

SUSTAINABLE CONSUMPTION OF FOOD

*An Analysis of
Current Situation and
Needs for Education*



**Assessing and Changing Adults' Behaviour on
Sustainable Consumption of Food**



This report was prepared as Output 1 of the project "Assessing and Changing Adults' Behaviour on Sustainable Consumption of Food" (Project No: 2018-1-TR01-KA204-058739), which is implemented in the frame of the Erasmus+ KA204 Strategic Partnerships for Adult Education.



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Erasmus+ KA2 Strategic Partnership for Adult Education
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Work Package 4: Need Analysis Report

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ABBREVIATIONS

ANR	Austrian Nutrition Report
BCFN	Barilla Center for Food and Nutrition Foundation
BWP	Blue Water Footprint
CSA	Community-supported Agriculture
DVFA	Danish Veterinary and Food Administration
ECR	Efficient Consumer Response
EU	European Union
FAO	Food and Agriculture Organization
FLW	Food Loss and Waste
FSC	Food Supply Chain
FSI	Food Sustainability Index
GHG	Greenhouse Gas
GMO	Genetically Modified Organism
LCA	Life Cycle Assessment
LIVSFS	The Swedish National Food Agency
MPSR	Ministry of Agriculture and Rural Development of The Slovak Republic
NAP.e.	Austrian National Nutrition Action Plan
PBS	Food Bank Slovakia
SCOFI	Sustainable Consumption of Food Index
SCP	Sustainable Consumption and Production
SDG	Sustainable Development Goal
SIPCAN	Special Institute for Preventive Cardiology and Nutrition
SOSR	The Statistical Office of the Slovak Republic
TGDF	Ministry of Food and Drink Industry Associations of Turkey Federation
TISVA	Turkish Foundation for Waste Reduction
TPB	Theory of Planned Behavior
TZOB	Türkiye Ziraat Odaları Birliği – Turkish Chamber of
UNEP	United Nations Environment Programme
WHO	World Health Organization
WRI	World Resources Institute

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EXECUTIVE SUMMARY and KEY RECOMMENDATIONS

This report presents an analysis of the current situation regarding sustainable food habits, primarily in partner countries, and compares with the need for sustainable consumption of food as expressed i.a. in the Sustainable Development Goals of the United Nations. We distinguish between the situation in countries with an existing long track record of influencing consumer behavior (Austria, Denmark, Sweden) and those more recently engaged (Slovakia, Turkey).

We identified partner countries as 'high-level' and 'low-level' countries. However, in both cases, the gap between the ideal and reality is significant. When it comes to bridging the difference, the report - in line with the aim of the SusCoF project - focuses primarily on the need and potential for consumer education.

List of recommendations

Based on the needs analysis, the following recommendations have been made, but are not intended to be exhaustive or descriptive. These recommendations were prepared to provide the basis for the discussions and to provide the basis for educational content to help adults develop their skills and behaviors to make food consumption more sustainable. It is also aimed that these proposals will contribute to the development of SCOFI, the next step of the project.

Recommendation 1: *Re-education*

The report gives sample support to the need for additional adult consumer education concerning food and sustainability. It illuminates some of the necessary characteristics of such knowledge, in particular:

- i. Action-oriented and long-term
- ii. Using emotional rather than only rational appeal

The findings of this report form a basis for developing a pan-European Index, SCOFI: The Sustainable Consumption of Food Index. The intention is to explore the scope for a single index for both high-level and low-level countries, and to test the index as a tool firstly for more detailed assessment and measurement of current food habits, secondly for designing scalable education programs addressing the need for change.

Although this was not the focus of the study, the report also sheds light on opportunities and needs for professional education at all steps in the food chain; and, indeed, for more research, especially multidisciplinary research.

- iii. Focusing on new habits integrated into the lifestyle
- iv. Respectful of culture and individual needs and choice

Knowledge alone will not change behavior. Having the right attitude supported by right and a variety of information and values are primarily necessary for long-time and permanent behavior change. Still, it is not enough to change dietary lifestyles. Emotions also have a stronger effect on changing behavior. As Darnton & Evans (2013) state, it makes no sense to “merely make rational appeals to people to change behavior based on factual and logical arguments ...”. It seems to be more useful to “provide emotional and empathetic messaging.”

Socio-demographic variables such as age, income, and education level should be considered as they have a substantial impact

on eating meat. A good approach to reaching people with lower levels of education would be to create appropriate places and environments, where they can observe and experience good practices of sustainable food consumption behavior.

Often, messages about the environmental impacts of adults' behavior can adversely affect behavior. In particular, demonstrating the harmful effects of the behavior of individuals on the environment may make people feel guilty. These messages are generally created due to the belief that the awareness on the subject will improve and change the individual's behavior. However, these negative, frightening, blaming, or threatening scenarios can also harm an individual's behavior. Therefore, positive scenarios and messages based on real success stories need to be created and presented for behavior change.

Using social media platforms and hashtags such as #EatSmartChallenge would be useful for raising awareness and prod people into action.

Recommendation 2: *Establish standardized index for data collection and self-assessment*

According to the desk research, qualitative and quantitative research findings made during the preparation process of the report, it was found that there is a lack of index which can be used to measure the sustainable consumption behaviors of consumers at the individual level. Measuring the sustainable food consumption behavior of consumers in different countries through a single index will provide many conveniences. Developing an index that allows the use of a standardized methodology will result in a more reliable and valid collection of data from consumers in different countries. This is also thought to facilitate the measurement of behavioral changes over time. The second output of the

SUSCOF project is based on this situation and ideas. At the same time, the data collected under this report provides the basis for determining the parameters and indicators that represent the starting point for the sustainable consumption of food index (SCOFI) to be created.

Recommendation 3: *Create a comparative competence map among countries to define food consumption patterns and food waste*

As a result of the creation of the SCOFI index, it is recommended to examine the sustainable food consumption behavior of consumers in various countries and to create a comparative competence map. With this map, it is aimed to reveal a general consumer behavior profile by analyzing the demographic and behavioral characteristics of consumers together. In this way, educational materials and contents will be created, which will provide the knowledge and skills that will lead to more sustainable food consumption behaviors for consumers in different countries. At the same time, the effects of these training can be continuously examined, and the behavioral changes and progress of the consumers in related countries can be monitored.

Recommendation 4: *Build on and expand current food waste initiatives described in the report especially in low-level countries*

With this report, although there are various initiatives and efforts on the sustainable consumption of food, it is seen that these efforts remain limited and do not affect the whole society. It has been identified that more projects, ideas, practices, and initiatives are needed to improve the level of knowledge and awareness of consumers in sustainable food consumption, especially in low-level countries, and at the same time to reflect this on their behavior. These initiatives should be supported to reach broader consumer segments, whether public

or private and through social efforts, and policies should be developed to increase the level of social awareness. Undoubtedly, planning and training activities on this issue

can be realized with the joint efforts of both public authorities and non-governmental organizations.

INTRODUCTION

Global and regional needs

The United Nations 2030 Agenda for Sustainable Development provides a global blueprint for dignity, peace, and prosperity for people and the planet, now and in the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries – developed and developing – in a global partnership.

The food regime is critical to both sustainable development and climate change mitigation, not only because it impacts all the

SDGs but also because it is the single biggest driver of climate change – and simultaneously highly impacted by climate, in a spiral that is currently negative but has the potential to be positive.

Food consumption is only one aspect of the food regime, but an important one. Moreover, consumers have the power to influence the other major sectors: food production, processing, and distribution, waste disposal.

Sustainable Production and Consumption, SPC

A key SDG is No. 12, “Ensuring sustainable consumption and production patterns”. According to the Sustainable Development Goals Report 2018 prepared by the United Nations, by 2018, 108 countries had national policies on sustainable consumption and production. People rely on products to meet basic needs for food, clothing, water, shelter, infrastructure, and many other aspects of life. To meet those needs, it is essential to decrease reliance on raw materials and increase their recycling to reduce environmental pressure and impact (United Nations, 2015).

This calls for a focus on food waste. According to reports of the Food and Agriculture Organization (FAO), approximately one-third of all food production is wasted or lost every year. The annual market value of food losses and waste at a global level amount to roughly 1.3 billion tonnes (FAO, 2011), with an estimated cost of € 850 billion (\$936 billion) (FAO, 2015). If current rates continue, the amount of food

loss and waste will grow to 2.1 billion tonnes in 2030 (Hegnsholt et al. 2018). These statistics indicate a harsh reality: the food currently wasted in Europe could feed 200 million people. Other statistics are equally dramatic. Something has to be done.

Some consumer-related reasons for this situation are

- i. Changing cultures where the value of local, seasonal produce has rapidly lost ground in favor of globalized, standardized, resource-demanding products; and where home cooking loses ground in favor of processed products and out-of-home eating
- ii. Changing purchasing habits where market visits to meet daily needs are replaced by bulk purchasing, often resulting in over-purchasing and impulse buying 'in case'
- iii. Diminishing knowledge, time, or infrastructure for making use of unconsumed food

Health and Education

Other relevant SDGs are Nos. 2, 3, and 4: Healthy lives, Quality education.

Healthy Lives: SDG 3 focuses on healthy lives and wellbeing; food is most significant single determinant of personal health, and the world is experiencing 'epidemics' of food-related disease. Three dimensions have come under scrutiny:

- i. The continuing prevalence of hunger in some regions and among some groups, SDG 2, is committed to eliminating hunger. Under-nourishment not only has serious health effects but also impedes education and breeds new inequalities.
- ii. Over-consumption, not least of luxury foods (out of season or resource-demanding for other reasons); obesity is rapidly overtaking hunger as a significant

The current situation

The Barilla Centre for Food and Nutrition Foundation (BCFN), in cooperation with The Economist Intelligence Unit, has developed a Food Sustainability Index (FSI) and ranks 67 countries according to their food system sustainability. The FSI is a quantitative and qualitative benchmarking model based on 38 indicators and 90 individual metrics that measure the sustainability of food systems across three pillars: food loss and waste, sustainable agriculture, and nutritional challenges. The index has three key performance indicators – environmental, societal, and economic – which are, in turn, based on 35 indicators and eight categories.

It can safely be said that no country today shows a fully sustainable food regime. France is in first place among 35 high-income countries in the 2018 edition of the FSI, followed by the Netherlands and Canada. When the overall scores are examined, France is the leader in food loss and waste, while Austria is the leader in sustainable

contributor to ill health and veritable epidemics of non-communicable diseases such as diabetes.

- iii. Paradoxically, over-consumption of cheap processed foods - a concomitant of poverty and in some cases of urban 'food deserts' – is leading not only to obesity but simultaneously to malnourishment.

SDG 4 concerns the provision of quality education for all, at all ages. SDG 4.7 highlights the need for education concerning sustainable development.

In this project, it is aimed to change adults' food behavior by educating them, creating tools for them, constructing informative social media channels, publishing books and booklets, etc. This research could be considered as the first step for all these.

agriculture, and Japan leads to nutritional challenges.

Among partner countries, Denmark gets the highest score overall (Rank: 6), followed by Sweden (Rank: 8), Austria (Rank: 9), Slovakia (Rank: 55), and Turkey (58) (Barilla Centre, 2019).

Despite the good status of three partner countries and the developing situation of the other two in the overall ranking, an unusual situation is observed when the food loss and waste dimension is examined. Among 67 countries, Sweden is in 22nd place, Austria 36th, Denmark 40th, Slovakia 56th, and Turkey 65th. Further action is clearly needed for partner countries, particularly in terms of food loss and waste.

To complement this overall picture, the current situation in partner countries has been researched and examined, using desk research, quantitative research, and

qualitative research. The results are presented in Parts B, C, and D of this report.

In line with the project objectives, the research was focused on the following questions:

- i. What are national and international guidelines for sustainable food consumption?
- ii. What is the current situation of food consumption patterns in partner

countries concerning health and sustainability, including food waste?

- iii. What are the educational opportunities concerning low-skill consumers for sustainable consumption?
- iv. What are the attitudes and behaviors of consumers towards sustainable food consumption?
- v. How different are the current food consumption patterns from recommended sustainable and healthy nutrition guidelines?

Anticipated outcomes

This report and the other expected outputs of the project are expected to contribute to increasing sustainable food consumption. It is anticipated that current and future outputs will change the negative behaviors of adults on food consumption. This needs

analysis/current situation report plays a crucial role in establishing a question pool as the source for developing the index (SCOFI), which is the second output of the SusCoF project, and in determining educational needs accordingly.



PART A BACKGROUND

A1. Sustainable Development and Consumption

A1.1 Sustainable Development

Nkamnebe (2011) defines sustainability as “...a global approach towards securing lasting welfare for the entire human race”. Derived from this definition, sustainable development represents development that meets present needs without compromising the abilities of future generations to meet theirs (WCED, 1987). This is possible only through the integration of the environmental, economic and social components of development (Jørgensen et al., 2008).

Perlas (1994) provides a more detailed analysis with seven components of sustainable development. Sustainable solutions should be socially just and equitable, respectful of cultural pluralism, ecologically sound, economically viable, based on science that considers the material and non-material bases of life equally, technologically appropriate, and designed to empower and develop human capacity and potential. Sustainable development aims to find a balance between these objectives (Perlas, 1994).

More recently, increasing emphasis is being placed on regeneration: the necessity, if a balance is to be achieved, of repairing damage already done to natural and social systems (Wahl, 2016; de Nooy van Tol, 2016).

In achieving this balance, consumers/citizens, and civil society organizations are linked to both producers and to political systems, infrastructure, and media in a complex web of relationships (Gardner & Stern, 2002). Jones et al. (2013) point out that sustainable consumption requires an integrated approach including the individuals’ consumption decisions, marketers’ business policies, and authorities’ supervision and monitoring.

- i. Producers are incentivized to maximize profits and turnover, and are thus motivated to influence consumers to buy (and waste) more than they need or can use; consumer choice is, however, a strong factor, and informed choice can influence product development, production, and marketing. Consumer education is thus a key factor.
- ii. Political structures are incentivized to generate citizen support, and thus need to be informed and concerned citizens to be able to invest in appropriate infrastructure and to regulate the private sector. Citizen education is thus a key factor.

A1.2 Sustainable Consumption

A working definition of sustainable consumption was proposed at the Oslo Symposium in 1994 as: “the use of resources to meet human needs and increase the quality of life, while minimizing the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle, in order not to jeopardize the needs of future generations.” To this should be added the more recent concern with regeneration: sustainable consumption enables the restoration of damaged ecological (Borgström, Zachrisson, Eckerberg, 2016) and social fabric.

It is thus apparent that sustainable consumption is not related to direct consumption only; it covers the whole impact of purchasing patterns. While consumption directly affects environmental sustainability, purchasing behavior also affects it indirectly, via the production and marketing of commodities (Han and Hansen, 2012).

Wolff and Schönherr (2011) define sustainable consumption as a socially and ecologically concerned way of buying, using, and disposing of goods and services. From a more comprehensive and analytical perspective, the definition of Zhao and Schroeder (2010) covers the complex social, economic and political drivers of global environmental change, including global climate change. The focus is on a resource-efficient and low-carbon economy. Lee (2014) also suggests that ecologically and socially responsible citizens express their environmental concerns through their private consumption decisions.

Such a comprehensive perspective requires a change of customer values, both social and ecological (Elkington 1999; Quoquab and Mohammad, 2017).

A1.2.1 Needs, desires, and values

Based on the definitions, it is understood that sustainable consumption depends upon a set of values that consumers are able and willing to put into practice:

- i. Environmental concern,
- ii. Considering the needs of future generations,
- iii. Meeting basic needs wisely.

