas)?"*

Response information on these questions was recoded to make the numbers match the frequency of the weekly intake. Further, the individual responses to each of these three questions were summed up, resulting in a score of fruit and vegetables intake ranging from 0-41. Low score correlates to low fruit and vegetables intake, whereas a higher score correlates to higher fruit and vegetables intake.

Screen time: Information on the participants' amount of screen time was obtained by asking: "Outside of working hours, how many hours a day do you usually watch TV or use a computer?" Answer options consisted of "none", "less than ½ hour", "½ - 1 hour", "2-3 hours", "4 hours" and "more than 4 hours". Further, this information was dichotomized into "low screen time" and "high screen time". Response options reporting screen time of maximum one hour was considered "low screen time", while response options reporting two or more hours were considered "high screen time".

Tobacco smoking: Information regarding smoking habits was obtained by asking: "Do you smoke?" Response alternatives were "no, I have never smoked", "no, I have quit smoking", "yes, but not daily" and "yes, daily". Responses were further dichotomized into "smoking", including participants smoking cigarettes both daily and more seldom. "Not smoking" correlate to participants who have quit smoking or have never smoked cigarettes.

Use of snuff: participants' use of snuff was measured similarly to smoking. Response options in the questionnaire were "no, I have never used snuff", "no, I have quit using snuff", "yes, but not daily" and "yes, daily". Responses were further dichotomized into "use of snuff", including the participants who use snuff both daily and more seldom. "Not using snuff" correlate to participants who have quit using or have never used snuff.

3.5 Statistical Analyses

All statistical analyses have been conducted by using IBM Statistical Package for Social Sciences (SPSS) version 21.

Initially, significance testing was performed in order to determine the statistical significance of the independent variables. Significance tests were performed with the dependent variables, "household food waste" and "animal product consumption" respectively. I.e. all tests were performed twice, once for each dependent variable. To ensure normal distribution of continuous variables, normal probability plots and assessments of the mean, median and mode were conducted (Johannesen 2009). To determine if any independent variables were significantly associated to sustainable food related choices, independent samples t-tests were applied on continuous variables, while chi-square statistical tests were applied on the categorical variables. In the present study, any p-values ≤ 0.05 are considered statistically significant. The results of the independent samples t-tests and chi square tests are presented in Table 1 and Table 2.

The main statistical analyses applied in the present study, are multivariate logistical regression analyses. In these analyses, all independent variables were included, regardless of the outcome of the independent samples t-tests and chi-square tests. Thus, all possible changes that could have occurred when adjusting for other independent variables, would be captured in the multivariate logistical regression analyses.

Similar to the significance tests, a total of two multivariate logistical regression analyses were conducted. Both analyses were conducted by the exact same procedure. However, one was with the dependent variable "household food waste" and the other with "animal product consumption". A block-wise approach was chosen for the multivariate logistical regression analyses, in order to examine all socio-demographic variables separately before the inclusion

of health related behaviors. Thus, both analyses consist of a total of two blocks. In the first block, all socio-demographic variables were included. The results of this analysis emerge as “Model 1”. The second block consists of both socio-demographic variables (Model 1), and the included health related behaviors. Results are presented as “Model 2”.

4.0 RESULTS

Results of the independent samples t-tests are presented by mean and standard deviation (SD). Chi-square tests are presented by numbers and percentage (%). In the multivariate logistical regression analyses, results are presented by odds ratio (OR) and 95% confidence intervals (CI 95%).

4.1 Independent samples t-test and chi-square statistics

Characteristics of the study sample are presented in Table 1 and Table 2 according to dependent variables "animal product consumption" and "household food waste".

Animal product consumption

In the initial significance tests, few variables proved significantly associated to the participants' consumption of animal products. No significant association was found for gender, household composition, parent educational level, annual household income, meal frequency, unhealthy snacks intake, screen time, commuting method, number of cars, ownership of a bicycle or use of snuff. However, the variables age (p=0.020), fruit and vegetables intake (p=<0.001), exercise (p=0.011) and smoking (p=0.003) were significantly related to participants' self-reported consumption of animal products.

Household food waste

A larger share of the independent variables were significantly associated to the participants' perception of the amount of food waste in the household. Age (p=<0.001), number of children in the household, p=0.039, parent educational level (p=0.005), annual household income (p=0.016), fruits and vegetables intake (p=<0.001), unhealthy snacks intake (p=<0.001), screen time (p=0.025), exercise (p=0.030), commuting method (p=0.037) and smoking (p=0.003) were significantly associated to household food waste. Gender, number of adults in the household, meal frequency, ownership of a bicycle, number of cars in the household and use of snuff were not significantly associated to household food waste.

The detailed results of the analyses are presented in Table 1 and Table 2.

Table 1. Description of all independent variables and the association to parent's self-reported intention to reduce consumption of animal products (AP). Continuous variables[2] are expressed by mean and standard deviation (SD). Categorical variables[3] are expressed by frequency and percentage (%).

		Totals	"Reduction of AP"	"No reduction of AP"	*p*-value
Age		41.1 (5.1)	42.5 (6.0)	41.0 (5.0)	0.020
Gender	Male	209 (21.5%)	19 (9.1%)	190 (90.9%)	0.406
	Female	761 (78.5%)	56 (7.4%)	705 (92.6%)	
Children (n)	≤ 1child	156 (15.9%)	10 (6.4%)	146 (93.6%)	0.433
(In the household daily)	2 children	493 (50.2%)	38 (7.7%)	455 (92.3%)	
	≥ 3 children	334 (34.0%)	32 (9.6%)	302 (90.4%)	
Adults (n)	1 adult	191 (19.3%)	11 (5.8%)	180 (94.2%)	0.173
(In the household daily)	≥ 2 adults	798 (80.7%)	70 (8.8%)	728 (91.2%)	
Parent educational level	No university	454 (46.1%)	32 (7.0%)	422 (93.0%)	0.251
	University	530 (53.9%)	48 (9.1%)	482 (90.9%)	

[2] Indepdendent samples t-tests were performed on continuous variables.
[3] Chi-square tests were performed on categorical variables.

Annual income *(NOK thousands)*	≤ 600 NOK > 600 NOK	413 (50.5%) 405 (49.5%)	36 (8.7%) 31 (7.7%)	377 (91.3%) 374 (92.3%)	0.580
Meal frequency *(Meals per day)*	≤ 3 meals 4 meals	485 (48.8%) 509 (51.2%)	42 (8.7%) 39 (7.7%)	443 (91.3%) 470 (92.3%)	0.565
Fruit and vegetables *(Score, 0-41 points)*		17.2 (7.4)	20.0 (7.5)	17.0 (7.3)	< 0.001
Unhealthy snacks *(Score, 0-19 points)*		3.5 (2.8)	3.2 (3.3)	3.5 (2.8)	0.433
Screen time *(Hours per day)*	≤ 1 hour ≥ 2 hours	490 (49.7%) 496 (50.3%)	46 (9.4%) 35 (7.1%)	444 (90.6%) 461 (92.9%)	0.183
Exercise *(Times per week)*	≤ 1 time ≥ 2 times	439 (44.8%) 540 (55.2%)	25 (5.7%) 55 (10.2%)	414 (94.3%) 485 (89.8%)	0.011
Commuting method *(To worksite)*	Passive Active No commuting	607 (68.4%) 184 (20.7%) 97 (10.9%)	49 (8.1%) 16 (8.7%) 8 (8.2%)	558 (91.9%) 168 (91.3%) 89 (91.8%)	0.964
Bicycle owner	Yes No	839 (86.4%) 132 (13.6%)	65 (7.7%) 16 (12.1%)	774 (92.3%) 116 (87.9%)	0.091

Number of cars *(In the household*)	≤ 1 car ≥ 2 cars	419 (42.6%) 565 (57.4%)	32 (7.6%) 49 (8.7%)	387 (92.4%) 516 (91.3%)	0.559
Smoking	Yes No	281 (28.5%) 706 (71.5%)	15 (5.3%) 66 (9.3%)	266 (94.7%) 640 (90.7%)	0.038
Use of snuff	Yes No	52 (5.3%) 934 (94.7%)	78 (8.4%) 3 (5.8%)	856 (91.6%) 49 (94.2%)	0.509

Table 2. Description of all independent variables and the association to parent's self-reported amount of household food waste. Continuous variables[4] are expressed by mean and standard deviation (SD). Categorical variables[5] are expressed by frequency and percentage (%).