Bulut et al. (2017) identify four dimensions of sustainable consumption named environmental sustainability behavior, unneeded consumption, savings, and reusability. Assuming that s/he has such choices available, a sustainable consumer is ready to reduce waste and 'luxury' expenditure, bear additional costs in order to purchase and use environmentally superior products, and make a habit of recycling and reusing products and packages (Quoquab and Mohammad, 2017).

The understanding of what constitutes a basic need, as opposed to a luxury item, is rapidly shifting as well as varying considerably between cultures (van der Veen, 2003). However, it can safely be said that both ends of the luxury-poverty scale are represented in all European cultures: some groups indulge in extravagant expenditure, while others suffer from having less than they need.

According to a report from The World Watch Institute (2014), 80% of the world's resources are used by a minority of the world's population (ca 17%); globally, cosmetics are bought for US\$18 billion per year, perfume for US\$15 billion. Ironically, huge posts in this 'luxury' category – In Europe, luxury goods (includes Apparel, Footwear and Leather Accessories, Eyewear, as well as Watches and Jewelry, and Cosmetics) €113.31 billion, tobacco € 204.12 billion, alcohol €387.95 billion, snack food €26.41 billion (Statista, 2019)- disproportionately impact low-income families, reducing their capability to make wise food choices.

In 2010 the FAO together with Biodiversity International redefined sustainable diets: “Sustainable diets are those diets with low environmental impacts which contribute to food and nutrition security, as well as to a healthy life for present and future generations. They contribute to the protection and respect of biodiversity and ecosystems, are culturally acceptable, economically fair and affordable, adequate, safe and healthy nutritionally, and simultaneously optimize natural and human resources” (BCFN, 2016:41).

It is important to note that the sustainability of food systems in this respect is highly connected to the health of humans: “The health of human beings cannot be detached from the health of ecosystems”. It is well known that for the majority of people a sustainable and healthy diet is not at present a reality (BCFN, 2016:78).

A1.2.2 How much food is sufficient?

The average nutritional requirement per person is around 2000 kcal per day. According to agronomists, the supply of food should be 130 % of nutritional needs in order to achieve food security (Smil, 2004). A supply of 2600 kcal/person is thus sufficient to ensure food security (Smil, 2004; Lundqvist et al., 2008). However, the food balance sheet of FAO shows that the retail sector in high-income countries makes over 3000 kcal of food a day available (FAO, 2010). The figure for the EU is 3500 kcal (Smil, 2004). There is thus an undesirable food surplus of nearly 1000 kcal/person per day (Papargyropoulou et al., 2014).

A1.2.3 Consumer strategies

Sustainable consumption habits cannot be assured through knowledge/education alone, or even through awareness; it requires conscious habit-forming based on positive intention and commitment (Quoquab and Mohammad, 2017). Two broad strategies are described by Verain et al. (2015):

- i. Choices concerning the means of production (e.g., organic, free-range or Fair-Trade products)
- ii. Choices concerning dietary composition and consumption curtailment (reduced quantity) within product categories (e.g., in most European societies, the reduced average consumption of meat, heavily processed foods, and sweetened beverages)

A third strategic path is the systematic reduction of food waste through purchasing decisions, e.g. buying short-dated items that would otherwise be discarded, and through creative use of leftovers.

A1.3 Problems in Adopting Sustainable Consumption

The adoption process is very slow in relation to the urgent need for change. Some of the major barriers to change:

- i. Lack of awareness. Consumers are often unaware of the negative consequences of their consumption habits; and/or have been misled by media to believe falsehoods. Mass media and social media could play a key role but often act in the opposite direction, spreading confusion and even direct falsehoods.
- ii. Another barrier is often referred to as 'people don't care'. Regardless of education and awareness, only when sustainable consumption is established as a social norm will a majority be attracted to change their behavior.
- iii. The cost associated with sustainable consumption, whether real or imagined, is another barrier.
- iv. A change may also be perceived as a sacrifice, in which case it risks being rejected regardless of economic considerations. In other words, weak ethical and moral filters create barriers to sustainable consumption (Quoquab and Mohammad, 2017).

Consumer International suggests that consideration for the environment could come only from well-informed citizens who are aware of and fully committed to their *rights to a quality environment*. In other words, public perception needs to shift from seeing behavior change as a sacrifice to see it as a way to secure basic human rights.

A2. Sustainable Food Consumption

Food is a major issue for SCP, with its impact on the environment, individual and public health, social cohesion, and the economy. However, there is as yet no commonly agreed-upon definition. One of the most encompassing definitions is that of the UK Sustainable Development Commission (2005; 2009), which defines “sustainable food” in a number of articles as:

- i. Safe, healthy, and nutritious for consumers in shops, and from professional kitchens
- ii. Meets the needs of the less well off at a global scale
- iii. Provides a viable livelihood for farmers, processors, and retailers whose employees enjoy a safe and hygienic working environment
- iv. Respects biophysical and environmental limits in its production and processing while reducing energy consumption and improving the wider environment
- v. Respects the highest standards of animal health and welfare compatible with the production of affordable food for all sectors of society
- vi. Supports rural economies and the diversity of rural culture, in particular by emphasizing local products that minimize food miles.

A2.1 Factors Influencing Purchasing Decisions

It would be simplistic to assume that food consumption behavior is primarily influenced by physiological needs combined with purchasing power. Other significant factors are

- i. Cultural traditions, norms, fashion
- ii. Exposure (availability, publicity)
- iii. Personal experiences such as taste, health
- iv. Time availability and household decision-making.
- v. Demographic characteristics of households (age, income, education, etc.)

A2.1.1 Convenience vs sustainability

An extensive range of foods is available in industrialized countries because technical and commercial developments have made it possible to supply most foods all year round. Additionally, changes in production and globalization have allowed consumers in many EU countries to enjoy comparatively low prices and high convenience. However, this convenience has come at a high cost to society, eg in terms of health and nutrition, as well as causing many consumers to stop producing their own food and forget the benefits of regional, organic, seasonal food (e.g., Tischner and Kjaernes, 2007; Blay-Palmer, 2008).

A2.1.2 Behavioral biases

Consumer behavior is also affected by perceptual biases, such as the *halo effect*, where products that are perceived as ecological are also perceived as better in other aspects, such as nutrition, health, etc. For example, an eco-labeled product may not only taste better and have a smaller environmental impact than the non-labeled alternative, but it is also perceived to be healthier (Lee et al., 2013; Wiedmann et al., 2014). This situation also reflects the fact that consumers may have limited factual knowledge about environmental impact (footprints) of food (Siegrist et al., 2015).

Another bias is “*compensatory green beliefs*”: some consumers feel that every individual is entitled to a certain budget of resources, so that saving in some resources gives them the right to offset by consuming more of other resources (or increasing waste), within the limits of this budget. Combined with the negative footprint illusion, this idea most likely causes consumers to

engage in acts of green consumption without actually lowering their total environmental impact (Gorissen and Weijters, 2016).

See further section A5.

A2.2 Health and Nutrition

"Let food be your medicine, and medicine be your food," said Hippocrates. Unfortunately, neither is the case for most Europeans today. At each end of the eating scale, there are large groups of people with severe health problems; and many of those in-between obtain insufficient nutrition levels.

- i. People who are unhealthily overweight suffer from excess calories, though often still undernourished. The number of such people is growing rapidly; in Europe, it has tripled since the 1980s and is still growing rapidly (WHO Europe, 2018).
- ii. People who are of normal weight and even with 'good' (recommended) eating habits are often obliged to take dietary supplements in order to achieve nutrition levels that should be available through their food; while their diets may place huge strains on the environment.
- iii. People who are undernourished, who go hungry for lack of access to enough food. These numbers are small in Europe and have been decreasing, though progress is threatened by climate change.

Educational needs can be easily identified for groups 1 and 2. In relation to Group 1, the unhealthily overweight, overall guidelines may be derived from the European Charter on Counteracting Obesity (WHO Europe, 2006), and emphasis may be placed on the quality of life, health, and wellbeing. For Group 2 the emphasis could additionally be placed on the link between the health of the soil and natural ecosystems as a concomitant to human health and wellbeing.

Influencing consumer choice in this way can bring significant results (Oppe et al, 2019), though it should be noted that in order to achieve sustainability in food consumption in both under- and over-consuming groups, it is also necessary to tackle food security and food safety issues. Also, policymakers should pay more attention to complex interdependencies along the food chain and the complexities of modern global food systems (Reisch et al., 2013).

A2.3 Impact of Food Consumption on Environment

Food consumption accounts for almost one-third of households' total environmental impact (EEA, 2015) and is thus of prime importance. These environmental impacts include climate change, soil degradation, water pollution, water scarcity, loss of habitats and biodiversity. In the report of the Institute for Climate Economics, Rogissart et al. (2019) estimated that GHG emissions from food consumption in 2010 were around 13,8 GtCO₂e (\pm 3,6 GteqCO₂), i.e. 28% of global emissions, all sectors combined. Around 75% of GHG are emitted during the production phase, 15% between the farm gate and the retail store, and 10% after retail. Similarly, Sandstöm et al. (2018) confirm that the food consumption of EU-28 citizens would have generated 540 MtCO₂eq in 2010, including land-use changes. According to the authors, the European Union would have been the net importer of about 160 MtCO₂eq through its food consumption, mainly because of land-use changes in the importing countries. According to them, 82% of GHG emissions from European food consumption come from animal products (excluding seafood products, diesel use in agriculture and all post-farm emissions except international transport).

A2.3.1 Where the impacts arise

A big part of the total environmental impact arises in the primary production stage. Current agricultural practices cause soil degradation, over-consumption of water, water pollution, biodiversity loss, and introduction of hazardous chemicals through synthetic pesticides and mineral fertilizers.

Consumers' habits during the handling and preparation stages also cause environmental impacts, through storage (primarily freezing), cooking, and dishwashing. More importantly, consumers affect the environment with their nutrition styles and diets. For example, consumption of (red) meat and dairy products have today by far the highest GHG emissions (OECD and FAO, 2011). Tukker et al. (2006) state that within the EU, meat and meat products contribute to between 9 and 14% of total releases, followed by milk, cheese, and other dairy products.

It has been estimated that converting current red meat production to regenerative practices could not only remove the releases but indeed provide one of the most promising carbon sinks, absorbing a significant proportion of the CO₂ that needs to be removed from the atmosphere. (Hawken, 2017). The main problem is 'not the cow, but the how'. However, such a radical transformation of farming methods will not be rapid and meanwhile, it is indisputable that average meat consumption in Europe needs to be reduced. This would also have health benefits. (Godfray et al., 2010).

Many researchers have demonstrated that consumers are either unaware of or underestimate the relationship between meat and climate change (Lea and Worsley, 2003; Tobler et al., 2011; Truelove and Parks, 2012; Vanhonacker et al., 2013; Bailey et al., 2014). In the study of Truelove and Parks (2012), a survey is made of college students in the USA and it is found that only 10% associated meat consumption with climate change. According to Lea and Worsley (2008), 22% of respondents in Australia believe that it would provide environmental benefits to consume less meat, while 90% believed that it is the food packaging that should be reduced. However, Hoolohan et al. (2013) estimated that eliminating packaging reduces GHG emissions by 12% while eliminating meat consumption accounts for 35% of consumer-related food emissions (Macdiarmid et al., 2016).

Compared to the impact of meat and dairy products, some studies suggest that cereals, fruit, and vegetables contribute low levels of GHG emissions (Dabbert et al. 2004; Carlsson-Kanyama and Gonzalez, 2009).

The production stage accounts for almost half of all nutrition-related GHG emissions, whereas the remaining half is generated by transportation, storage, food preparation, and consumption.

A2.3.2 Changing lifestyles

With the trend of spending less time on food purchasing, cooking and eating over the last decades, home-cooked meals have lost their significance, while convenience products, fast foods and restaurant meals have gained importance.

In the study of Vandevijvere et al. (2009), it is found that 35% of the Belgian population consumes more than 25% of its daily energy intake outside the home. In another study, Bes-Rastrollo et al. (2010) report that around 27% of participants in Spain eat out at least twice a week. The habit of eating out can have two opposite environmental effects, depending on the behavior and expectations of consumers. If consumers attach great importance to the aesthetics and

presentation of the food, many food products can be separated and discarded for reasons such as deformation. Furthermore, in cases where rapid service is required, a large amount of product may be wasted during the preparation of the meals in restaurants. This type of food habit has a clear impact on both climate and eutrophication (Saarinen et al. 2012, Eberle et al. 2006). On the other hand, if systems such as donating excess food collected from restaurants, conveying it to those in need, and using available ones to prepare new products, are established and expanded, environmental impact will be much less.

From this perspective, individuals' and households' income levels and spending patterns also impact the environment. For example, increased income is suggested to be associated with higher meat consumption and higher food waste, which increase GHG emissions and contribute to climate change (Macdiarmid et al., 2016).

Europeans have been shifting in the direction of food habits prevalent in the USA. American food production systems are very land-intensive, so if this trend continues, there will be higher pressure on land in Europe. Combined with the findings of Carlsson-Kanyama and Faist (2000), demonstrating that the production of animal fodder uses relatively higher energy and GHG emissions compared to the production of plant foods, the nutrition patterns of consumers should be a major concern for policymakers.

A2.4 Footprints of Food Consumption

A2.4.1 Types of footprints

The different types of footprint measurements enable quantitative expressions of the appropriation of natural resources by humans (Hoekstra, 2008).

There are three dimensions for providing sustainable development: environmental protection (ecology), economic prosperity, and the social dimension (OECD, 2004 and 2008). For these dimensions, numerous footprints have been created. What they have in common is the translation of resource use into a common unit, i.e. land area.

Complementary to the original ecological footprint (Wackernagel and Rees, 1990) several others have been developed, for example,

- i. Energy footprint (Wackernagel and Rees, 1996)
- ii. Water footprint (Hoekstra and Hung, 2002)
- iii. Exergy footprint (Chen and Chen, 2007)
- iv. Carbon footprint (Wiedmann and Minx, 2008)
- v. Biodiversity footprint (Yaap et al., 2010)
- vi. Chemical footprint (Panko and Hitchcock, 2011)
- vii. Phosphorus footprint (Wang et al., 2011)
- viii. Nitrogen footprint (Leach et al., 2012)

Despite the existence of so many footprints, a completely satisfactory and generally accepted footprint that can solely represent the overall impacts of human activities as the "golden standard" indicator has not yet been created (Huijbregts et al., 2010). A composite footprint indicator has however been designed by De Benedetto and Klemeš (2009) as a single measure for the sustainability of a given option. Similarly, an integrated footprint-based approach for environmental labeling of products has been developed by Niccolucci et al. (2010).

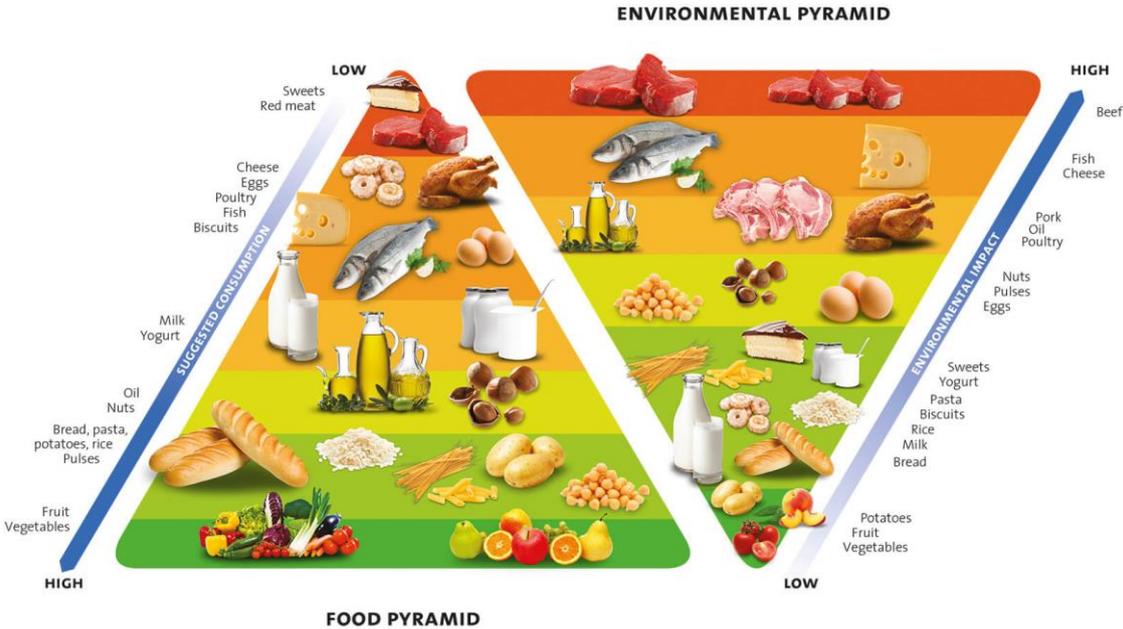
In their study, Herva et al. (2011) proposed the ecological and carbon footprints as the most useful indicators for business. As an addition to this study, the OPEN: EU Project within the Seventh Framework Program has extended the integrated footprint family by adding the water footprint in collaboration with an environmentally extended multiregional input-output (MRIO) model (Galli et al., 2012, 2013). Existing literature also accepts these three footprints (ecological, carbon and water) as the most important indicators together with energy footprint, because they relate to four global concerns over threats to human society: food security, energy security, climate security, and water security (Mason and Zeitoun, 2013).

A2.4.2 Double food pyramid

Since 2010 the Barilla Centre for Food and Nutrition also publishes an annual 'Double Food Pyramid'. One is the well-known Food Pyramid, which serves as a visualization aid in many countries for dietary guidelines. The second is the Sustainability Food Pyramid, which visualizes for every level of the Food Pyramid the carbon, the water and the environmental footprint.

The Double Food Pyramid is based on an extended literature review of several hundred scientific studies. The results are striking, but also in a way reassuring that there is no better option for the future than to aim for a healthy dietary lifestyle.

Fig. 1: The Double Food Pyramide



Source: BCFN (2016)

All three indicators (ecological, carbon, water) combined with the environmental footprint portray a clear picture. The more on top of a food product is situated in the Food Pyramid, the higher is its environmental footprint (Figure 1).

This reflects the current position, given today's agricultural practices. It does not reflect the potential for significant change.

A2.4.3 Ecological footprint

The ecological footprint raises awareness of the impacts of production and consumption activities on the environment. It is a measure of the amount of productive land and water required to

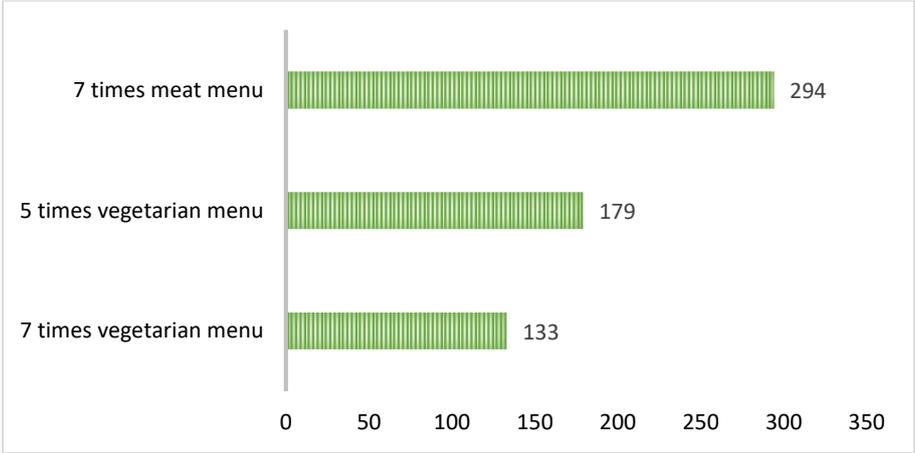
produce a specific activity that consumes resources and generates carbon dioxide (CO₂) (Wackernagel and Rees, 1990, 1996; Monfreda et al., 2004). Recently, it is used to measure the amount of land resource required for supporting the activities taking place within a given year, considering the prevailing technology (Bastianoni et al., 2012; Borucke et al., 2013), population growth, and waste rates (Dietz and Neumayer, 2007).

The following six footprint components, which are distinguished in accordance with major land-use types, make up the ecological footprint (Galli et al., 2012; Kitzes et al., 2009; Moore et al., 2012):

- i. Plant-based food production
- ii. Livestock-based food production
- iii. Fish-based food production
- iv. Timber production
- v. Living space
- vi. Energy-related CO₂ absorption

The ecological footprint is a land-based indicator, and it is expressed in the common unit of global hectares (gha), which is equal to the hectares of land normalized to world average productivity of all biologically productive space within a given year (Galli et al., 2007; Fang et al., 2014).

Fig. 2: Weekly Impact of Three Different Dietary Lifestyles on the Ecological Footprint (global sq m2)



Source: BCFN (2016)

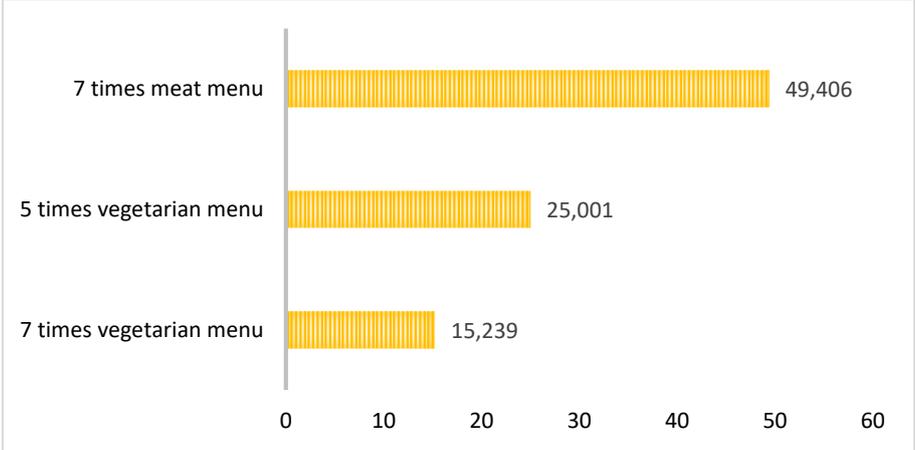
A2.4.4 Carbon footprint

The carbon footprint measures the amount of CO₂-equivalent emissions (Wiedmann and Minx, 2008; Cucek et al., 2012), or the GHG emissions over the life cycle of a process or product (BSI, 2008). Therefore, LCA is widely accepted as a useful tool for calculating the carbon footprint (Wiedmann and Minx, 2008). Some standards such as the PAS 2050 (BSI, 2008) and ISO 14067 (Wiedmann, 2009b) have been or are being established on a life cycle basis.

The root of the carbon footprint stems from the demand for measuring the amount of GHGs that contribute to global warming when considering a specific time horizon (Høgevold, 2003; Wiedmann, 2009b). The carbon footprint includes a variety of GHGs, such as CO₂, CH₄, and N₂O and the GHG characterization factors are broadly used as weightings dependent on the 100-year Global Warming Potential (GWP). The measure of carbon footprint is CO₂-equivalent mass units

such as kilograms or ton. Using this measure Figure 3 visualizes the carbon footprint of a diet rich in meat (7 times a week meat), a flexitarian diet and a vegetarian diet.

Fig. 3: Weekly Impact of Three Different Dietary Lifestyles on the Carbon Footprint (g. CO2-eq)



Source: BCFN (2016)

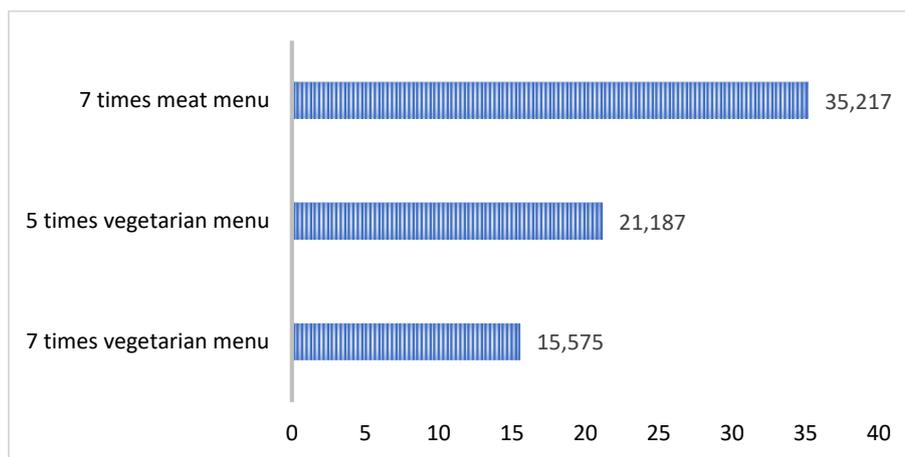
A2.4.5 Water footprint

The water footprint is used to measure the cumulative amount of water consumed or polluted in order to produce a product or service (Hoekstra and Hung, 2002; Hoekstra and Chapagain, 2006; Hoekstra, 2009).

There are three types of water footprints; blue, green and grey. If the subject of measurement is the consumption of surface and groundwater by individuals and societies, the relevant indicator is the blue water footprint (BWF). If the consumption of rainwater is considered as the subject, the footprint indicator is the green footprint; and it is grey if the volume of water required to dilute pollutants to water quality standards is considered (Mekonnen and Hoekstra, 2010; Klemes et al., 2009; Cucek et al., 2012).

A water footprint provides a broad perspective on water consumption; however, it represents only the amount of water resources consumed or polluted, without any respect to environmental impacts. An additional weakness of the water footprint is that the estimate of the grey footprint is subjective (Jeswani and Azapagic, 2011), and no uncertainty studies are available even though uncertainty can be significant (Galli et al., 2011, 2012). A water footprint is measured in volumetric units equivalent to water (Galli et al., 2012). Figure 4 shows the weekly impact of different types of dietary menus on water footprint.

Fig. 4: Weekly Impact of Three Different Dietary Lifestyles on the Water Footprint (liters)



Source: BCFN (2016)

A2.4.6 The negative footprint illusion

By choosing organic options instead of their nonorganic counterparts, consumers may reduce the footprints. However, food production and consumption inevitably lead to greenhouse gas emissions, unless the production captures carbon from the atmosphere. This is indeed a strong potential, already demonstrated and gaining ground (refs); but the requisite change in production practices is so large that, without powerfully enabling legislation, it is unrealistic to expect widely available food products to have a ‘negative footprint’ within the next decade. Given this fact, combining green food with non-green food increases the total environmental impact (Hillier et al., 2009). However, consumers sometimes erroneously believe that adding green food may decrease the total impact of non-green food and this situation leads the consumers to increase their consumption to reduce their footprint.

The negative footprint illusion is not primarily related to the characteristics of added items; the presence of an organic label has more effect on this perception. The illusion is even strengthened if the organic product has a “greener” reputation, such as seasonal fruits (Siegrist et al., 2015). From this perspective, carbon footprint labels, which express the environmental impact of a product or activity in terms of its greenhouse gas emissions, may help to inform the consumers and reduce the environmental impacts of food consumption, because footprints quantify the cumulative impact and these labels illustrate that adding products implies adding impact. Including the footprint on product packaging may result in more realistic choices (Gorissen and Weijters, 2016).

A3. Nutrition Patterns

The Food and Agriculture Organization (FAO) defines the “sustainable diet” as a diet that is nutritionally adequate and healthy, safe, with a low environmental impact, economically fair and affordable, and culturally acceptable (Macdiarmid et al., 2016). Since research shows that consumption of meat and other animal-based products is currently associated with high environmental impact and climate change (Hedenus et al., 2014), reducing the consumption of animal products has become a major concern in achieving a sustainable diet. At this point, meat consumption is the focus of researchers studying nutrition and its impacts on health and the environment.

A3.1 Calls to Reduce Meat Consumption

Meat consumption

- i. is beneficial as a rich source of nutrients (high-quality protein and essential micro-nutrients)
- ii. at high consumption levels, increases the risk of chronic diseases (Micha et al., 2010; Pan et al. 2011)
- iii. with currently conventional production methods, places significant pressure on the environment, such as the use of finite resources, contribution to climate change, etc. (Eshel et al., 2014).

Therefore, it is highly recommended to reduce meat consumption in sustainable diets. This can be accomplished in different ways, such as decreasing meat portion size, reducing the frequency of meat consumption, preparing and eating meatless meals several times a week, or becoming vegetarian. While doing this, either animal-based (such as fish, cheese) or plant-based (such as pulses) products can supply nutrients earlier obtained by eating meat (Verain et al., 2015).

Barriers to meat curtailment have been documented as cultural (lack of knowledge concerning meat substitutes, lack of cooking skills), taste (appreciation of meat), intellectual (disbelief in environmental impacts of meat consumption). (Lea and Worsley, 2008; Vanhonacker et al., 2013; Mäkinemi and Vainio, 2014).

Socio-demographic factors also play an important role. Regarding socio-demographic characteristics, gender is found to be a significant predictor of meat curtailment. Convinced meat-eaters are more often male. (Hayley, Zinkiewicz, and Hardiman, 2015; Tobler et al., 2011, van Rossum et al., 2011). In addition, higher education, higher socioeconomic status, smaller household sizes, and higher age levels appear related to a higher level of meat curtailment (Hoek et al., 2004; Schösler et al., 2012; Verain et al., 2015). However, Tobler et al. (2011) found a negligible and insignificant effect for education and age differences. Additionally, the results of the logistic regression analysis in their study showed that having a vegetarian household member considerably decreases a person's meat consumption. In country-level analysis, it is found that an increase in national income increases meat consumption; but once it reaches a certain level, consumption stabilizes and starts to decrease slowly (Vranken et al., 2014; Macdiarmid et al., 2016). However, this decrease in meat consumption alone is not enough for attaining either health or sustainability. In the UK, Bates et al. (2014) state that 56% of men and 32% of women eat more than the recommended maximum intake of meat.

A3.2 'Not the Cow but the How'

Production methods are critical to any dietary recommendations. To take the case of meat, extremes are to be found in (for example) Saudi Arabia and Austria.

In Saudi Arabia, there is a national policy to be self-sufficient in dairy production (Shadtbolt, 2013). This has led to the raising of 67,000 Holstein-Friesian cows in one barn in the desert. Holstein-Friesian is a breed, which has a temperature optimum around 5°C – held in a desert with above 50°C in summer. The producer has not only to cool the barn, but also to import feed from Arizona, depleting the water resources of the Colorado River, and ship it around the globe.

This example clearly displays the perversities of global food production and shows what humans do when they have limitless economic resources. But it also makes evident that it makes no sense

to formulate global dietary guidelines. Healthy and sustainable guidelines have to be formulated in accordance with the local specifics of agricultural and food production.