		Totals	”High food waste”	”Low food waste”	*p*-value
Age		41.1 (5.1)	40.6 (5.0)	42.1 (5.2)	<0.001
Gender	Male	208 (21.4%)	118 (56.7%)	90 (43.3%)	0.380
	Female	762 (78.6%)	458 (60.1%)	304 (39.9%)	
Children (n)	≤ 1child	157 (16.0%)	83 (52.9%)	74 (47.1%)	0.039
(In the household daily)	2 children	491 (50.0%)	310 (63.1%)	181 (36.9%)	
	≥ 3 children	334 (34.0%)	190 (56.9%)	144 (43.1%)	
Adults (n)	1 adult	190 (19.2%)	105 (55.3%)	85 (44.7%)	0.202
(In the household daily)	≥ 2 adults	799 (80.2%)	482 (60.3%)	317 (39.7%)	
Parent educational level	No university	455 (46.2%)	292 (64.2%)	163 (35.8%)	0.005
	University	529 (53.8%)	293 (55.4%)	236 (44.6%)	
Annual income	≤ 600	412 (50.5%)	228 (55.3%)	184 (44.7%)	0.016
(NOK thousands)	> 600	404 (49.5%)	257 (63.6%)	147 (36.4%)	

[4] Indepdendent samples t-tests were performed on continuous variables
[5] Chi square tests were performed on categorical variables.

Meal frequency *(Meals per day)*	≤ 3 meals 4 meals	486 (48.9%) 508 (51.1%)	300 (61.7%) 290 (57.1%)	186 (38.3%) 218 (42.9%)	0.136
Fruit and vegetables *(Score, 0-41 points)*		17.2 (7.4)	16.3 (7.6)	18.5 (6.8)	<0.001
Uhealthy snacks *(Score, 0-19 points)*		3.5 (2.8)	3.8 (3.0)	3.0 (2.5)	<0.001
Screen time *(Hours per day)*	≤ 1 hour ≥ 2 hours	491 (49.8%) 495 (50.2%)	274 (55.8%) 311 (62.8%)	217 (44.2%) 184 (37.2%)	0.025
Exercise *(Times per week)*	≤ 1 time ≥ 2 times	440 (44.9%) 540 (55.1%)	277 (63.0%) 303 (56.1%)	163 (37.0%) 237 (43.9%)	0.030
Commuting method (To worksite)	Passive Active No commuting	608 (68.5%) 183 (20.6%) 97 (10.9%)	383 (63.0%) 99 (54.1%) 52 (53.6%)	225 (37.0%) 84 (45.9%) 45 (46.4%)	0.037
Bicycle owner	Yes No	839 (86.4%) 132 (13.6%)	498 (59.4%) 79 (59.8%)	341 (40.6%) 53 (40.2%)	0.915
Number of cars (In the household)	≤ 1 car ≥ 2 cars	417 (42.4%) 567 (57.6%)	236 (56.6%) 347 (61.2%)	181 (43.4%) 220 (38.8%)	0.146

Smoking	Yes	282 (28.6%)	188 (66.7%)	94 (33.3%)	0.003
	No	705 (71.4%)	398 (56.5%)	307 (43.5%)	
Use of snuff	Yes	52 (5.3%)	32 (61.5%)	20 (38.5%)	0.728
	No	934 (94.7%)	552 (59.1%)	382 (40.9%)	

4.2 Multivariate logistical regression analyses

Multivariate logistical regression analyses were performed block-wise on both dependent variables with a separation between socio-demographic determinants and other health related behavioral determinants.

Animal product consumption

The results of the multivariate logistical regression analysis performed with animal product consumption as the dependent variable, are presented in Table 3. Model 1 of the analysis included all socio-demographic determinants (age, gender, household composition, educational level, annual household income, number of cars and ownership of a bicycle). In Model 1, only age proved to have a statistically significant association to animal product consumption when adjusting for all other socio-demographic variables (OR 1.070, 95% CI 1.010 - 1.133). This result corresponds to the initial independent samples t-test result on the same variable (p=0.020). Results suggest participants are 7% more likely to reduce consumption of animal products per year older. I.e., results indicate a tendency towards more sustainable food related choices with increasing age.

Model 2 (Table 3), included both Model 1 and health related behaviors. When adjusting for both socio-demographic and health related behaviors, age did not remain significant. However, in this model, annual household income (OR .416, 95% CI .203-.852) was significantly associated to consumption of animal products. This association was not found in Model 1. Results indicate that households are 58.4% more likely to reduce consumption of animal products if their total annual income is high (above 600.000 NOK). In terms of health related behaviors, fruits and vegetables intake (OR 1.070, 95% CI 1.019-1.123) was the only health related behavior significantly associated to consumption of animal products when adjusting for both socio-demographics and other health related behaviors. A total of 7 % of variance in consumption of animal products may be explained by high intake of fruit and vegetables in the regular diet.

Exercise and smoking were significantly associated to consumption of animal products in the crude tests, but these associations were no longer found when adjusting for other variables in the multivariate logistical regression analysis.

Household food waste

When adjusting for all socio-demographic variables, age, parent educational level and annual household income were significantly associated to the amount of household food waste in Model 1 (Table 4). No associations were found for gender, household composition, number of cars in the household or ownership of a bicycle. Results indicate that increasing age (OR .956, CI .925-.988) is associated to lower amount of household food waste, although the association is weak. Per year of age, results suggest participants are 4.4% less likely to have high household food waste per year. Further, participants with a university level education were 34.3 % less likely to waste food (OR .657, CI .469 - .923) compared to participants with no university education. Results on annual household income indicate the opposite. Results show that high income (OR 1.649, CI 1.138-2.389) is strongly associated to household food waste, with a 64.9% increased risk of generating higher amounts of household food waste compared to households with low annual incomes.

In Model 2 (Table 4), both socio-demographic and health related behaviors are adjusted for. In this model, only income is significantly associated to household food waste among the socio-demographic variables. With an OR of 1.827 and a CI of 1.219-2,758, results indicate that high-income households are 82.6% more likely to also have high amounts of household food waste compared to low-income households. Among health related behavioral variables, only unhealthy snacks consumption is significantly associated to household food waste (OR 1.102, CI 1.031-1.177). Results on this variable indicate that participants with a high intake of unhealthy snacks are 10% more likely to have high amounts of household food waste in comparison to participants with a lower consumption of unhealthy snacks. No other health related behaviors were significantly associated to household food waste according to this model.

Fruits and vegetables intake, smoking, screen time, number of children in the household and commuting method were significantly associated to household food waste in the crude tests, but these associations were no longer found when adjusting for other variables in the multivariate logistical regression analysis.

Table 3. Multivariate logistical regression analysis with the dependent variable "animal product consumption". Independent variables are included block-wise according to socio-demographic determinants and health related behaviors.

Presented as odds ratio (OR) with Confidence intervals (CI 95%).

Socio-demographic variables		Model 1			Model 2		
		OR	95 % CI		OR	95 % CI	
			Lower	Upper		Lower	Upper
Age		1.070	1.010	1.133	1.058	.990	1.131
Gender	(Males vs. females)	.995	.508	1.946	1.436	.665	3.098
Children	(2 children vs. 1 child)	1.310	.510	3.364	1.176	.438	3.159
	(≥3 children vs. 1 child)	1.720	.650	4.553	1.376	.492	3.847
Adults	(1 adult vs. ≥ 2 adults)	2.058	.788	5.379	.405	.142	1.157
Education	(High vs. low)	1.203	.640	2.262	.884	.430	1.815
Income	(High vs. low)	.646	.336	1.241	.416	.203	.852
Bicycle	(No vs. yes)	1.176	.499	2.772	1.518	.602	3.831
Cars	(≥2 cars vs. ≤1 car)	.687	.366	1.288	.812	.699	1.650

Health related behaviors

Meal frequency (≤3 meals vs. 4 meals)		1.158	.615	2.181
Unhealthy snacks consumption		1.029	.919	1.152
Fruits and vegetables consumption		1.070	1.019	1.123
Exercise	(≥2 times vs. ≤1 time/week)	1.665	.817	3.396
Screen time	(≥ 2 vs. ≤ 1 hour/day)	.544	.283	1.045
Commuting	(Active vs. passive)	.866	.400	1.960
	(No commuting vs. passive)	1.123	.394	3.202
Smoking	(Yes vs. no)	.563	.231	1.369
Snuff	(Yes vs. no)	.933	.201	4.332

Model 1: Containing socio-demographic determinants as independent variables.
Model 2: Containing Model 1 and all health related behaviors as independent variables.