At the other end of the scale, red meat is produced in Austria with pasture-raised cattle, with local breeds, under organic standards. Alpine cows have 365 days of free-range possibility with no tethering system, on average on a farm with about 30 cows. They are fed only local organic hay, grass or grain. This neo-traditional silvopastoral approach to beef production is gaining ground (Jose and Dollinger, 2019), though slowly. It should be noted that it also has the potential to sequester large amounts of carbon. (Giraldo et al., 2011; Calle et al., 2013).

A3.3 Changes in Dietary Patterns

There is an incontestable need for behavior changes since the prevalence of overweight and obesity worldwide has doubled in the last two decades (OECD, 2010).

The good news is that high quality, health-oriented and organic foodstuffs have become increasingly popular, with the help of health and fitness concerns gaining more attention by consumers. European consumers, with little differences among countries, are found to prefer organic food, primarily because they believe it to be healthier (Thøgersen, 2009; Willer and Kilcher, 2012).

Recently an international commission published a “planetary health diet” in *The Lancet*. Its recommendations are more radical than those based on the Double Food Pyramid, including halving red meat and sugar consumption, while vegetables, fruit, pulses, and nuts should double. For Europeans, the Lancet commission recommends eating 77% less red meat and 15 times more nuts and seeds (Willett et al., 2019). These recommendations are probably intended to be inspirational rather than realistic. Further, they take no account of the conditions under which meat is produced; see above, A3.2.

In high-income countries, there are fewer barriers to buying and consuming organic food as regards access, availability, and affordability. However, increases in the global price index for food of almost 20% (from 2005 to 2012) have created serious difficulties for vulnerable, low-income households: the “paradoxical lack of food security amid an abundance of food” (Reisch, et al., 2013).

Even in Europe, about 5% of the population is at risk of malnutrition, more so among vulnerable groups (the poor, the elderly, and the sick).

Food-related health problems such as cardiovascular disease, obesity, and diabetes have increased worldwide, because of diet-related factors (high intake of saturated fat, salt, and sugar and the low consumption of fruits and vegetables). Especially, diabetes is becoming so widespread in developed countries that the “old age”-diabetes had to be renamed by the medical profession because a rising share of teenagers are diagnosed with this specific form – now known as Diabetes Type 2.

A3.4 Example: Recommendations from Austria and Germany

Austria is indeed a source of reliable and up-to-date research concerning food. Not least, the “Österreichische Ernährungsbericht”, the Austrian Nutrition Report (ANR) has been published every five years since 1998 (Elmadfa and Freisling H, 2017). The ANR is a cross-sectional study of 2,129 Austrians (782 men and 1,347 women) aged 18 to 64. It identifies three age groups (19 to 25 years, 25 to 51, and 51 to 65). To improve the healthy eating behavior of Austrians, the Austrian Nutrition Society proposes the following guidelines (Elmadfa and Freisling, 2007):

- i. Enjoy a variety of foods
- ii. Eat more carbohydrate-rich food and side dishes – eat less fried food
- iii. Eat plenty of fruit and vegetables – take 5 a day
- iv. Eat less fat and fat-rich foods
- v. Drink enough but choose your drinks reasonably
- vi. Enjoy your foods
- vii. Stay active and fit with physical activity

These guidelines are supported and visualized in public communication by the German Nutrition Cycle (“Ernährungskreis”) and the food pyramid. The Nutrition Cycle is based on the “DACH Reference Values for Nutrient Intake” (Elmadfa and Freisling, 2007). It visualizes seven recommended food groups and gives advice about the recommended quantitative daily intake (Deutsche Gesellschaft für Ernährung, 2019):

- i. Cereals and potatoes
- ii. Vegetables and salad
- iii. Fruits
- iv. Milk and dairy products
- v. Meat, processed meat, fish, eggs
- vi. Oils and fats
- vii. Beverages

Given the differing nutrition availability between high-income and low-income countries, considerable attention is paid to food waste, as a potential way to bring down the cost of food and thus increase access.

A4. Food Waste

A4.1 Definitions

Food waste has three fundamental definitions in the literature. The first definition belongs to the Food Agriculture Organization (FAO, 1981): *food waste* is wholesome edible material destined for human consumption but discarded, lost, degraded, or consumed by pests at any point in the supply chain. Stuart (2009) extends the definition by including human-edible material, which is intentionally fed to animals or is a by-product of food processing diverted from the human food chain. An even more comprehensive definition is of Smil (2004) adds over-nutrition, which represents the excess energy consumed per capita over the needed amount.

On the other hand, FAO defines *food loss* as “...a decrease in mass (dry matter) or nutritional value (quality) of food originally intended for human consumption. These losses are mainly caused by inefficiencies in the food supply chains, such as poor infrastructure and logistics, lack of technology, insufficient skills, knowledge, and management capacity of supply chain actors, and lack of access to markets. Besides, natural disasters play a role” (EU FUSIONS, 2016).

If the decrease in edible food mass occurs at production, post-harvest, or processing stages in the food supply chain (FSC) it is called food loss. At the final stages of FSC, distribution, and consumption stages, the term used for it is food waste and more related to behavioral issues (Parfitt et al., 2010; Gustavsson et al., 2011; Kummu et al., 2012).

Kummu et al. (2012) claim that almost a quarter of all food intended for human consumption is lost or wasted.

In the following, the term food waste is used to include both food waste and food loss.

A4.2 Where Is Food Wasted or Lost?

In higher-income countries, the waste incurs primarily during distribution and consumption, whereas in lower-income countries agricultural and post-harvest stages account for much of it (Parfitt et al., 2010; Kummu et al., 2012).

According to an EU project, FUSIONS, which estimates food waste levels for Europe, 88 million tonnes of food were wasted in the EU in 2012. This includes both edible food and inedible parts and equates to 173 kilograms of food waste per person. The total amounts of food produced in the EU were around 865 kg per person meaning that in total 20 % of the total food produced is wasted. Households contribute most to food waste with more than 50% (Griffin et al., 2009; Kummu et al., 2012). In Europe, 42 percent of food loss and waste occur in the consumption stage, followed by the production stage with 33 percent (WRI, 2019)

There are several reasons for waste in agriculture, such as extreme weather events and lack of good harvesting technology, but experts agree that a significant amount of food waste is generated due to regulatory standards and quality assurance. For instance, (Pladerer et al., 2016) show that:

- i. In the UK 30% of vegetables produced are not harvested
- ii. In Germany, 30% of carrots and 10% of apples do not enter the post-harvest process
- iii. In Switzerland, two out of three potatoes are lost in the food chain, which corresponds to 303,000 tons of potatoes

In developed countries, the distribution and consumption stages play a major role in food waste with over 40% of waste in FSC. Globally, one-third of food is wasted during the distribution stage (Gustavsson et al., 2011). Parfitt et al. (2010) identified major drivers for food waste of households in developed countries as:

- i. Household size and composition; single households produce more food waste than family households.
- ii. Household income; there is less food waste in low-income households.
- iii. Household demographics; older people produce less food waste than younger people, and the least is produced by pensioner households.

A4.3 Prevention Strategies

Recent studies show that if it had been better managed, 60 % of wasted food could have been eaten (FUSIONS, 2014; Kranert et al. 2012).

A4.3.1 Why do consumers waste food?

Several explanations are proposed for consumer food waste, for instance, over-purchasing, poor menu planning, time constraints, lack of cooking skills, pricing policies.

Over-purchasing. Unplanned purchases cause the excessive purchase of foods (Brook Lyndhurst, 2007; Evans, 2012; Bravi et al., 2019). It is possible to decrease the likelihood of unnecessary purchases by checking stocks and preparing a purchase list before shopping (Bell et al., 2011).

Time constraints. Unlike other types of wasted materials, food is highly perishable (Evans, 2011). Lack of competence concerning freshness and the storability of food also plays a major role. Uncertainty created by producers and suppliers is another problem for the consumers. There is, for instance, a tendency to confuse 'best-by' dates with 'consume before' dates.

Poor menu planning. Stefan et al. (2013) state in their study that planning routines, such as planning meals in advance, can contribute to lower food waste. If a meal is unbalanced (containing mostly similar nutrients), or the amount prepared is more than the desired amount, some is wasted. Cooking too much food is usually accepted as one of the main drivers of food waste together with excessive purchasing, though better use of leftovers could contribute to lower levels of food waste (Brook Lyndhurst, 2007).

Lack of cooking skills. Cooking skills and experience are important determinants of the amount of foods used in the meal preparation and also in the ability to make use of leftovers.

Pricing policy. Sellers/suppliers sometimes offer large packages at a lower price per unit. This pricing policy attracts customers, who may buy more than they need, leading to waste.

A4.3.2 Impact of food waste

Food waste has environmental, economic, social, and ethical impacts. Together, they point to a need to review food security.

Environmental impact. Food waste entails unnecessarily used resources, such as water, cropland, fertilizers or fossil fuels, as well as GHG emissions (Bio Intelligence Service, 2010; Kummu et al., 2012). During the life cycle stages of the food, activities such as agriculture, processing, transportation, storage, refrigeration, distribution, etc. create embedded carbon storage in the food (Lundqvist et al., 2008; Tuncer and Schroeder, 2011; Padfield et al., 2012).

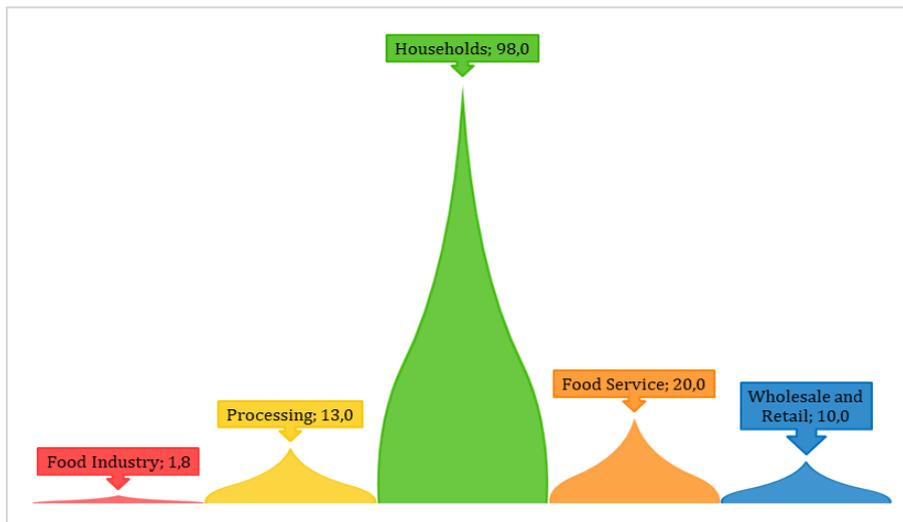
At the time of final disposal in landfills, as part of its decomposition process carbon in the food is converted into methane and carbon dioxide (CO₂), which are GHGs that, if not captured, contribute to climate change. Approximately 3% of global GHG emissions are estimated to stem from the waste sector (UNEP, 2010; Defra, 2011; Papargyropoulou et al., 2014).

The depletion of natural resources as well as disruption of biogenic cycles of nitrogen and phosphorus as fertilizers are counted as other environmental impacts of food waste (Smil, 2002; Rockström et al., 2009).

According to Barrett and Scott (2012), GHG emissions can be reduced significantly through changes in the food sector. Only by preventing food waste, it is possible to eliminate 456 million tons of GHG emissions by the year 2050 in the UK. The European Commission (2006) stated that the food sector was the cause of approximately 22% of global warming in Europe.

Economic impact. The cost of food wastage for EU-28 in 2012 is estimated at €143 billion. €98 billion of this amount is associated with food waste from households, €20 billion from food service, €13 billion from processing, €10 billion from distribution, and finally €1.8 billion from production, as represented in the figure below.

Fig. 5: Costs Associated with Food Waste by Sector (Values in Billions of Euros)



Source: Stenmarck et al. (2016)

Social and ethical impact. The social implications of food waste are related to its ethical and moral aspects (Salhofer et al., 2008), for instance regarding inequality between wasteful practices on one hand and poverty on the other (Evans, 2011). Some movements against this inequality are introduced in the literature, for instance in Australia. According to Edwards and Mercer (2007), “freeganism” and “gleaning” movements have emerged as an alternative to current consumption patterns. The main objective is minimizing environmental impacts and addressing the social inequality for food access, and to succeed, these groups consume discarded food.

In another study, Evans (2011) discusses that frugality, which requires careful consumption of resources and avoidance of waste, has a strong moral dimension and is a way to improve sustainability when wasting or diverting food from human consumption is accepted as immoral (Parfitt et al., 2010).

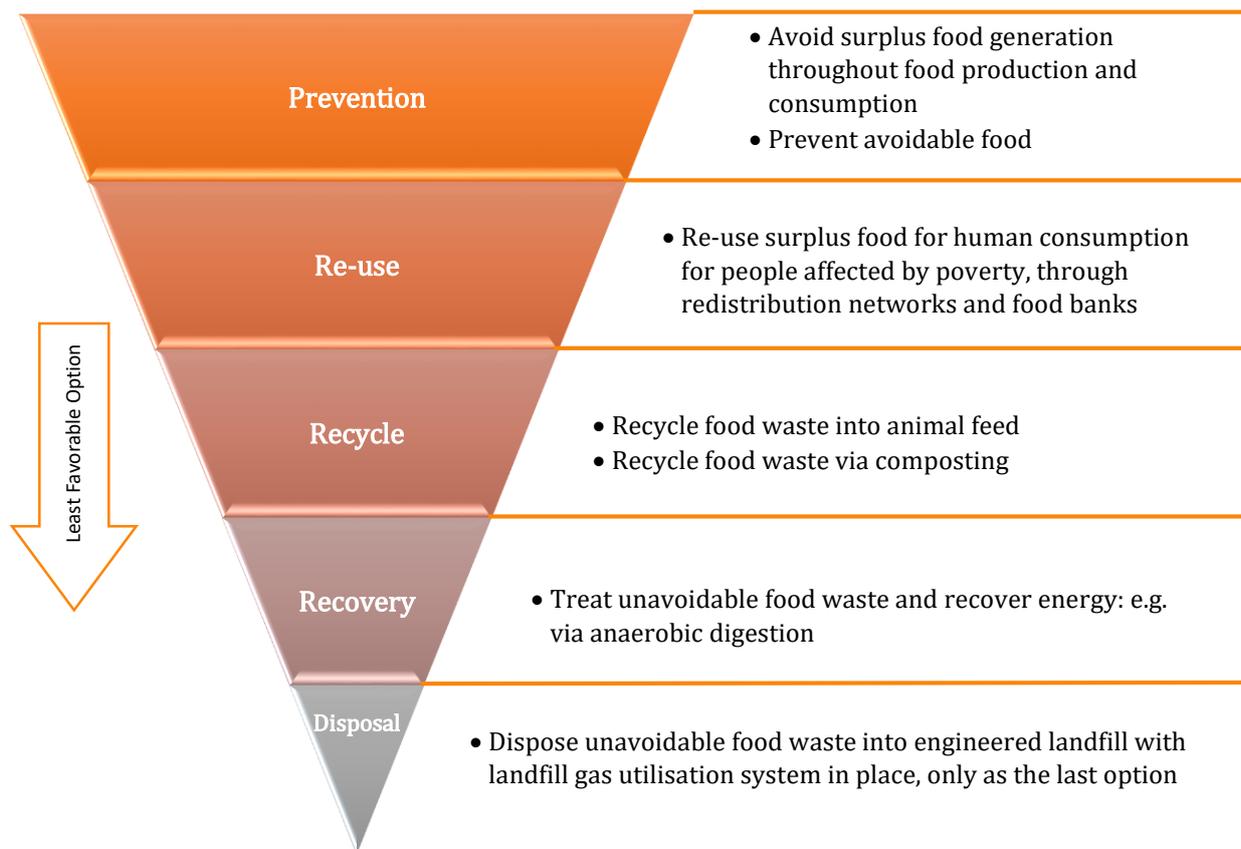
In the literature, the moral aspects are accepted as relevant to food waste behavior, because consumers are assumed to feel guilty or uneasy about wasting food (Brook Lyndhurst, 2007; Hamilton et al., 2005; Stefan et al., 2013). However, in a recent study, Watson and Meah (2013) report that consumers are not conscious of the environmental impacts of food waste (such as GHG emissions) and only a few accept social impact as a reason for feeling guilty about their waste. Additionally, the most important drivers for consumers for not wasting food are found to be time and money.