Table 4. Multivariate logistical regression analysis with the dependent variable "household food waste". Independent variables are included block-wise according to socio-demographic determinants and health related behaviors.

Presented as odds ratio (OR) with Confidence intervals (CI 95%).

Socio-demographic variables		Model 1			Model 2		
		OR	95 % CI		OR	95 % CI	
			Lower	Upper		Lower	Upper
Age		.956	.925	.988	.972	.937	1.008
Gender	(Males vs. females)	.916	.632	1.326	.668	.431	1.035
Children	(2 children vs. 1 child)	1.052	.662	1.672	1.138	.696	1.860
	(≥3 children vs. 1 child)	.850	.517	1.397	.846	.496	1.444
Adults	(1 adult vs. ≥ 2 adults)	1.087	.664	1.780	1.108	.648	1.893
Education	(High vs. low)	.657	.469	.923	.771	.527	1.128
Income	(High vs. low)	1.649	1.138	2.389	1.827	1.219	2.738
Bicycle	(No vs. yes)	1.317	.803	2.161	1.135	.655	1.965
Cars	(≥2 cars vs. ≤1 car)	1.180	.822	1.695	1.123	.750	1.681

Health related behaviors				
Meal frequency (≤3 meals vs. 4 meals)		1.143	.815	1.602
Unhealthy snacks consumption		1.102	1.031	1.177
Fruits and vegetables consumption		.978	.952	1.005
Exercise	(≥2 times vs. ≤1 time/week)	.834	.583	1.195
Screen time	(≥ 2 vs. ≤ 1 hour/day)	1.079	.767	1.519
Commuting	(Active vs. passive)	.822	.536	1.195
	(No commuting vs. passive)	.791	.447	1.401
Smoking	(Yes vs. no)	1.073	.714	1.614
Snuff	(Yes vs. no)	1.230	.588	2.574

Model 1: Containing the socio-demographic determinants as independent variables.
Model 2: Containing Model 1 and health related behaviors as independent variables.

5.0 DISCUSSION

5.1 Discussion of research question

Existing literature stresses the need for change in the global food system in order to feed an expanding world population (Parfitt et al. 2010, Godfray et al. 2010). Mitigating and adapting to climate change is a significant, additional challenge to the current food system. Among the most promising measures to achieve food sustainability, is to increase FSC efficiency by reducing food waste and decreasing consumption of animal products. Consumer level changes are likely to be relevant to achieve these targets, as consumers in industrialized countries are among the largest contributors to food waste. Furthermore, consumer choices directly affect the global demand for animal products, whose production is associated with major environmental impact. Knowledge of determinants mediating or moderating behaviors is considered important for successful preventive measures (Bartholomew et al. 2011, Stancu et al. 2015). Therefore knowledge of socio-demographic determinants and relevant health related behaviors might facilitate future public health interventions aimed at increasing sustainable food related choices among consumers.

The results of the present study show that food waste and animal product consumption constitute important, but distinct behaviors related to food sustainability, where determinants may not always coincide for both behaviors. The findings of the present study indicate that some important determinants are common, such as age, income and different aspects of diet. Other determinants are individually related to food waste or animal product consumption. Individual determinants associated to household food waste were educational level and unhealthy snacks intake, whereas fruits and vegetables intake was associated to animal product consumption.

The results of the present study have shown considerable variation according to demographics and SES. Thus, it is likely necessary to tailor interventions both to different food sustainability concepts *and* to different groups of the population. It should be stressed that few existing studies dealing with determinants of consumption of other animal products than meat were identified. The lack of such knowledge makes it difficult to discuss the present results against other animal products than meat.

5.1.1 Demographic determinants of sustainable food related choices

In the present study, higher age was significantly associated both to lower household food waste and lower animal product consumption. Age was a significant determinant in both models controlling for other socio-demographic determinants (Model 1, Table 3 & Model 1, Table 4). Although the present associations were not very strong, results indicate that age is relevant as a predictor of sustainable food related choices among consumers, also when adjusting for gender, household composition and the socio-economic background of participants.

The importance of age to make sustainable food choices is consistently supported by existing research on food waste behavior. Both Stensgård & Hanssen (2015) and WRAP (2014) found respectively age groups ≤25, 26-39 and 18-34 were the most wasteful compared to older age groups. The present results display a possibility that there are differences in food waste behavior in the current adult generations, as well as the established distinction between adults and elderly. The term "generation food waste" most often refers to age differences between the immediate post-war generation and the current young and adult generations (Parfitt et al. 2010). However, the gap between the eldest generations and younger age groups is expected to fade out with upcoming shifts in generations. I.e., when the immediate post-war, "low food waste" generation dies, the differences between old and young would be expected to become less significant (Gjerris & Gaiani 2013). As such, it is interesting that age differences in regard to household food waste were still significant in the present study, despite the fact that elderly were not included.

Similarly, Daniel et al. (2010) found age group 20-49 were the most frequent meat consumers in the US. Kayser et al. (2013), on the other hand, found no connection between age and meat consumption. As the existing evidence is both limited and inconsistent, there is uncertainty in whether age has an impact on meat consumption. With regard to fish consumption, few previous studies have been identified. Only Pienak et al. (2010) found a tendency of increasing fish and seafood consumption with age. But in accordance to this finding, authors stressed the possibility that increasing age leads to higher interest in the health outcomes of different dietary habits. Increased health interests may be reflected in reduced meat consumption or choice of poultry meat and fish in favour of red and processed meat. Thereby, health interests may be a confounding factor to the age association. No existing studies

dealing with dairy, eggs or total animal product consumption were identified. Previous associations only emphasize meat or fish consumption, and this definitional difference disrupts the ability to compare previous results with the present research question. Nevertheless, results from the present study indicate increasing age is relevant to having an intention to reduce animal product consumption. Therefore, future interventions aimed at food related sustainability should preferably be aimed at adults and younger age groups who seems to hold the best potentials for improvement.

Gender differences in sustainable food related choices were not found in the present study, neither for household food waste nor animal product consumption. In existing literature, gender differences in food waste are uncertain. Only one study (Koivupuro et al. 2012) found households with a woman mainly responsible for grocery shopping displayed a tendency to be more wasteful compared to men. On the other hand, evidence seems to be strong regarding gender and meat consumption (see below). A likely cause of this result mismatch, is that the present study examined total animal product consumption and not meat products exclusively. Thus, the present study may not have captured existing gender differences in meat consumption.

In the majority of previous research on determinants of animal product consumption, findings suggest men eat considerably more meat than women, both in total meat consumption and per meat type (Daniel et al. 2010, Wang et al. 2010, Cross et al. 2011, Helsedirektoratet 2012). Men do have larger daily calorific needs, which may contribute to a larger meat intake. However another likely explanation is a culture contingent difference, where the leading norm is animal products, especially meat, historically is more associated to masculinity (Schösler et al. 2015). Furthermore, women are more likely to maintain healthy diets and have an average consumption of fruits and dietary fiber higher than men's (Helsedirektoratet 2012). In such, extensive consumption of meat products does not correspond to a healthy diet, and may therefore contribute to gender specific consumption patterns.