Food security. Combining the impacts of food waste from all aspects, it is suggested that food security is becoming a more urgent issue with the continuous increase in population (Lundqvist et al., 2008; Gustavsson et al., 2011); the reduction of food waste becomes vital for feeding the population (Godfray et al., 2010; Stancu et al., 2016).

A4.3.3 The waste hierarchy

The EU defined a waste hierarchy in 1989 based on a Dutch model, the Lansink Ladder. This hierarchy is adopted worldwide as the principal framework for waste management. The waste hierarchy provides a hierarchy of options that present the best overall environmental outcomes (Papargyropoulou et al., 2014).

Fig. 6: The Food Waste Hierarchy



Source: Papargyropoulou et al., 2014

Waste prevention. The aim is to avoid waste generation and reduce the food surplus. In agriculture and production, the priority is to prevent overproduction and oversupply of food. In other words, to produce only the amount of food necessary to cover nutritional needs and safeguard food security. Improved agricultural infrastructure, technological skills and knowledge, and more efficient storage, transport and distribution are important for preventing food waste in these stages.

In the final stages of FSC (distribution and consumption), prevention activities include supply/purchase of the food in appropriate amounts, improved food labelling, better planned shopping and food preparation, and improving shelf life for perishable foods; as well as shifting to more sustainable consumption patterns and increasing the consciousness of consumers on environmental impacts of waste.

Avoidable vs unavoidable. It is important to distinguish between waste that is “avoidable” and that which is “unavoidable”, in order to assess the degree to which food waste prevention is feasible. If the wasted food is clearly edible, it is called avoidable waste. On the other hand, if it is not edible under normal circumstances (such as apple cores, fruit peel, meat bones, etc.), it is called unavoidable waste. It is, however, important to keep in mind that the distinction is to some extent personal: an avoidable waste can be regarded as unavoidable, because of personal values, norms, and cultural beliefs.

Legal and regulatory barriers. In some cases, waste is caused by unreasonable legal barriers or misdirected food safety standards.

A4.3.4 Dealing with food waste

Waste management includes all activities to deal with food waste once it has been generated. At this point, the distinction between avoidable and unavoidable food waste is important. For example, it is possible to redirect much avoidable waste into animal feed.

Unavoidable food waste offers several options for re-use, including composting/soil improvement, and generation of commercially viable methane.

If recycling is not feasible, treatment with energy recovery is another way of waste management. The last and least preferred option is to dispose in a landfill for both avoidable and unavoidable wastes.

Example: Sweden

In Sweden, households are responsible for the largest volumes of food waste. About 771,000 tonnes of food waste were generated in households in 2012 or just under 81 kg per person. About 35 % of this was avoidable. (Swedish EPA, 2013.)

To treat food waste, the Swedish EPA points to four methods: recycling, biological treatment, energy recovery, and landfill. Biological treatment uses anaerobic digestion or composting system to convert the waste into fertile soil. Alternatively, the energy recovery process takes the waste that cannot be recycled or made into soil and creates energy from it, in the form of co-generation of heat and electricity.

Swedish Waste Management, Avfall Sverige, notes that in 2012, Sweden converted 673,180 tonnes of organic waste into soil.

By 2011, 154 of the 290 Swedish municipalities responsible for collecting waste had developed a system for the collection of food waste to use for energy or biological treatment. As of 2012, 15.3 percent of all waste generated by households was biologically treated: instead of producing traditional fertilizer, which requires finite resources, the waste is turned into digestate, a type of fertilizer requiring no fossil fuels for its creation.

A5. Factors Affecting Consumers' Food Choices

Food expenditure –an expenditure that consumers cannot avoid – varies according to lifestyle, culture, income and other demographic variables. Changes in the demographic structure of the population are often important determinants of trends in food consumption. Therefore, agricultural and food policies, as well as marketing strategies and practices, benefit greatly from the response of food consumption to demographic changes (Moro and Sckokai, 2000: 305).

Indices of food expenditure are also regarded as important indicators of welfare (Kiren Gürler et al., 2018).

A5.1 Theory of Planned Behavior (TPB)

Among researchers, the most influential theory to explain consumer behavior is the Theory of Planned Behavior (TPB), which states that the primary antecedent of human behavior is the intention. According to TPB intention is determined by three factors:

Consumers' attitudes towards the behavior

Attitudes reflect consumer opinion on whether the behavior is favorable or unfavorable. The more an action is regarded as favorable, the more possible that the consumer acts accordingly.

Subjective (social) norms

These norms are related to social pressure to engage in the behavior. If the consumer perceives more social pressure, it is more probable that s/he will act accordingly.

Perceived behavioral control (PBC)

PBC refers to people's perceptions of their ability to perform a given behavior. The probability of taking action is positively related to the degree of perceived control by the consumer.

Some researchers include *personal norms*, also called moral norm or perceived moral obligation, as a fourth dimension completing the TPB, as it reflects the individual's perception of the moral correctness or incorrectness of performing a particular behavior (Ajzen, 1991). This dimension is related to the personal feelings of people relevant to the responsibility of performing or not performing a behavior (Han and Hansen, 2012).

A5.2 Socio-demographic Factors

Socio-demographic factors are found to be associated with food behavior, in particular with food waste behavior (Koivupuro et al., 2012). Higher household income levels are associated with more waste, whereas higher age is associated with less waste (Brook Lyndhurst, 2007; Stefan et al., 2013).

Research also shows that women are more likely to purchase organic food compared to men (Hughner et al., 2007; Aertsens et al., 2009).

A5.3 Motives and Hindrances

In a study by Steptoe et al. (1995), health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, and ethical concern are found to be the motivational dimensions of the integrative framework on food choice.

Hughner et al. (2007) classify the factors that drive consumers' organic food choices in two categories as "motives for purchase" and "hindrances to purchase". In the motives category, health and nutritional concerns, superior taste, environmental concerns, food safety, concerns about animal welfare, and supporting the local economy are included as possible reasons that drive consumers to purchase organic food. On the other hand, higher prices, unavailability, perceived time barriers, unawareness of the environmental impact of food, skepticism of certification boards and organic labels, and satisfaction with current food sources are the factors that prevent a switch to organic food.

A6. Challenges and Barriers

Unsustainable forms of consumption and production in current business practices and consumer lifestyles give rise to global challenges, such as scarcity of natural resources, environmental issues

and an increase in waste generation. Therefore, producers, consumers, and policy-makers all have a role to play in order for SCP thinking and acting to become mainstream.

Business level activities focus on the production aspects, with an emphasis on developing and implementing macro-level policies. At the same time, in order to implement decisive policies, business is dependent on government to establish a 'level playing field' or indeed to favour sustainable above unsustainable practices; and depends on building consumer demand for new products and services.

Policy-makers and regulators need to balance the need for regulation favorable to sustainable development with the need for support from citizens. In other words, the support of an educated citizenry is essential if the changes necessitated by the demands of SCP shall succeed.

Citizens and consumers are of course the same individuals, but they may act and indeed believe quite differently depending upon the role in which they perceive themselves. It has been questioned whether the citizen at the ballot box is indeed the same person as the consumer in the store. The two roles may come closer together in social and civil society movements, which also play a role in representing and educating both consumers and citizens (Stern et al., 1999)

The adoption of SCP practices requires 'lifecycle thinking', to integrate sustainable thinking across all levels of production and consumption. The adoption of SCP practices is inhibited by several barriers. Application of the TOPSIS method led to identified and prioritized barriers as follows (Khan et al, 2018):

- i. Lack of consumer awareness
- ii. Lack of awareness program to promote sustainable consumption
- iii. Lack of knowledge among stakeholders
- iv. Lack of policy for sustainable consumption
- v. Lack of effective communication
- vi. Lack of government support
- vii. Lack of regulatory framework
- viii. Lack of resources
- ix. Reluctance to change
- x. Lack of skilled workforce

Different organisations might have different views regarding barriers to adopting SCP initiatives in supply chains. Nonetheless, the analysis could be helpful for policymakers evaluating their existing practices of SCP; and indeed, for government bodies reviewing relevant legislation.

A6.1 Sustainable Production

At the turn of the new millennium, it appears that disillusionment, not least with large-scale business, is growing. Currently, production systems and consumption patterns are based on conventional courses of action and use methods and technologies that are generally not sustainable. As a result, sustainable consumption and production is becoming an important means by which business organizations prepare for sustainable development.

A6.1.1 Business barriers and the role of marketing

Achieving sustainable production trends in supply chains is difficult due to the presence of several related barriers (Mangla et al., 2017). For instance, traditional communication cultures no longer suffice; producers, entrepreneurs and all stakeholders who have seriously and responsibly

engaged in the supply of organic products have begun to focus on sustainability and ethical dimensions in their marketing strategies (Belz and Peattie, 2009).

Even as consumers demand better accountability from companies, few change their own consumption patterns. Most are blocked by availability, affordability and their own scepticism. Transparency offered by technology and consistent and effective customer service can alter the public perception of green claims. (<https://www.weforum.org/agenda/2016/06/sustainable-consumption-and-the-fourth-industrial-revolution/>).

In terms of sustainable marketing (Pajtinková Bartáková and Gubíniová, 2012), sales focus on

- i. Products and services that meet sustainability requirements
- ii. Offered with sufficient information to motivate a decision to purchase
- iii. Include easy instructions for use and responsible disposal

When selling organic foods, the market should try to establish that the higher price of organic products is commensurate with high quality. In order to achieve a growth strategy for the organic market, it is necessary to provide attractive opportunities for entrepreneurs and individuals at all stages of the supply chain.

A6.1.2 Opportunities for entrepreneurs

Sustainable development carries opportunities for entrepreneurs (Trojánek, 2012).

- i. The concept of sustainable marketing is important to ensure a company's long-term performance combined with a high degree of social satisfaction (Mitchell et al., 2009).
- ii. It also requires a systemic approach and cooperation among actors operating in the supply chain, from producer to final consumer.
- iii. It involves engaging consumers through awareness-raising and education on sustainable consumption and lifestyles, providing adequate information through standards and labels, and engaging in sustainable public procurement.

(<http://www.un.org/sustainabledevelopment/sustainable-consumption-production/>).

A6.1.3 Cyber research

A food production challenge has been described by the Interdisciplinary Centre for Climate Change (iClimate) at Aarhus University, Denmark, as the potentially vicious circle of climate change → poorer growing conditions → less food production, in times of growing population pressure. In response to this challenge, the Centre proposes innovations in linking physical food production with increasingly sophisticated cyber systems.

A6.2 Role of Consumers

In the context of sustainable marketing, customers can be seen as active allies in the process of creating positive social change, as well as in the process of sustainable consumption. By virtue of their purchasing decisions, they essentially determine the success or failure of marketing activities and strategies (Williams, 2009).

A6.2.1 Behavior change models and methods

Despite the huge body of psychological, sociological and anthropological literature about human behavior, there is still confusion about how to induce long-term behavior changes for a healthier and more sustainable lifestyle.

A study by the Swedish EPA, 2019 (not yet published) documents several different approaches: 6 Swedish, one Swedish-multinational, one Hungarian-multinational, and one British. One conclusion is that education as such is most effective when delivered in a context of action and empowerment.

Empowerment

The two multinational examples build on the same methodology of empowerment through small-group, action-oriented education (Mehlmann and Pometun, 2013). Some key principles are

- i. Build on the existing concerns of participants (eg health)
- ii. Help participants give concrete expression to their intentions
- iii. Create opportunities to experiment with and evaluate new behaviors
- iv. Develop feedback channels so that participants see the impact of their actions

The context of Education for Sustainable Development (UNESCO GAP ESD, 2014) is highly relevant to the question of consumer education.

Nudging

The concept of 'nudging' consumers to behave more sustainably has been gaining ground, based on the concept of influencing "choice architecture" surrounding the behavior – i.e. the physical, social, and psychological aspects of the contexts that influence and in which our choices take place – in ways that promote a more preferred behavior (Thaler and Sunstein, 2008). Such experiments have been undertaken by both producers and policy-makers, so far with mixed results.

One possible conclusion is that nudging can function as an effective adjunct to action-oriented education.

A6.2.2 Barriers and promoters of sustainable lifestyle

Human behaviors are embedded in complex systems, and system structures are often the biggest barriers to behavioral change. For example, urbanization with cities built for cars and automated jobs with less manual labour leads to an increasingly sedentary lifestyle. The stressful 'modern' lifestyle, with long working hours for both men and women, reduces the time spent for conscious food shopping and cooking; and promotes the consumption of convenience foods with higher sugar, fat and salt contents.

Rising income inequality makes conscious food choices even harder for more and more people; cost is often cited as a major obstacle (Husmer et al., 2003). In the long term, this kind of system leads to higher numbers of overweight and obese people. In fact, the share of obesity in a society can be seen as one indicator of social inequity.

A thorough understanding of the systems that are desired to be changed is a crucial prerequisite for solving complex problems. A better understanding of systems helps practitioners to develop interventions that promote a healthy and sustainable lifestyle (Meadows and In Wright, 2015). For example, in order to change the nutrition habits of adults on target, the first step is to analyze the lifestyle of those adults. The living conditions, family size, income level, work-life, etc. are all useful in nutrition habits. Therefore, information on the environment of adults is beneficial for changing the lifestyle with a sustainable one.

However, it is certain that *information alone does not change behavior*. As Darnton and Evans (2013) stated, it makes no sense to “merely make rational appeals to people to change behavior based on factual and logical arguments ...”. It seems to be more useful to “provide emotional and empathetic messaging”.

- i. An appeal to emotions is more likely to succeed than an appeal to rationality (Kollmuss and Agyeman, 2002; Piazza et al., 2015).
- ii. The right attitude, right knowledge, and right values are necessary but not sufficient to change dietary lifestyles (Dibb and Fitzpatrick, 2014; Verbeke, 2008). Typically, attitudes and norms shift on the basis of experience (Mehlmann and Pometun, 2013).
- iii. Norms, values, and culture play an important role in adults' eating habits (Robinson et al., 2013; Higgs and Thomas, 2016)

As an instance of cultural impact, the Danish food culture and heritage has its roots in the old farming life. The cold weather conditions have been a determining influence, and Danes have been eating a lot of potatoes and meat for centuries – especially pork. There are actually more pigs in Denmark than there are people (Hansen, 2016). Consumers tend to prefer conventional Danish products over foreign, sustainable products (Husmer et al., 2003).

Numerous studies cite a *lack of public trust in labeling*, whether of organic food or of other sustainability dimensions.