Household composition, measured by number of children in the household, was not significantly associated to animal product consumption or to household food waste in the adjusted models of the present study. For animal product consumption, no previous research has been identified either. However, evidence of household composition as a determinant of food waste is strong. In accordance to existing studies, single person households generate

more food waste per capita than larger households. Furthermore, larger households naturally have higher total food waste (Baker et al. 2009, Koivupuro et al. 2012, WRAP 2014, Stancu et al. 2015, Stensgård & Hanssen 2015). In the present study, number of children was only significantly associated to household food waste in the chi square test, and the association was no longer found in the multivariate logistical regression model. This means that the effect of household size weakened when adjusting for other variables, a result that is not consistent with previous research. It was surprising that number of children in the household did not continue to be significantly associated to household food waste. A likely cause of the non-significance of household composition in the present study is that all included participants are parents. Therefore no assumption or comparison could be made for households of less than two people or households not containing children. However, future interventions should take into account how varying household demographics affect food waste in accordance to the existing evidence.

In addition to the included demographic determinants, there are many indications that general cultural differences affect food consumption patterns (Stuart 2009). This has not been investigated in the present study, but should be taken into consideration by professionals who encounter different population groups.

5.1.2 SES and sustainable food related choices

In the present study, both annual household income and parent educational level seem to be key determinants of sustainable food related choices. Annual household income and educational level were the only significant determinants of household food waste in the model controlling for all included socio-demographic variables (Model 1, Table 4). Furthermore, income was the only significant socio-demographic determinant in the model controlling for both socio-demographics and health related behaviors (Model 2, Table 4). Thus, income seems to be among the strongest predictors of household food waste as results from Model 2 showed high-income families were 82.6% more likely to have high household food waste in the present study. The majority of previous research has found weak or no associations between high income and high food waste (Stefan et al. 2013, Koivupuro et al. 2012, Williams et al. 2012). On the other hand is Baker et al. (2009), whose results showed a clear connection between high income and high food waste in Australian households. A possible explanation for this result is increased consumerism, which reflects upon higher income, and

a higher amount of food waste is the by-product. Furthermore Baker et al. (2009) found financial savings was the largest motivator to reduce household consumption, and this motivation may be less prominent in high-income households.

In contrast, educational level was associated to *lower* household food waste in the present study (Model 1, Table 4). I.e., a participant with a university level education was more likely to have low household food waste. Educational level, through acquisition of knowledge and ability to process knowledge, is strongly associated both to healthier food choices and more positive health outcomes (Pienak et al. 2010). It is interesting that educational level and household income have opposite effects on household food waste. This suggests social inequality may be of importance to the understanding of- and ability to make sustainable food related choices. Thus, consumer information and education should be key focus areas to address the food waste challenge. Further, more research should be conducted to explore this topic, as educational level and its connection to food waste seem to be insufficiently examined in existing research. In the majority of previous studies, income and/or employment status are used as SES indicators. Only one study (Koivupuro et al. 2012) included educational level, but found no significant correlation to household food waste.

In terms of animal product consumption, educational level did not turn out significant in any of the statistical models in the present study. However, other recent research suggests education is relevant to meat consumption. Daniel et al. (2010) found a university level education was associated to lower total meat consumption. Furthermore, a number of studies suggest educational level is among the most relevant predictors of which meat products are chosen. People with a high education more often choose fish and poultry meat, compared to lower educated people (Guenther et al. 2005, Pienak et al. 2010, Daniel et al. 2010). Differences in choice of meat products are also of great environmental importance, due to the varying environmental impacts of meat and other animal products. Both fish products and poultry products are significantly more environmentally sustainable than red and processed meat products (De Vries & De Boer 2010). Unfortunately, no basis for comparison has been found for other animal products such as dairy and eggs. Once again this could be due to definitional differences.

In contrast to household food waste results, household income was inversely associated to animal product consumption in the present study. Here, the results showed a small tendency

towards a reduction of animal product consumption in high-income households. This finding is contradictory to the fact that increasing wealth on a population basis is seen to create higher demand for meat and animal products. However, few studies have examined income and meat consumption in households, and comparable results from other studies have not been identified. Only Guenther et al. (2005) found, similar to the results regarding education, that income was more likely to predict certain meat choices than the total consumption.

In summary, the results of the present study indicates SES as an important determinant of sustainable food related choices, yet educational level and household income seems to have strongly varying effects. High income may contribute to unsustainable food waste behavior, yet in regard to animal products, high income seems to be related to a decrease in consumption. SES measured by education was not related to consumption of animal products, but higher education was associated to lower household food waste (Model 1, Table 4). In this respect, education and knowledge appears to be important determinants of sustainable food related choices among consumers.

5.1.3 Health related behaviors and sustainable food related choices

Few health related behaviors were significantly associated to sustainable food related choices in the present study. The results suggest only the participants' dietary habits are relevant to the degree of sustainable food related choices. However, different aspects were relevant to household food waste and animal product consumption respectively.

"Fruits and vegetables intake" was related to consumption of animal products (Table 3), thereby constituting the only health related behavior with a significant association animal product consumption. Participants with a high consumption of fruit and vegetables were more likely to try to reduce the household consumption of animal products. However, many confounding explanations are relevant to this connection, such as general health beliefs and health interests. Even so, a high consumption of fruit and vegetables is in line with Norwegian dietary recommendations (Helsedirektoratet 2015a), and it is favourable if promotion of fruits and vegetables is associated to a reduced consumption of animal products as well. According to the results from both present study and previous studies, fruits and vegetables as substantial dietary components seem to be important not only to population health, but also to food related sustainability. Thus, fruit and vegetables consumption should proceed to be target

areas in public health interventions. These products are both healthy and nutritious, while their environmental impact is low compared to animal products (McMichael et al. 2007, Carlsson-Kanyama & González 2009). Moreover, plant-based foods could advantageously receive more attention in dietary guidelines, as an integration of both health and environment in public recommendations (Macdiarmid et al. 2012).

Regarding household food waste, "unhealthy snack intake" was the only significantly associated health related behavior (Model 2, Table 4). Results showed that a high consumption of unhealthy snacks was inversely associated to household food waste. In this case, there is a lack of basis for comparison because no prior research assessing this connection has been identified. Therefore no likely cause or explanation of this relationship can be pointed to, and further research is needed to gain more knowledge on the relationship between food waste and diet quality.

Apart from diet, smoking was associated both to animal product consumption and household food waste in the unadjusted significance tests. Although these associations were uncertain and not significant in the main statistical models of the present study, the association is in accordance to previous studies regarding meat consumption. American research on meat consumption indicates people who smoke have a higher total meat, red meat and processed meat consumption (Cross et al. 2010). To this connection, SES might be a confounding variable, as low SES is interrelated both to smoking and higher meat consumption.

5.2 Discussion of methodology

5.2.1 Study design

The present study aimed at identifying socio-demographic determinants and health related behaviors associated to sustainable food related choices. To date, there are only a few other studies solely addressing this topic, and for many determinants, results have not been consistent. The current limited knowledge and contribution to new insights have been key drivers, however the topic of food sustainability in itself is interesting and not least important.

A quantitative, cross sectional study was considered the most appropriate design according to the available data set, the research question and aim of the present study. A cross-sectional

study design provides the opportunity to investigate a variety of independent variables and outcomes, while being economically feasible (Polit & Beck 2014). The nature of a master thesis in terms of time limits also excluded longitudinal designs.

The results of cross-sectional studies are mainly used to describe prevalence, or to provide information on associations between suspected causes of certain outcomes in a moment in time. In such, a cross-sectional study design can be described as taking a "snapshot" from a population (Saks & Allsop 2013). Thus, the present study is well suited to identify determinants and behaviors likely to be associated to making sustainable food related choices. However, no *"cause and effect"* relationship may be determined on the basis of a cross-sectional study. It is therefore important to stress that the determinants and behaviors associated to food related sustainability in the present study cannot be regarded as causal. This means no certain knowledge of the temporal order of the relationships between variables can be provided, and underlying factors may affect their significance.

Inclusion of variables

The inclusion and exclusion of variables was a challenging process, as there were many interesting aspects to examine. In the present study, data was already collected and therefore information was limited to that which was included in the questionnaire applied in FVMM (Bere et al. 2010). No specific inclusion or exclusion criteria were established in the process of selecting variables. The inclusion procedure consisted of carefully selecting variables relevant to the research question, as well as reviewing results from other relevant research. Household food waste and animal product consumption were selected as dependent variables to indicate the participants' willingness to make sustainable food related choices. The vast majority of literature and previous research stresses the importance of improvement in these areas to ensure global food sustainability. Thus, the selected dependent variables are considered valid and relevant indicators of food related sustainability at the consumer level.