A6.2.3 Consumer perceptions: Organic food

Organic food represents the consumers a function to promote health, a healthy lifestyle, and a healthy balance between private and working life. However, a separate concept concerns the feelings of happiness and joy of buying and consuming organic food. Consumer confidence in organic food means to trust in organic certification and marketing communication requirements, especially labels and trust in organic food products, producers, traders, sellers, and certification organizations. Consumers perceive the effects of organic food on health and environmental, ethical, production and shopping experience according to taste and quality (Sultan et al., 2013). There is a general consensus on why people buy organic food. Hughner et al. (2007) suggest:

- i. interest in personal health
- ii. product quality
- iii. concerns about the destruction of the environment
- iv. concerns about food safety
- v. concerns over animal welfare
- vi. supporting the local economy

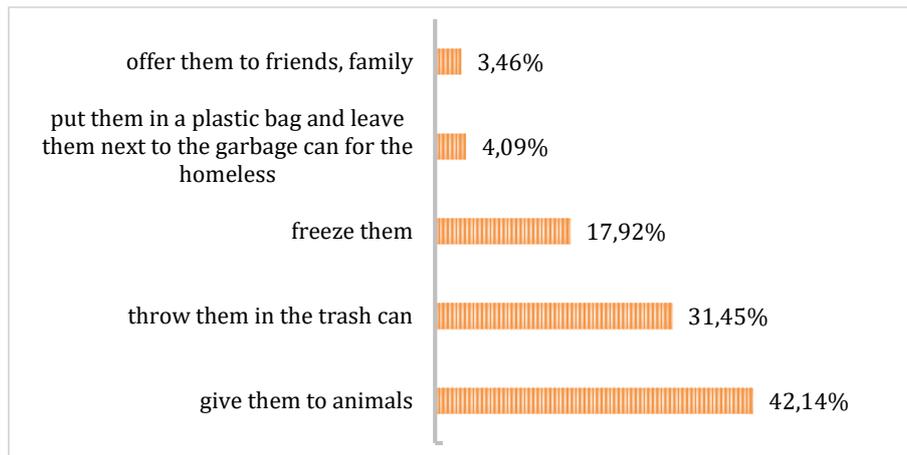
Pearson (2014) postulates that there are also factors preventing the purchase of organic products, including:

- i. they are not readily available
- ii. they tend to be more expensive

A6.2.4 Consumer perceptions: Food waste

In Slovakia, research was conducted to find out how consumers handle the household excess food. Almost 40% of respondents give excess food to farm animals, followed by a classic option- a trash bin (31.45%), 22% of respondents say that they freeze food and a few respondents say they leave food for the homeless or offer to the family (Fig. 7, Paluchová and Prokeínová, 2013).

Fig. 7: Handling Food Waste



Source: Based on marketing research by Paluchová and Prokeínová (2013)

The researchers focused on the management and efficient consumption of food. They asked whether the respondents actually consume all their purchased food. 85% said they consume all purchased food. If their responses were accurate, it would be a positive phenomenon in terms of sustainable consumption.

A6.2.5 Meat consumption

A comprehensive list of barriers and opportunities to change meat consumption behavior is provided below in the table by Stoll-Kleemann and Schmidt (2017).

Any attempt to educate about the consequences of meat-eating behavior should take into account a factor not mentioned in the table, i.e. the huge differences in environmental impact occasioned by different methods of raising the animals (see Section A3.2). These differences range from extremely negative to extremely positive.

Table 1: Barriers and Opportunities to Change Meat Consumption Behavior

Factors	Barriers	Opportunities
Knowledge and skills	Low knowledge of the consequences of high meat consumption and reasons for reduced meat-eating behavior	Campaigns based on emotional messages, specific arguments and with particular tools for targeted groups
	Lack of skills relating to practical issues (such as those related to vegetarian cooking)	Increasing skills that facilitate a plant-based diet
	Denial mechanisms provided by cognitive dissonance, which block new knowledge	Mechanisms and tools to overcome cognitive dissonance
Values and attitudes	Low priority of values/attitudes which favour low meat consumption;	Campaigns based on emotional and symbolic messages
	Denial mechanisms provided by cognitive dissonance and social norms which block the incorporation of ethical food attitudes into behavior	Mechanisms and tools to overcome cognitive dissonance
Emotions and cognitive dissonance	Cognitive dissonance blocks new knowledge and adequate values through denial and defense mechanisms	Emotional and symbolic messaging, promotion of new social norms
		Removing cognitive dissonance by changing behavior to encourage reduced meat consumption
Habits and taste	Day-to-day food habits as unconscious routine	Infrastructure supportive of plant-based diet: vegetarian-friendly shopping and dining environments (including canteens and hospitals) support the establishment of new habits
	Taste preferences towards meat	
	The production and supply system has a major influence on food habits	
Sociodem. variables and personality traits	Being male, elderly, belonging to a lower social class (in terms of income and/or education)	Strong health argument for men and the elderly
	Personality traits: being extravert, facing a lack of conscientiousness	Promoting flexitarianism as a new food style
Perceived behavior control	Low perceived ability to control behavior reduces the probability of behaving in the desired way	Increasing skills and self-esteem by stressing the role of vegan/vegetarian opinion leaders as role models
Culture and religion	Symbolism attached to meat: desire to express human power in order to dominate the natural world	Taboos and prohibitions in several religions (e.g. the ahimsa concept)
	Cultural belief that meat provides strength and vigour (in particular to men)	Promotion of new social and cultural norms
Social identity and lifestyles	Meat consumption as a social marker in the construction of social identities and lifestyles (e.g. as a sign of prosperity or masculinity)	Flexitarianism as a new food style;
		Enhancing the social status of plant-based diets
Social norms, roles and relationships	Perceptions of normative behavior by socially connected peers who favour meat consumption	Promotion of new social norms, e.g. by stressing the role of vegan or vegetarian opinion leaders as role models and community-based social marketing
Political and economic factors	Lack of political will	Increasing prices (e.g. by eliminating harmful subsidies, internalising external costs and/or imposing taxes on animal production and products)
	Powerful lobbies in agro-industry	
	High subsidies for the production of animal-based food	
	Low prices of animal-based products	
Food environment	No broad infrastructure that facilitates a plant-based diet; lack of vegetarian-friendly shopping and dining environments (including canteens, college refectories and hospitals), especially in rural areas	Increase in tasty and affordable vegetarian products in supermarkets, on the menus of restaurants, in hospitals, canteens and college refectories

Source: Stoll-Kleemann and Schmidt (2017)

A6.3 Breaking Down the Barriers

In recent years, there has been an increase in public interest in food quality. Not least, consumers who are concerned about their own health and the safety of the food system are particularly interested in organic food.

A6.3.1 Role of producers

The market responds by developing new products and modernizing communications. According to Úrgeová (2011), organic food is still only a small share of the market worldwide, but currently, the market is expanding and has great potential for further growth in all countries.

More generally, UNEP (2005) has published a guide to help producers reduce the barriers to sustainable consumption, Table 2.

Table 2: Decreasing the Consumers' Barriers to Sustainable Consumption

Barriers perceived	Communication	Other aspects of marketing	Other levers
Lack of information and awareness	<ul style="list-style-type: none"> ▪ Advertising campaigns ▪ Use of well-known labels ▪ Educational websites, leaflets, packaging and in-store communication 	<ul style="list-style-type: none"> ▪ Proper training of marketers and sales forces 	<ul style="list-style-type: none"> ▪ Support to public awareness campaigns, databases and benchmarking surveys
Lack of trust in claims	<ul style="list-style-type: none"> ▪ Endorsements and labels ▪ Linking products and reporting 	<ul style="list-style-type: none"> ▪ Independent certification ▪ Procedures to prevent irresponsible marketing practices 	<ul style="list-style-type: none"> ▪ Support for certification schemes ▪ Implement a Corporate Responsibility strategy and reporting
Not trendy	<ul style="list-style-type: none"> ▪ Use models such as movies, stars, etc. ▪ Avoid over-technical claims 	<ul style="list-style-type: none"> ▪ Do not design it only for "true blues" ▪ Sponsorship and endorsement 	
Habits	<ul style="list-style-type: none"> ▪ Use role models, norms and commitments 	<ul style="list-style-type: none"> ▪ Offer free tests of products/services ▪ Use behavior change tools 	<ul style="list-style-type: none"> ▪ Support the phase-out of "old" products
Lack of quality and/or functionality	<ul style="list-style-type: none"> ▪ Re-assurance on basic functions 	<ul style="list-style-type: none"> ▪ Aim at differentiation rather than designing it only for "true blues" ▪ Certify other aspects of quality 	<ul style="list-style-type: none"> ▪ Good quality management
Poor availability	<ul style="list-style-type: none"> ▪ In-store communication 	<ul style="list-style-type: none"> ▪ Properly train sales forces to maximize distribution 	<ul style="list-style-type: none"> ▪ Contact retailer's CR manager to facilitate negotiations
Too expensive	<ul style="list-style-type: none"> ▪ Show the economic benefits (energy savings, etc.) 	<ul style="list-style-type: none"> ▪ Do not target only the A-class ▪ Offer consumer credits/spread out payments to compensate the extra-cost 	<ul style="list-style-type: none"> ▪ Lobby for stricter standards and financial incentives (tax and subsidies)

Source: UNEP (2005)

When crafting responses to these challenges, variables such as socioeconomic status and age should be considered, because they have a strong influence on, for instance, meat consumption (Stoll-Kleemann and Schmidt, 2017).

Framing specific “positive” messages for different target groups can be powerful (Stoll-Kleemann and Schmidt, 2017; Dibb and Fitzpatrick, 2014; Joyce et al., 2012; Garnett et al., 2015), for instance

- i. Health benefits for men or older people
- ii. The impact on future generations for younger people, connecting with personal health, animal welfare and dietary flexibility

Working with observations and experience (Darnton and Evans, 2013) is a good strategy, not least to engage people with lower education levels.

Stimulating empathy is crucial to motivate people to change their behavior (Zaki, 2014), especially when linked to a positive or hopeful message. Often messages about the environmental impact of behavior convey an apocalyptic future scenario, which often makes people feel guilty, and can have an adverse effect on their behavior (Genevsky et al., 2013; Lertzman and Baragona, 2016). Those messages are communicated with the belief that increased awareness will change behavior, but negative, scary or threatening scenarios tend to have the reverse effect (Lertzman and Baragona, 2016).

In short, socially responsible behavior depends on the existence of socially responsible consumers, who are aware of the necessity and significance of the protection of the environment and society as a whole, are willing to allow their values to guide their actions, and possess certain purchasing power. The increase of purchasing power; awareness of customers concerning the significance of environment; the creation of a culture of production, purchase, and consumption of sustainable products and the recycling of products depend further on the economic and legal environment of the country or region (Rakic and Rakic, 2015).

A6.3.2 Other actors

Civil society organizations and policy-makers with an ambition to influence consumer behavior can benefit from the same strategies.

Policy-makers have the additional opportunity to influence producers through the traditional instruments of 'carrot, stick, and education'.

Civil society organizations have opportunities less accessible to others, for instance in educating consumers to work together to influence the distribution stage of the food system.

A7. Need for Education for Behavior Change of Adults

It can be deduced from the above that all adults could benefit from action-oriented education concerning the food system, whether as consumers or in their professional roles. In this report, we focus primarily on the need and opportunity for consumer education.

A7.1 Knowledge of Methods and Tools

When consumers do not have sufficient knowledge to guide their behaviors, they have less tendency to adopt sustainable consumption practices such as involvement in recycling activities. For example, DeYoung (1989) states that a study of recyclers and non-recyclers has concluded that the attitudes and motives of the two groups were not that different, however, they were

different in their level of operational knowledge; and confusion concerning the recycling process was associated with non-recycling behavior.

Haron et al. (2005) state that by improving public environmental knowledge it is highly probable that public sustainable consumption behavior will be increased. However, to succeed in this technical know-how and skill-related information are also required next to the basic environmental knowledge.

Stancu et al. (2016) suggest that the biggest contribution is possible through changing routines for the re-use of leftovers, as well as shopping routines. Improving people's skills related to food routines by providing easy access to support, infrastructure, advice, and information on how to deal with food-related activities can be an effective method for reducing food waste.

Based on the facts of the Austrian Nutrition Report and the studies about food waste in Austria, it is evident that there is a need to educate Austrian adults about healthy and sustainable food consumption with an emphasis on reducing food waste. There are several educational programs in Austria for pregnant women, young mothers, and school children. But the majority of Austrian adults still have food habits that ignore the guidelines for healthy nutrition and sustainable consumption. A list of institutions and programs that offer adult education on the topic is listed in Appendix 1.

A7.2 An Eco-conscious Consumer Profile

In research by Paluchová and Prokeínová (2013), an eco-conscious consumer profile was created, as a role model to aspire to. Every adult should be able to assess the extent to which s/he lives up to the model.

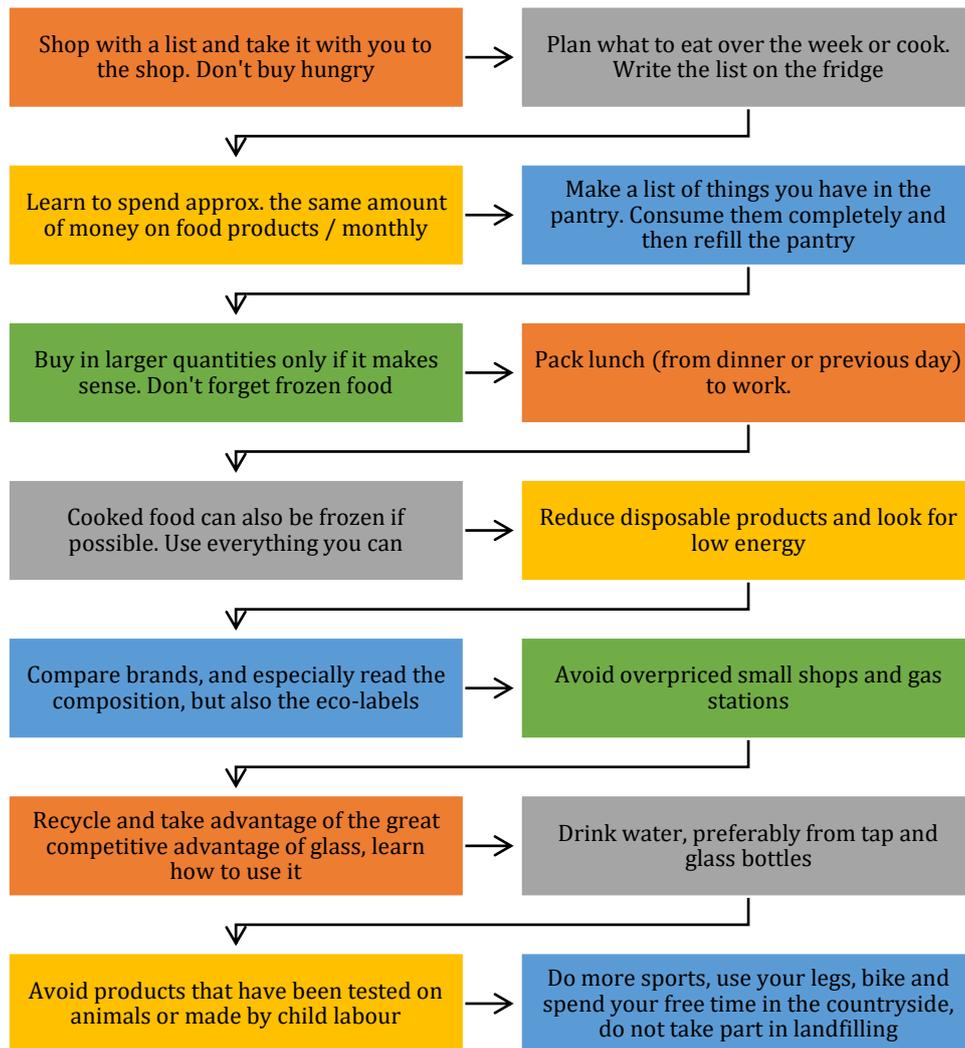
- i. Consumes natural food, raw food or organic food
- ii. Saves energy (in several ways)
- iii. Creates a home with minimized use of other resources and free of toxins (many ways)
- iv. Looks for clothes made from sustainable/recyclable materials
- v. Gives domestic animals natural/organic feed

A sustainable and environmentally oriented consumer should pay attention to the following principles when wasting food (Paluchová and Prokeínová,2013):

- i. Plan food purchases in relation to menu plans, and gradually learn how much the household consumes
- ii. Note the expiry date; buy as much as will be consumed by then
- iii. Be careful with your money – thrown away food is thrown away money
- iv. Keep the fridge clean (also behind) because when it is clean it needs less electricity and the food can be stored for longer
- v. Store food as shown on the packaging,
- vi. Rotate: older purchased foods immediately to hand, newly purchased stored behind
- vii. Experiment with reducing portion size
- viii. Look out for new ways to use or freeze leftovers
- ix. Use food waste as compost or fertilizer

The most important recommendations and suggestions stemming from the study, based on a survey focused on sustainable consumption and sustainable marketing in 2013 among Slovak consumers, are provided in Figure 8. These recommendations and suggestions are designed to make sustainable consumption more effectively and encourage a critical approach to sustainable marketing, selected brands, and their marketing campaigns:

Fig. 8: Slovakian Recommendations Regarding Sustainable Consumption

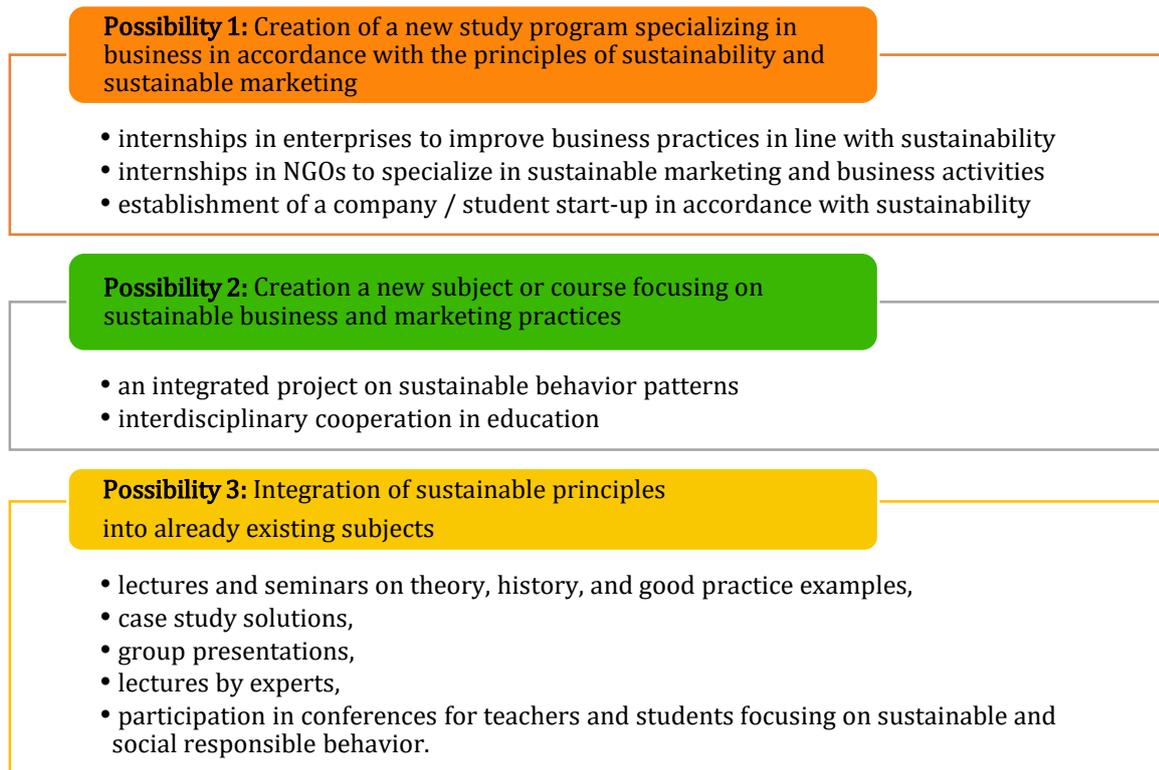


Source: Based on the study of Paluchová and Prokeínová (2013)

A7.3 Higher Education and Sustainable Production

Many universities have realized their roles in educating future entrepreneurs, managers, and marketers towards sustainable business practices. It is, therefore, more than important to address issues such as “how to integrate sustainability issues” (sustainable marketing, sustainable development) into curricula by the most appropriate means. Fig. 9 below provides an overview of how to integrate the above-mentioned topics into business and marketing courses.

Fig. 9: Overview of Integrating Sustainability into Business



Source: Holienčinová (2016)

Such initiatives also influence the consumer behavior of many students, many of whom may become life-long highly aware consumers (Holienčinová, 2016).

In this concept home farming is another issue. For example, in Slovakia, there are excellent conditions for people to grow their own fruits, vegetables or to keep their own animals for meat. However, for the sake of convenience, many people go to the supermarket and buy various processed foods. It is therefore important to spread awareness about the benefits of home production. Home farming is an opportunity to promote sustainable consumption in Slovakia. Composition and natural colouring, comfort, fewer calories, reducing disease risk, vitamin and mineral content, climate variety, natural flavour, and delicacy are the basic reasons that a conscious consumer should take into account.

For those for whom significant home farming is not an available option, there may be other local opportunities eg in the form of a farmers' market, or a group for Community Supported Agriculture, CSA (see A8).

A8. Policy Instruments

Changing consumer behavior should be seen in a long-term perspective and take a multi-stakeholder perspective. For example, the rise of alternative agro-food networks and different forms of community-supported agriculture (CSA) (Oosterveer and Sonnenfeld, 2012) offers both civil society and public policy-makers an opportunity to increase the availability, affordability, and accessibility of secure and sustainable food supply.

Public authorities, industry representatives, universities, civil society, and other organizations have every reason to cooperate at the European level in order to achieve food security and sustainability.

To make organic food as an example, there are several instruments (such as subsidies provided to organic producers) to increase the availability and affordability of organic products. Governments in about half of the EU countries organize certification, standardization, and inspection of organic and regional foods. The effectiveness of labeling for changing buying behavior is admittedly limited (Larceneux et al., 2012); nonetheless such state-backed labels are important tools for creating trust and raising consumer awareness (Eberle et al. 2011).

Governments also use taxes as tools for influencing consumers' food choices. Some governments impose additional taxes on undesired food types or food components such as certain fats (Nicholls et al. 2011). These kinds of financial tools are effective 'nudges' in terms of food choice because the price is a key factor affecting consumption.

More recently, self-regulation in the form of sustainable public food procurement in public bodies (such as kindergartens and schools, staff cafeterias in the public sector, etc.) is another effective approach to promote sustainable food consumption. At the household level, a weekly "veggie day" that promotes vegetarian dishes is an increasingly popular approach.

Information-based and education-oriented tools that focus on raising awareness are still the dominant policy instruments for sustainable food consumption. However, the increasing trend towards out-of-home and ready-made food consumption, as well as inadequate importance is given to sustainable food in school curricula, tend to erode the level of education relevant to production, consumption, and storage of food.

Sample regulations and practices about legal issues concerning sustainability and food consumption are presented in section B5 of this report.

PART B

CURRENT SITUATION AND NEEDS ANALYSIS – DESK RESEARCH

After an introduction to the methodology, the findings of the desk research are presented describing the situation regarding food consumption behavior of consumers, especially in partner countries. The focus is on adult food consumption with respect to health, food waste and environmental issues, challenges, barriers, and examples of good practice.

B1. Methodological Aspects of Desk Research

The desk research was designed to collect information regarding sustainable consumption of food in the countries involved in the project. Desk research covers secondary data and previous/current findings. In particular, it involves finding and analyzing relevant documents, ministerial regulations concerning the rules, requirements, and characteristics of adult behavior with respect to food consumption, examples of common and good practice in partner countries.

After discussion and review of the background of sustainability, sustainable consumption, and the food-related context such as footprints, environmental impacts, and food waste in Part A, the desk research section of this report is dedicated to more specific findings related to the current situation in partner countries.

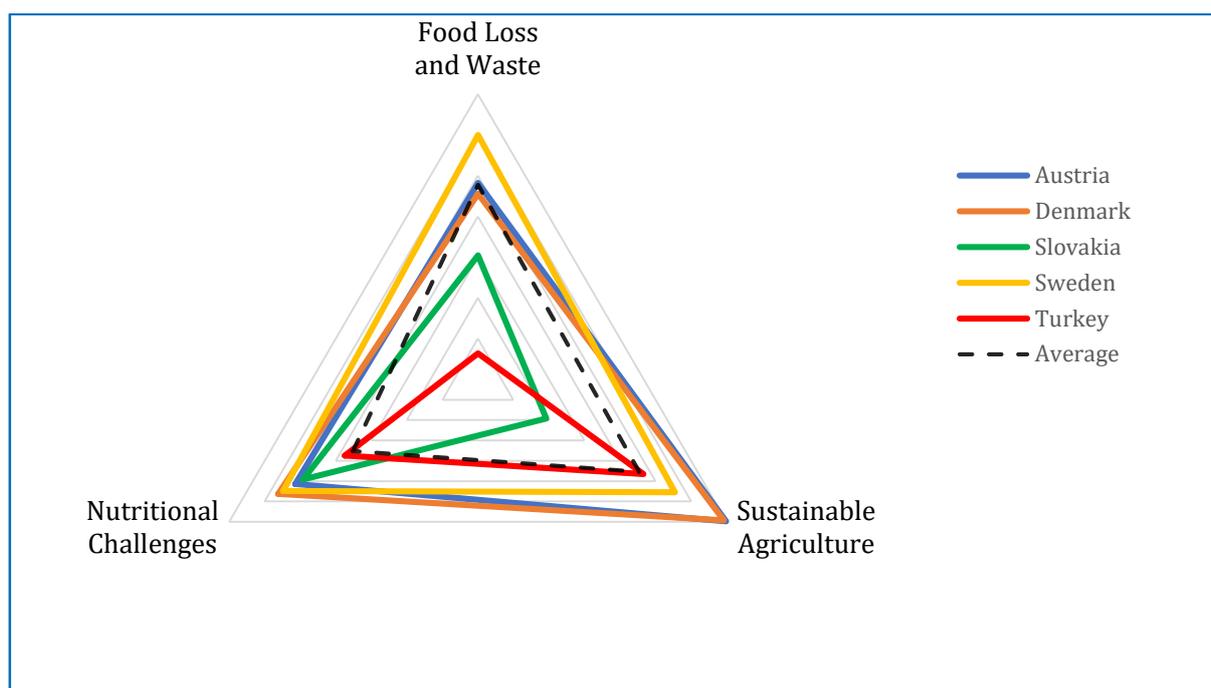
B2. Overall Analysis of the Current Situation

The Food Sustainability Index (FSI) published by the Barilla Centre for Food and Nutrition Foundation (BCFN) ranks 67 countries according to their food system sustainability. It is a quantitative and qualitative benchmarking model based on 38 indicators and 90 individual metrics that measure the sustainability of food systems across three pillars: food loss and waste; sustainable agriculture, and nutritional challenges.

The index has three key performance indicators—environmental, societal and economic—which are in turn based on 35 indicators and eight categories selected on the basis of expert analysis by The Economist Intelligence Unit in consultation with an advisory board. The scores for the three main pillars are calculated from the weighted mean of underlying indicators and are scaled from 0 to 100, where 100 equals most sustainable. The overall score for the FSI (also on a scale of 0 to 100) is calculated from a weighted average of the category scores (BCFN, 2019).

France is in first place among 35 high-income countries in the 2018 edition of the FSI, followed by the Netherlands and Canada. Colombia is the leading middle-income country, out of 23, thanks in particular high scores in sustainable agriculture and nutritional challenges. Among the nine low-income countries, Rwanda has the strongest performance overall. When then rankings are examined in overall scores, France is the leader in food loss and waste dimension, while Austria is the leader in sustainable agriculture and Japan is at the top in nutritional challenges. Among partner countries, Denmark gets the highest overall score (Rank:6/67), followed by Sweden (Rank:8/67), Austria (Rank: 9/67), Slovakia (Rank:55/67), and Turkey (58/67) respectively (BCFN, 2019). Figure 10 shows the current situation of each partner country in the three dimensions of FSI. The average score of all 67 countries can be seen from the figure for ease of comparison.

Fig. 10: FSI Dimension Scores of Partner Countries



The partner countries are divided into two groups as Low-Level Countries and High-level Countries based on their scores according to FSI. Due to low scores, Slovakia (Score: 61.4; Rank: 55/67) and Turkey (Score: 60.1; Rank: 58/67) marked as Low-level Countries and Denmark (Score: 73.5; Rank: 6/67), Austrian (Score: 73.3; Rank: 9/67) and Sweden (Score: 73.4; Rank: 8/67) marked as High-level Countries. The comparisons in further chapters of this report are made through this classification.

In spite of the good status of three partner countries and the developing situation of the other two in the overall ranking, a noteworthy situation is observed when the food loss and waste dimension is examined. Among 67 countries, Sweden is decreased to 22nd, Austria to 36th, Denmark to 40th, Slovakia to 56th and Turkey to 65th. This proved that further actions are needed for partner countries, particularly in terms of food loss and waste. Adult education is one of the main actions that can be taken in this regard

B3. Food Consumption Behavior of Adults

A variety of data were collected from each countries' publically accessible reports, articles, related websites, etc.

B3.1 Consumer Opinion

According to a study by Arla Foods, three out of four Danes wish to live sustainably. Most respondents of the study feel that it is not the politicians' or the producers' responsibility – it is the consumers that need to act sustainably and promote sustainable consumer behavior. However, the consumers can obviously not carry the entire responsibility; producers have a responsibility to make it as easy as possible for the consumer to make sustainable choices. The study also points out that 64 % of consumers actually do not know what it takes and how to live a more sustainable life (Rethink Business, 2018).

B3.2 Consumption Patterns

B3.2.1 Spending

One pattern is to be found in spending habits. For instance, in 2012, Slovaks spent on food and non-alcoholic beverages an average of € 865.2 per capita. Food and non-alcoholic beverages make up almost 25% of total consumption expenditure each year.

B3.2.2 Quantities

Alcohol-free beverages

In Austria, both women and men consume more than the recommended 1,5 liters a day (BCFN, 2016) of alcohol-free beverages (2,3–2,4 l and 2,3–3,0 l respectively). Notable is that the older the men the less they consume of such beverages (age group 19–25: 3,0 l; 25–51: 2,6 l; 51–65: 2,3 l) (Elmadfa and Freisling, 2017).

In Sweden, it has been observed that the consumption of alcohol-free beverages rises four times from 1960 (205,8 million kg) to 2017 (966 million kg) (Jordbruksverket, 2018).

In Slovakia, the consumption of non-alcoholic beverages per capita grew by 5.2 l (2.5%) and represented 216, 4 l. (SOSR, 2018).