Regarding demographics and SES, relevant findings from existing research were available and variables were selected accordingly. As indicators of demographic characteristics of the study sample, age, gender and household composition were included. These variables are considered central descriptive factors of the participating households. SES was assessed by educational level of the participant, annual household income, number of cars in the household and ownership of a bicycle. In general, educational level and income are the most

frequently used SES indicators, and are therefore among key variables to measure SES (Dahl et al. 2014). Number of cars in the household and ownership of a bicycle were also included, with an intention to include some additional indicators of SES and environmental consciousness. There is a well-established connection between SES and general health and mortality outcomes in the Norwegian population (Dahl et al. 2014), and an interesting aspect of including health behaviors is whether this connection could be transferable to sustainable food choices as well.

Health related behaviors were included to assess the possibility of significant relationships between positive health related behaviors and sustainable food related choices. However, to the author's knowledge, several of the health related behaviors have not previously been examined according to food sustainability. Diet, meal frequency, physical activity, commuting method, smoking and use of snuff were included to examine this hypothesis.

5.2.2 Questionnaire as method of measurement

Quantitative studies are often associated with the use of questionnaire surveys, which is one of the most common quantitative methods to collect data. As such, application of questionnaires to obtain information and examine research questions is a very valuable method in terms of being able to observe and compare groups or populations (Saks & Allsop 2013). Data collections through questionnaire surveys are also feasible and economical methods both for researchers and respondents. Furthermore, information obtained from questionnaires provides structured and standardized data material, which is considered to be one of the strengths of the method (Saks & Allsop 2013). In questionnaires, respondents are also non-identifiable, which is another advantage of questionnaire surveys (Polit & Beck 2014). In the present study, the FVMM parent questionnaire survey was the source of data (Bere et al. 2010). This questionnaire provided a broad descriptive overview of the participants and the included topics. The FVMM study also yielded an adequate response rate (59.1%), which is likely to be sufficient to lower the risk of non-response bias. The distribution of questionnaires in collaboration with participating schools may also have increased the response rate, by strengthening the participants' perceived importance of completing the questionnaire.

Weaknesses of questionnaire surveys may be derived from misunderstandings and poorly formulated questions leading to errors. Another weakness is how questionnaire surveys are unable to identify the participants' meanings and actions (Saks & Allsop 2013). Thus, the data obtained in the FVMM study does not provide contextual information of the participants' thoughts and perceptions regarding sustainable food related choices. A specific weakness of the questionnaire related to the present study, is that the questionnaire was not intended to measure sustainable food related choices. The main focus of the questionnaire was to obtain information of diet and commuting method. However, food waste and animal product consumption were included and thus applied in the present study as indicators of sustainable food related choices among consumers.

Reliability and validity

To ensure stability of results, a test-retest reliability study was conducted in connection to the FVMM project. The aim of the study was to report the test-retest reliability of the, at the time, newly developed and comprehensive questionnaire applied in the present study (Appendix 1). Results suggested high test-retest correlation coefficients with 0.85-0.92 for pupils and 0.82-0.95 for parents (Bere & Bjørkelund 2009). However, the test-retest reliability study was only performed with the commuting part of the questionnaire, therefore there are no existing reliability analyses of the questions applied in the present study. Despite this, the majority of questions are similarly designed, and it is likely that the test-retest results can conform to other parts of the questionnaire. This contributes to the probability of reliable results in the present study.

In terms of internal validity, it should be noted that the question regarding animal products in the present study is considered too general. Information from this question constituted the dependent variable "consumption of animal products" and was obtained by asking *"Are you attempting to reduce the household consumption of animal products (meat, fish, eggs and dairy products) in order to save the environment?"* According to the highly variable environmental impact of different types of animal products, the question should ideally focus on red and processed meat (De Vries & De Boer 2010, Nijdam et al. 2012). Or, there should be an additional question separating animal product types. This would arguably generate more detailed information of the participant's environmental awareness and intent to make sustainable food related choices. Furthermore, other recent studies differentiate between specific products, which complicates comparison of results.

In an external validity perspective, a large study sample is required to draw any credible conclusions. A study sample of adequate size was accessible from the FVMM study (Bere et al. 2010), which aimed to examine fruit and vegetable intake of adolescents through questionnaires. The study study sample size (n=1012) of the present study contributes to the supposition of adequate credibility of results. As such, the study sample size must be considered a strength of the present study. Another aspect relevant to assess external validity is the random selection of schools participating in the FVMM study. Random school selection is considered to have increased the ability to generalize present results across different populations. On the basis of the study sample and the random school selection, it is likely that the present results are applicable to similar populations and settings.

Nevertheless, some validity constraints should be noted. The selection of counties during the FVMM study was a convenience sample, as these counties were chosen due to the program start-up of school fruit in Hedmark and Telemark at this point in time (Bere et al. 2010). Hedmark and Telemark are rural Norwegian counties mainly consisting of smaller towns and villages. This convenience sampling of counties may have an affect on the ability to generalize results onto more urban counties due to differing demographics and infrastructure. Furthermore, the response rate was 59.1%, and as a result it can be assumed that there is a somewhat selected sample due to the possibility of social- and health inequalities between those who did and those who did not complete the questionnaire. Additionally, a large majority of the parents participating in the study were women (78.5%). This is likely to be a factor of influence as it differs from the general population.

5.3 Limitations of the study

The present study has provided new insights and relevant answers to the research question. Still, some limitations of the study have been identified and needs to be mentioned. In the present study, all data material was self-reported. It is well documented that self-reported data, in this case obtained from a questionnaire survey, are linked to social-desirability bias. Social-desirability bias concerns the fact that study participants often show a tendency to answer in a manner that feels socially acceptable, although this may undermine facts. It cannot be ruled out that the results of the present study are affected by social desirability bias.

Furthermore, the question regarding animal product consumption in the questionnaire applied in the study (Appendix 1) should be mentioned. Information obtained from this question was used to assess food related sustainability by measuring the household's willingness to reduce consumption of animal products. The vast majority of respondents initially answered that they did not try to reduce their animal product consumption (91.9%). This is likely to have weakened the statistical strength of results related to consumption of animal products.

6.0 CONCLUSION

Returning to the research question, results of the present study suggest that age, annual household income and educational level are likely to be key socio-demographic determinants associated with sustainable food related choices. Increasing age was positively associated both with household food waste and consumption of animal products. A university education was associated with more sustainable food related choices in regard to household food waste. Annual household income was contrastingly associated with sustainable food related choices. Results suggested high income was associated with reduced consumption of animal products and with higher household food waste.

Regarding health related behaviors, present results suggest type of diet was associated with sustainable food related choices. High consumption of unhealthy snacks was associated to higher amounts of household food waste. On the other hand, participants reporting a diet with high consumption of fruits and vegetables were more frequently trying to reduce their consumption of animal products.

In a more general conclusion, age, SES and diet are likely to be important determinants of sustainable food related choices at consumer level. However, more research is needed on determinants and behaviors of importance to food and dietary sustainability. Such knowledge is essential to implement successful public health interventions aimed at creating more sustainable consumption patterns. More research regarding the significance of SES to sustainable food related choices should also be a priority area, preferably longitudinal and intervention studies.

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UNIVERSITETET I AGDER

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Spørreskjema om kosthold, fysisk aktivitet og miljø

Takk for at du vil delta i forskningsprosjektet "Frukt og grønt i 6/Aktiv transport til og fra skolen i Norge".

I dag har elevene i din datter/sønns klasse svart på et liknende spørreskjema.

Det er kun en av elevens foreldre/foresatte som skal fylle ut dette spørreskjemaet.

Alle svarene behandles konfidensielt. Er det spørsmål du ikke kan eller vil svare på kan du la det være.

Det ferdig utfylte skjemaet legges i den konvolutten den kom i, forsegles og sendes med din sønn/datter tilbake til kontaktlærer.

Vi gir gjerne mer informasjon. Line Anita Bjørkelund (line.a.bjorkelund@uia.no, 38 14 18 63).

TAKK FOR HJELPEN!

Elling Bere
Førsteamenuensis
Prosjektleder

Marit Hilsen
Stipendiat

Line Anita Bjørklund
Stipendiat

1. Er du?

(1) ☐ Mann

(2) ☐ Kvinne

2. I hvilket år er du født?

1	9		

3. Hvilken dato er det i dag?

Del A - Hva spiste du i går?

Dagen i går er delt opp i 4 perioder: Frokost, mellom frokost og middag, middag og kvelds.

- Kryss av for om du spiste de forskjellige matvarene til de forskjellige tider eller ikke.
- For **frukt, grønnsaker, poteter**, **juice og vann** skal du også skrive HVA du spiste/drakk og HVOR MYE. Under følger en beskrivelse av hvordan du skal gjøre dette.
- For **brus, snop, nudler** og **boller** skal du kun krysse av for om du spiser det eller ikke. Her skal du IKKE skrive ned hva og hvor mye

For å skrive ned hvor mye du spiste og drakk skal du tenke på følgende:

Frukt og **bær** måles i antall (f.eks. ett eple, en banan) eller i porsjon (f.eks. en porsjon fruktsalat)

Grønnsaker måles i antall (f.eks. en gulrot) eller i porsjon (f.eks. en porsjon salat, en porsjon brokkoli)

Poteter måles i antall (f.eks. 2 poteter) eller i porsjon (f.eks. en porsjon potetstappe eller en porsjon stekte poteter)

Juice og vann måles i antall glass (f.eks. ett glass eplejuice)

Hvis du spiste noe som ikke kan måles i stykker, porsjoner eller antall, må du beskrive best mulig hvor mye du spiste (f.eks. 2 never bringebær, 1½ skive kålrot eller 3 ringer paprika).

Brus med sukker er f.eks. Solo, Pepsi, Fanta eller Coca-Cola.
Brus uten sukker er f.eks. Solo lett, Pepsi MAX, Coca-Cola light/zero eller Tab X-tra.

Tenk tilbake til i går tidlig

Frokost

4. Spiste du frokost i går tidlig?

☐ Ja ☐ Nei

5. Spiste du frukt eller bær i går tidlig?

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags og hvor mye **frukt** og **bær** du spiste her:

6. Spiste du grønnsaker i går tidlig?

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags og hvor mye **grønnsaker** du spiste her:

7. Drakk du juice i går tidlig?

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags og hvor mye **juice** du drakk her:

8. Drakk du vann i går tidlig?

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags **vann** og hvor mye du drakk (fra spring eller kjøpevann, med eller uten kullsyre, med eller uten smak. Skriv merke/ type):

9. Drakk du brus MED sukker i går tidlig? (f. eks. Solo, Pepsi, Fanta, Coca Cola)

☐ Ja ☐ Nei

10. Drakk du brus UTEN sukker i går tidlig? (f.eks. Solo lett, Pepsi MAX, Tab X-tra, Coca Cola Zero eller Light)

☐ Ja ☐ Nei

11. Spiste du nudler (f.eks. Mr Lee) i går tidlig?

☐ Ja ☐ Nei

12. Spiste du boller, muffins, kake eller annen søt gjærbakst i går tidlig?

☐ Ja ☐ Nei

13. Spiste du snop, potetgull eller lignende i går tidlig?

☐ Ja ☐ Nei

Tenk på tiden mellom frokost og middag i går

14. Spiste du lunsj/ formiddagsmat i går?

☐ Ja ☐ Nei

15. Spiste du frukt eller bær i tiden mellom frokost og middag i går? **Formiddag**

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags og hvor mye **frukt** og **bær** du spiste her:

16. Spiste du grønnsaker i tiden mellom frokost og middag i går?

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags og hvor mye **grønnsaker** du spiste her:

17. Drakk du juice i tiden mellom frokost og middag i går?

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags og hvor mye **juice** du drakk her:

18. Drakk du vann i tiden mellom frokost og middag i går?

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags **vann** og hvor mye du drakk (fra spring eller kjøpevann, med eller uten kullsyre, med eller uten smak. Skriv merke/ type):

19. Drakk du brus MED sukker i tiden mellom frokost og middag i går?

☐ Ja ☐ Nei

20. Drakk du brus UTEN sukker i tiden mellom frokost og middag i går?

☐ Ja ☐ Nei

21. Spiste du nudler (f.eks. Mr Lee) i tiden mellom frokost og middag i går?

☐ Ja ☐ Nei

22. Spiste du boller, muffins, kake eller annen søt gjærbakst i tiden mellom frokost og middag i går?

☐ Ja ☐ Nei

23. Spiste du snop, potetgull eller lignende i tiden mellom frokost og middag i går?

☐ Ja ☐ Nei

Tenk tilbake til middagstid i går

Middag

24. Spiste du middag i går?

☐ Ja ☐ Nei

25. Spiste du potet til middag i går?

☐ Ja ☐ Nei

Hvis ja, skriv ned i hvilken form og hvor mye **potet** du spiste her:

26. Spiste du grønnsaker til middag i går?

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags og hvor mye **grønnsaker** du spiste her:

27. Drakk du juice til middag i går?

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags og hvor mye **juice** du drakk her:

28. Spiste du frukt eller bær til middag eller som dessert i går?

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags og hvor mye **frukt** og **bær** du spiste her:

29. Drakk du vann til middag i går?

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags **vann** og hvor mye du drakk (fra spring eller kjøpevann, med eller uten kullsyre, med eller uten smak. Skriv merke/ type):

30. Drakk du brus MED sukker til middag i går?

☐ Ja ☐ Nei

31. Drakk du brus UTEN sukker til middag i går?

☐ Ja ☐ Nei

32. Spiste du nudler til middag i går?

☐ Ja, vanlige middagsnudler ☐ Ja, Mr Lee eller lignende ☐ Nei

33. Spiste du boller, muffins, kake eller annen søt gjærbakst til middag eller som dessert i går?

☐ Ja ☐ Nei

34. Spiste du snop, potetgull eller lignende til middag eller som dessert i går?

☐ Ja ☐ Nei

Tenk tilbake til tiden etter middag i går

35. Spiste du kveldsmat i går kveld?

☐ Ja ☐ Nei

36. Spiste du frukt eller bær etter middag eller til kvelds i går? **Kvelds**

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags og hvor mye **frukt** og **bær** du spiste her:

37. Spiste du grønnsaker etter middag eller til kvelds i går?

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags og hvor mye **grønnsaker** du spiste her:

38. Drakk du juice etter middag eller til kvelds i går?

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags og hvor mye **juice** du drakk her:

39. Drakk du vann etter middag eller til kvelds i går?

☐ Ja ☐ Nei

Hvis ja, skriv ned hva slags **vann** og hvor mye du drakk (fra spring eller kjøpevann, med eller uten kullsyre, med eller uten smak. Skriv merke/ type):

40. Drakk du brus MED sukker etter middag eller til kvelds i går?

☐ Ja ☐ Nei

41. Drakk du brus UTEN sukker etter middag eller til kvelds i går?

☐ Ja ☐ Nei

42. Spiste du nudler (f.eks. Mr Lee) etter middag eller til kvelds i går?

☐ Ja ☐ Nei

43. Spiste du boller, muffins, kake eller annen søt gjærbakst etter middag eller til kvelds i går?

☐ Ja ☐ Nei

44. Spiste du snop, potetgull eller lignende etter middag eller til kvelds i går?

☐ Ja ☐ Nei

Del B - Dine meninger om frukt og grønnsaker

Nå kommer en rekke utsagn om frukt og grønnsaker. Hvor enig er du i de forskjellige utsagnene? Alternativene er **helt uenig**, **litt uenig**, **litt enig** eller **helt enig**. Hvis du ikke har noen mening, eller du ikke vet hva du skal svare, så krysser du av for **verken enig eller uenig**

1. Hjemme har vi som regel grønnsaker til middag hver dag

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

2. Min sønn/datter liker frukt veldig godt

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

3. Det hender ofte at min sønn/datter finner seg frukt og grønnsaker hjemme mellom måltider

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

4. Min sønn/datter spiser frukt og grønnsaker til hvert måltid

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

5. Det hender at jeg eller min ektefelle/samboer kutter opp frukt eller grønnsaker til min sønn/datter som snacks

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

6. Min sønn/datter liker grønnsaker veldig godt

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

7. Det hender at min sønn/datter kutter opp frukt eller grønnsaker til seg selv som snacks

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

8. Min sønn/datter får lov å spise frukt og grønnsaker når han /hun selv vil

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

9. Min sønn/datter spiser alltid opp grønnsakene sine til middag.

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

10. Hjemme har vi vanligvis frukt stående fremme i en skål

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

11. Min sønn/datter trenger å spise mer frukt og grønnsaker

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig
(6) ☐ Helt enig

12. Hjemme har vi vanligvis alltid frukt og grønnsaker i kjøleskapet

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

Del C - Hva spiser du vanligvis?

Når du fyller ut disse spørsmålene skal du tenke på hva du vanligvis spiser/drikker. Tenk gjerne på hva du har spist/drukket de siste 3 månedene. Tenk på både hva du spiser hjemme, på arbeid og i fritiden. Kryss av i den ruten du føler passer best for deg.

1. Hvor ofte spiser du potet?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

2. Hvor ofte spiser du grønnsaker til middag?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

3. Hvor ofte spiser du grønnsaker på brødskivene?

(11) ☐ Aldri
(12) ☐ Sjeldnere enn 1 gang i uken
(13) ☐ 1 gang i uken
(14) ☐ 2 ganger i uken
(15) ☐ 3 ganger i uken
(16) ☐ 4 ganger i uken
(17) ☐ 5 ganger i uken
(18) ☐ 6 ganger i uken
(19) ☐ Hver eneste dag
(20) ☐ Flere ganger hver dag

4. Hvor ofte spiser du andre grønnsaker (f.eks. gulrot til lunchen)?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

5. Hvor ofte spiser du eple, appelsin, pære og banan?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

6. Hvor ofte spiser du annen frukt og bær (andre frukter og bær enn eple, appelsin, pære og banan)?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

7. Hvor ofte spiser du nudler (f.eks. Mr.Lee)?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

8. Hvor ofte spiser du potetgull?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

9. Hvor ofte spiser du godterier (sjokolade, blandet godt osv.)?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

10. Hvor ofte spiser du boller, muffins, kake eller annen søt gjærbakst?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

11. Hvor ofte drikker du juice?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

12. Hvor ofte drikker du saft?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

13. Hvor ofte drikker du brus MED sukker?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

14. Hvor ofte drikker du brus UTEN sukker?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

15. Hvor ofte drikker du vann fra springen?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

16. Hvor ofte drikker du reint kjøpevann? (uten kullsyre og smak)

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

17. Hvor ofte drikker du vann med kullsyre og/ eller smak?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver dag
(10) ☐ Flere ganger hver dag

Del D - Spørsmål om deg og ditt

1. Hvor mye bor du sammen med din sønn/datter?

(1) ☐ Hele tiden
(2) ☐ 50% eller mer av tiden
(3) ☐ Mindre enn 50%

2. Hvor mange personer er dere i familien (bor sammen til daglig)?

☐ Voksne

☐ Barn

3. Hva veide du sist du veide deg?

_____ kg

4. Hvor høy var du sist du målte deg?

_____ cm

5. Trener/mosjonerer du regelmessig?

(1) ☐ Ja
(2) ☐ Nei
(3) Hvis ja, skriv hva :

6. Jeg er i bedre form enn de fleste andre på min alder.

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

7. Utenom arbeidstid: Hvor mange GANGER i uken driver du idrett eller mosjonerer du så mye at du blir andpusten og/eller svett?

(1) ☐ Hver dag
(2) ☐ 4 - 6 ganger i uken
(3) ☐ 2 - 3 ganger i uken
(4) ☐ En gang i uken
(5) ☐ En gang i måneden
(6) ☐ Mindre enn en gang i måneden
(7) ☐ Aldri

8. Utenom arbeidstid: Hvor mange timer per dag pleier du å se på TV og/eller sitte foran PC'en?

(1) ☐ Ingen
(2) ☐ Mindre enn en ½ time om dagen
(3) ☐ ½ - 1 time
(4) ☐ 2 - 3 timer
(5) ☐ 4 timer
(6) ☐ Mer enn 4 timer

9. Har du egen sykkel?

(1) ☐ Ja
(2) ☐ Nei

10. Hvor mange biler har familien din?

☐ Bil(er)

11. Neste gang familien skal kjøpe bil: Kommer dere til å kjøpe en "miljøvennlig" bil?

(1) ☐ Ja, helt klart
(2) ☐ Det vil bli vurdert
(3) ☐ Nei

12. Hvor mange bøker har dere hjemme hos dere?

(50 bøker er ca. 1 meter i bokhyllen)

(1) ☐ Ingen bøker
(2) ☐ Mindre enn 20
(3) ☐ 20 - 50
(4) ☐ 50 - 100
(5) ☐ 100 - 500
(6) ☐ 500 – 1000
(7) ☐ Mer enn 1000

13. Hvor ofte er familien din på tur i skogen/ på fjellet

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang per måned
(3) ☐ Sjeldnere enn 1 gang per uke
(4) ☐ 1 gang i uken
(5) ☐ Mer enn 1 gang i uken

14. Har familien din fjelltelt?

(1) ☐ Ja
(2) ☐ Nei

15. Har dere hage?

(1) ☐ Ja
(2) ☐ Nei
(3) Hvis ja, skriv hvor stor (m^2):

16. Røyker du?

(1) ☐ Nei, jeg har aldri røykt fast
(2) ☐ Nei, jeg har sluttet
(3) ☐ Ja, men ikke daglig
(4) ☐ Ja, daglig

17. Snuser du?

(1) ☐ Nei, jeg har aldri snust fast
(2) ☐ Nei, jeg har sluttet
(3) ☐ Ja, men ikke daglig
(4) ☐ Ja, daglig

18. Hvor ofte drikker du alkohol?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uka
(3) ☐ Ukentlig, men ikke daglig
(4) ☐ Daglig

19. Prøver du å slanke deg?

(1) ☐ Nei, vekten min er passe
(2) ☐ Nei, men jeg trenger å slanke meg
(3) ☐ Ja

20. Hvor mange timer sover du vanligvis om natten?

☐ Timer

21. Hvor lang utdanning har du?

(1) ☐ Grunnskole
(2) ☐ Videregående skole (inkl. Gymnas/yrkesskole)
(3) ☐ Universitet eller høyskole (3 år eller mindre)
(4) ☐ Universitet eller høyskole (mer enn 3 år)

22. Hvor lang utdanning har din ektefelle/samboer?

(1) ☐ Grunnskole
(2) ☐ Videregående skole (inkl.Gymnas/yrkesskole)
(3) ☐ Universitet eller høyskole (3 år eller mindre)
(4) ☐ Universitet eller høyskole (mer enn 3 år)
(5) ☐ Har ikke ektefelle/samboer

23. Hva var din husstands samlede årsinntekt for forrige år (brutto)?

_____ kr

24. Hva er ditt og din partners nåværende arbeid og stillingsprosent?

Deg selv

_____ i _____%

Din partner

_____ i _____%

25. Hvor langt er det fra der du bor til nærmeste matbutikk?

☐ km

26. Hvis det hadde vært stortingsvalg kommende mandag, hvilket parti ville du stemme på?

(1) ☐ Rødt
(2) ☐ Sosialistisk Venstreparti
(3) ☐ Arbeiderpartiet
(4) ☐ Senterpartiet
(5) ☐ Miljøpartiet: De grønne
(6) ☐ Kristelig folkeparti
(7) ☐ Venstre
(8) ☐ Høyre
(9) ☐ Fremskrittspartiet
(10) ☐ Annet parti……...
(11) ☐ Ville ikke stemt

27. Hvor ofte ser du på tv mens du spiser?

(1) ☐ Aldri
(2) ☐ Sjeldnere enn 1 gang i uken
(3) ☐ 1 gang i uken
(4) ☐ 2 ganger i uken
(5) ☐ 3 ganger i uken
(6) ☐ 4 ganger i uken
(7) ☐ 5 ganger i uken
(8) ☐ 6 ganger i uken
(9) ☐ Hver eneste dag
(10) ☐ Flere ganger hver dag

28. Hvor ofte har din sønn/datter med seg frukt eller grønnsaker hjemmefra på skolen?

(1) ☐ Hver skoledag
(2) ☐ 4 dager i uken
(3) ☐ 3 dageri uken
(4) ☐ 2 dager i uken
(5) ☐ 1 dag i uken
(6) ☐ Sjeldnere enn en dag i uken
(7) ☐ Aldri
(8) ☐ Vet ikke

29. Ranger trafikksikkerheten på skoleveien til barnet ditt fra 1 (meget farlig vei) til -10 (helt trygg vei)?

☐ km

Del E - Spørsmål om hvordan du kommer deg til arbeid (arbeider du både utenfor hjemmet og hjemme, tenk kun på arbeidsplassen utenfor hjemmet)**.**

1. Hvordan er din arbeidssituasjon?

(1) ☐ Arbeider kun utenfor hjemmet

(2) ☐ Arbeider både utenfor hjemmet og hjemme

(3) ☐ Arbeider kun hjemme/hjemmekontor (gå til spørsmål 21)

(4) ☐ Arbeider ikke/er hjemmeværende (gå til spørsmål 21)

2. Hvor mange dager i uka arbeider du utenfor hjemmet?

☐ dager

3. Hvordan kom du deg til arbeid i går?

(1) ☐ Gikk

(2) ☐ Syklet

(3) ☐ Kjørte bil

(4) ☐ Tok kollektiv transport (buss, tog e.l.)

(5) ☐ Var ikke på jobb utenfor hjemmet i går

4. Hvordan kom du deg fra arbeid i går?

(1) ☐ Gikk

(2) ☐ Syklet

(3) ☐ Kjørte bil

(4) ☐ Tok kollektiv transport (buss, tog e.l.)

(5) ☐ Var ikke på jobb utenfor hjemmet i går

5. Hvordan kommer du deg vanligvis til og fra arbeid utenfor hjemmet. Skriv inn antall dager i en normal uke ved de forskjellige årstidene. Summer for hver linje (jobber du 5 dager/uke utenfor hjemmet skal summen for hver linje bli 5, jobber du 3 dager utenfor hjemmet/uke skal summen bli 3).

Årstid		Går	Sykler	Kjører bil (motorsykkel e.l.)	Kollektiv transport	Totalt
Høst (sept- nov)	Til arbeid					=
	Fra arbeid					=
Vinter (des- feb)	Til arbeid					=
	Fra arbeid					=
Vår (mars- mai)	Til arbeid					=
	Fra arbeid					=
Sommer (jun- aug)	Til arbeid					=
	Fra arbeid					=

6. Har du tilgang på parkeringsplass på arbeidsplassen?

(1) ☐ Ja

(2) ☐ Nei

7. Når du kjører/tar bil til jobb, hvor mange voksne er det vanligvis i bilen?

☐ voksne

8. Hvor langt er det fra hjemmet til arbeidet?

☐ km

9. Hvor lang tid bruker du på å gå *til og fra* arbeid (NB: et svar til arbeid og et svar fra):

	Til	Fra	
(1)	☐	☐	Mindre enn 10 min
(2)	☐	☐	10-20 min
(3)	☐	☐	20-30 min
(4)	☐	☐	30 min eller mer
(5)	☐	☐	Går aldri

10. Hvor lang tid bruker du på å sykle *til og fra* arbeid:

	Til	Fra	
(1)	☐	☐	Mindre enn 10 min
(2)	☐	☐	10-20 min
(3)	☐	☐	20-30 min
(4)	☐	☐	30 min eller mer
(5)	☐	☐	Sykler aldri

11. Dersom du går eller sykler *til og fra* arbeid, blir du andpusten og/eller svett?

	Til	Fra	
(1)	☐	☐	Ja
(2)	☐	☐	Nei

12. Har du sykkelhjelm?

(3) ☐ Ja

(4) ☐ Nei

13. Bruker du sykkelhjelm når du sykler til jobb?

(1) ☐ Ja

(2) ☐ Av og til

(3) ☐ Nei

(4) ☐ Sykler aldri

14. Ranger trafikksikkerheten på arbeidsveien din fra 1 (meget farlig vei) til 10 (helt trygg)?

☐

15. Er det noe konkret som hindrer deg i å gå /sykle til arbeid så ofte som du vil ?

(1) ☐ Ja

(2) ☐ Nei

(3) Hvis ja, skriv hva :

16. Dersom du tar kollektiv transport til arbeid, hvor langt er det fra der du bor til holdeplassen/stasjonen?

☐ km

17. Dersom du tar kollektiv transport, hvordan kommer du deg som regel til holdeplassen/stasjonen

(1) ☐ Går

(2) ☐ Sykler

(3) ☐ Kjører bil

Her er noen påstander rundt arbeidsvei, skolevei og miljø. Hvor enig/uenig er du i påstandene?

18. Jeg liker å gå/sykle til arbeid

(1) ☐ Helt uenig

(2) ☐ Litt uenig

(3) ☐ Verken enig eller uenig

(4) ☐ Litt enig

(5) ☐ Helt enig

19. Jeg bruker veien til arbeid som trening for å holde meg i god fysisk form

(1) ☐ Helt uenig

(2) ☐ Litt uenig

(3) ☐ Verken enig eller uenig

(4) ☐ Litt enig

(5) ☐ Helt enig

20. Jeg går/sykler sjelden til/fra arbeid hvis det er dårlig vær

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

21. Jeg er opptatt av at mitt barn skal gå/sykle til skolen

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

22. Jeg er bekymret for at mitt barn skal skade seg i trafikken på veg til/fra skolen

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

23. Jeg er bekymret for at noe kriminelt skal hende med mitt barn på veg til/fra skolen

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

24. Jeg er bekymret for at mitt barn skal bli mobbet på veg til/fra skolen

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

25. Jeg overbeskytter mitt barn

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

Del F - Hvor enig/uenig er du i følgende påstander

1. Miljøpolitikken har stor betydning for hvilket parti jeg stemmer på

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

2. Jeg reduserer mitt generelle forbruk for å ta vare på miljøet

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

3. Jeg velger bevisst varer som er merket med disse miljømerkene:

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

4. Jeg utfører miljøvennlige tiltak i hjemmet mitt for å få ned energibruken

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

5. Jeg er flink til å kildesortere husholdningsavfallet.

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

6. Jeg kjører minst mulig bil for å begrense mitt CO2 utslipp.

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

7. Jeg går og sykler ofte distanser hvor andre gjerne kjører bil.

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

8. Når jeg har et reelt reisevalg så velger jeg alltid det mest miljøvennlige alternativet (f.eks. tog vs fly, sykkel vs bil)

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

9. Jeg bruker alltid bil når jeg skal handle mat.

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

10. Jeg handle ofte økologiske matvarer

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

11. Jeg handler ofte lokalproduserte matvarer

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

12. Jeg prøver å spise mindre animalske matvarer (kjøtt, fisk, meieriprodukter og egg) for å spare miljøet.

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

13. Jeg kaster nesten aldri mat.

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

14. Jeg prøver å kjøpe matvarer når de er i sesong

(1) ☐ Helt uenig
(2) ☐ Litt uenig
(3) ☐ Verken enig eller uenig
(4) ☐ Litt enig
(5) ☐ Helt enig

15. Jeg dyrker spiselige planter hjemme til eget bruk (f.eks. bær, grønnsaker).

(1) ☐ Ja i stor grad
(2) ☐ Ja noe
(3) ☐ Nei

16. Jeg høster spiselige ville planter (f.eks. ville bær) og/eller plukker sopp.

(1) ☐ Ja i stor grad
(2) ☐ Ja noe
(3) ☐ Nei

17. Jeg fisker

(1) ☐ Ja i stor grad
(2) ☐ Ja noe
(3) ☐ Nei

18. Jeg går på jakt

(1) ☐ Ja i stor grad
(2) ☐ Ja noe
(3) ☐ Nei

TAKK FOR HJELPEN!

Har du noen kommentar til spørreskjemaet eller noe du vil si om kosthold/aktivitet/miljø?
Skriv det gjerne her!