Fruit and vegetables

An average EU citizen eats 390 grams of natural vitamins per day, mostly in the form of fruit. The recommended annual intake per individual is 96.7 kilograms and the 'safe' interval is from 86.7 to 106.7 kilograms per year.

Austrians consume too little fruit. Instead of eating two portions a day (250 to 300g a day), Austrian men only consume 132 to 147g on average, which corresponds to one portion. Austrian women eat a little more (150 to 220g) but also below the recommended daily intake. Instead of the recommended three portions of vegetables, Austrians consume only one portion a day (200 – 218g per day).

Turkish people eat almost 140 kg of fruit per year, or 385g per capita per day, and almost 280 kg of vegetables (TZOB, 2017).

In Slovakia, a positive trend is reflected in the increase in consumption of fruits by 3.8 kg from 2010 to 2014 (MPSR, 2015). The consumption of fruit and fruit products increased by 2.0 kg (3.3%) to 62.4 kg in 2017 compared to 2016. The consumption of vegetable and vegetable products decreased by 4.9 kg (4.5%) against 2016 and represented 103.3 kg in 2017. The consumption of fresh vegetables decreased by 5.5 kg (7%) and was 73.4 kg. (SOSR, 2018). The context must be sought in the state of agriculture, lifestyle and business relations.

In Sweden on the contrary fruit intake has risen, by 24% from 1980 to 2017, to 103 kg, and vegetables by 95% to a still modest level of 80 kg in the same period (Jordbruksverket, 2018).

Grain and potatoes

In Slovakia, there has been a significant decline in potato consumption while consumption of pasta is rising. Helena Tibenská from the Research Institute of Agriculture and Food Economics confirmed (Zajíčková, 2008) this is a worldwide trend. The consumption of potatoes was 48.9 kg per capita in 2017, it means a decrease in consumption by 2.5% compared to 2016. The

consumption of cereals (in the equivalent of flour) decreased by 0.9 kg (1.1%) and represented 78.0 kg per capita. Mainly the consumption of wheat flour decreased by 1.2 kg (1.8%) and contrary consumption of rice mildly grew by 0.4 kg (7.0%). (SOSR, 2018).

In Turkey, 200 kg grain and 52.3 kg potatoes are consumed in a year per capita (TZOB, 2017).

In Austria, in the category *grain and potatoes*, only three of the four recommended daily portions are consumed. Both women and men consume only a quarter of one portion of potatoes. 2,75 portions of the three are grain products.

In Sweden, it is observed that the consumption of potatoes decreased from 649 million kg to 469,7 million kg since the 1960s (Jordbruksverket, 2018).

Vegetarians

Several countries report a rise in the number of vegetarians. Italy, Austria, Germany, UK, Sweden: all report a number of 'full-time' vegetarians, including vegans, equal to 9-10% of the population. This represents a considerable increase. In Austria, for instance, 13 years ago there were 3 % vegetarians. In Denmark however, the number of "full time" vegetarians is only equal to 2.4 % of the population (Aagaard, 2018).

Animal protein

Major changes in pan-European intake of animal protein 1995–2009 are primarily represented by increases in consumption of poultry and cheese. Other sources are fairly stable, with a slight decline for beef. (EEA, 2015).

Meat intake and its causes have been examined and documented (SOSR, 2018) in detail in Slovakia. Over the past twenty years, the decline in total meat consumption, accompanied by the decline in beef consumption and the increase in poultry consumption, has been clearly observed. Important causal factors (Sedlák, 2012) are

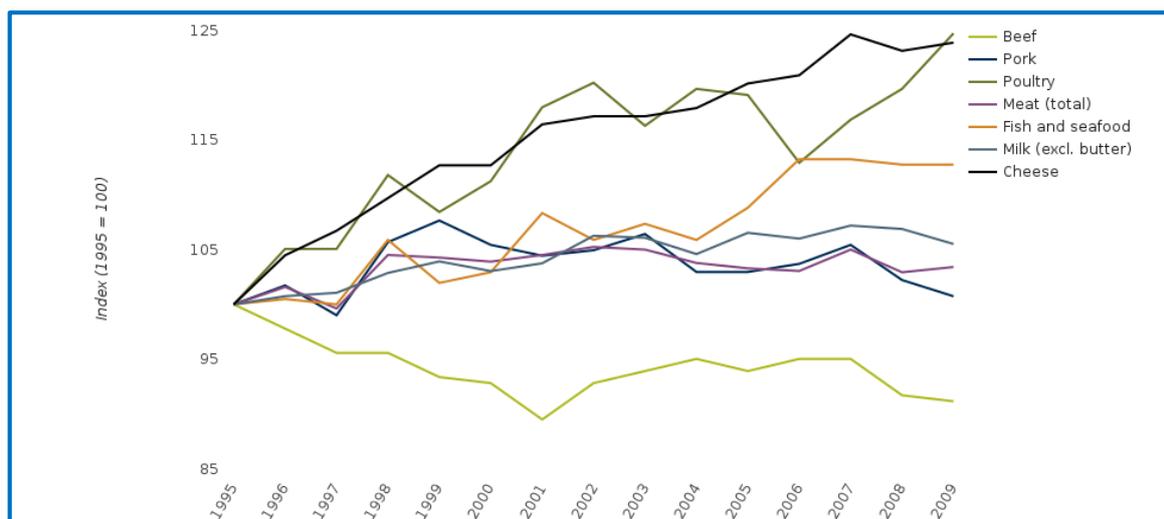
- i. The strong pricing policy of large retail chains
- ii. Problems of domestic production
- iii. Import of lower-quality products

In recent years, the consumption of poultry has increased, especially at the expense of bovine, but also pork, to a two- to five-fold difference between the price of chickens, pork and beef. In 2017, the consumption of poultry was 20.2 kg while it was 16.9 in 2013. The total consumption of fish and fish products (5.5 kg) increased by 0.4 kg (7.8%) compared with 2016. Consumption of eggs in 2017 was 223 pieces (13.6 kg) per capita, showing higher consumption by 4 pieces compared to the previous year.

Annual consumption of beef per capita has dropped incredibly, from 28 kilograms in 1990 to 3.5 kilograms in 2013. In 2017 beef and veal consumption increased and reached 5.2 kg per capita. While this is within the recommended range, the proportion of different meat types is unfavorable. For instance, with an annual 35.9kg consumption per head of pork.

The poultry meat consumption rate is 98.26% in Turkey. This rate is quite high. Annual poultry meat consumption in Turkey is 16.67 kg/per capita/per year. The most important reasons for unconsuming poultry meat products are, dislike the taste of poultry meat and dislike slaughter and feather pecking methods (Durmus et al., 2012).

Fig. 11: Per Capita EU-27 Consumption of Meat, Fish and Dairy (by weight)



Source: EEA (2015)

Dairy products

There is no clear consensus about the value of dairy products for human health, and indeed individual people have different tolerances. Despite this, some national agencies recommend specific quantities, even as a minimum. Consumption varies widely in partner countries.

In Turkey, people consume 25 kg of milk and 30 kg yogurt in a year, or about 100 g per day of dairy products excluding cheese (TZOB, 2017).

Austrian women consume 255 to 268g milk and other dairy products per day, which is only approximately half the national recommendation; men consume a little more with 260 to 318g per day.

The consumption of milk and dairy products (in terms of milk without butter) was 174.6 kg i.e. by 1.6 kg lower (0.9%) than in 2016. Noticeably the consumption of cheese in total decreased by 0.6 kg (3.6%) and contrary fermented milk products recorded a mild increase in consumption of 0.1 kg (0.6%) (SOSR, 2018)

In Sweden, the consumption of milk has decreased from 1,241 million kg to 1,037 million kg, or to 125 l per capita per year, in a slow decline over almost 60 years (Jordbruksverket, 2018).

Meat and meat products

Meat and meat products are in stark contrast to the above-mentioned food categories. The recommendation is three portions per week, which is a maximum of 450 g.

- i. Turks consume 36.2 kg per capita per year or about 700 gr per week.
- ii. Austrian men consume three times more meat than recommended; women eat significantly less, 483 to 546 g per week. With increasing age meat and meat products are consumed less for both genders.
- iii. An average Dane consumes 52 kg of meat per year or 1,000 g per week, representing 85 kg including bones (Fagt et al., 2018), while 24 % eat vegetarian at least once a week. In Sweden, total meat consumption is the same as in Denmark, representing an increase of over 30 % since the 1980s.

B3.2.3 Those 'empty calories'

All health guides include recommendations to eliminate or minimize items at the top of the food pyramid: *sweets, foods rich in sugar or fat, pastries, snacks, and soft drinks*.

The trend is, however, the opposite: spending and consumption in these categories are growing. To take Austria as an example:

- i. Sweets, pastries, snacks: men consume 38g. to 51g. per day and women 37g. to 41g. per day
- ii. Soft drinks: both genders consume significantly more than recommended, especially young men. Women consume from 84 to 141g and men from 238 to 16 g (later amount from older consumers)
- iii. Alcohol: consumption rises with increasing age, with men consuming from 212g (age group 19–25) to 339g (51–65). Women consume less but also increases with age, from 72 to 86g.

B4. Food Waste in Partner Countries

Global resources, which are already limited, are consumed as if they are unlimited; people throw away much of the food they buy. This situation also has a great impact on environmental pollution. 8% of the carbon emissions in the world are caused by food waste. On the other hand, 60% of food waste can be prevented by conscious practices. (XTRlarge, 2018).

Food is wasted at every stage of the food chain, by producers, processors, distributors, consumers. In this regard, the reduction of food waste is a highly topical issue on the EU agenda, which in 2018 called for immediate collective action to reduce food waste by half by 2025. Food is a top priority in the EU “Roadmap to a Resource Efficient Europe” (EC COM 152, 2011).

This effort requires coordinated efforts across the whole food chain. Reducing waste also requires changes in consumer behavior. A large part of waste (37 million tons) is generated by households in Europe's rich countries. A UK study suggests that if household waste were to be reduced by 60%, each household would on average save more than €500 p.a.

An often-mentioned reason for discarding food is the misunderstanding of “best before date” and “expiry date”. The best before date is the date for which a food company guarantees that the food product, under the right storage and closed packaging, maintains its specific attributes (e.g. taste, look, consistency, nutritional values). Food can still be edible after the best before date, and it can still be sold. The expiry date is normally used for highly perishable foods such as fresh meat, raw minced meat, fish, raw milk and so on. After the expiry date, it is not permitted to sell these food products (Hietler and Pladerer, 2017).

B4.1 Measuring Food Waste

There is as yet no universally accepted definition of what constitutes food waste, nor any agreed method by which to measure it. The numbers in this chapter are qualified estimates based on the best national and regional data available.

When it comes to measuring food waste, this is the subject of an ongoing EU research project, FUSIONS.

When defining food waste, different categories are discerned-though it is not always easy to distinguish between them, especially at the household level. They are

- i. Food loss, meaning food that is produced for human consumption but never arrives at a consumer, mainly because of inefficiencies in the food supply chains
- ii. Unavoidable food waste: parts of food that, while they could perhaps theoretically be used in other ways for either animals or people (like, cauliflower stalks for soup or potato peelings for 'chips'), are normally discarded
- iii. Avoidable food waste: food bought or grown by the consumer that is discarded before or after cooking

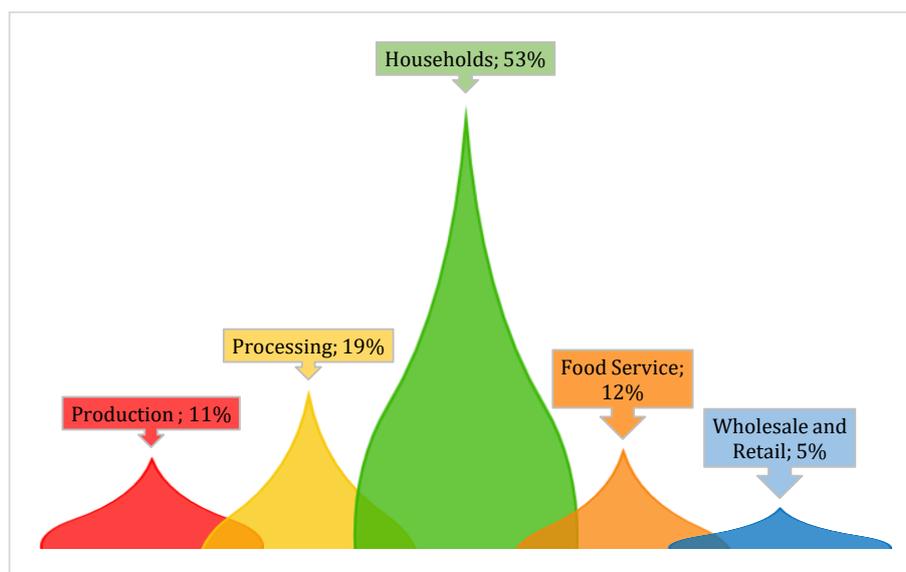
In the following, the generic term 'food waste' is used to cover all categories.

B4.2 Who Wastes What?

In 2012, 88 million tonnes of food was wasted in the EU28 (FUSIONS project). This amount includes both edible food and inedible parts and equates to 173 kilograms of food waste per person in the EU28. The total amounts of food produced in the EU were around 865 kg per person meaning that in total 20 % of the total food produced is wasted.

Households contribute the most to food waste with more than 50% in Europe (Griffin et al., 2009; Kummu et al., 2012). The figure below represents the share of each stage in total food waste.

Fig. 12: Split of EU-28 Food Waste in 2012 by Sector; Includes Food and Inedible Parts Associated with Food



Source: Stenmarck et al. (2016)

Household food loss and waste within the EU27 is 8.3 million tonnes/year total, or an average of 113 kg/capita/year. Within the partner countries the numbers are:

- Austria: 41.94 kg/capita/year (366,700 tonnes) (Hietler and Pladerer, 2017; Pladerer et al. (2016)
- Denmark: 42.95 kg/capita/year (247,000 tonnes) (The Local, 2018)
- Slovakia: 111 kg/capita/year (The Slovak Spectator, 2018)
- Sweden: 107 kg/capita/year (Sörme et al., 2014)
- Turkey: Estimates are uncertain ranges from 76 to 132 kg/capita/year (Salihoglu et al., 2018)

This category is highly significant in the total picture of food waste and is the main focus of this project.

In Austria, 25% of vegetables get lost on the place of production, 5% during handling and storage, 10% during distribution and 19% at the consumer level (Leibetseder, 2012).

The total food loss from the agricultural production step in the FSC in Turkey was found to be approximately 13.7 million tons, which accounts for 11.9% of the food produced. According to Salihoglu et al. (2018), approximately 9.48 million tons of fruits and vegetables were lost in 2016 in Turkey during the agricultural production stage, which is comparable with Europe, North America, and Latin America; food loss accounts for 20% of the food produced in these regions. It is estimated that 24% of losses in the fruit and vegetables are due to harvest, 16% during transportation to the market, 30% during the preparation to market, 20% during storage and 10% at the consumer level (<https://haberyedibolge.com/haber-et-sut-ve-su-urunleri-icin-standartlar-belirleniyor-4718.html>).

In the estimations of Leibetseder (2012), there are no valid studies about the amount of avoidable food waste and food loss on the agricultural level in Austria. In the Austrian food industry, a recent study estimated the unavoidable food waste, which the authors called “organic by-products” with 1.338.000 tons. From these organic by-products, 7% are estimated as avoidable food waste in the Austrian food industry, which corresponds to 121.800 tons (Hietler and Pladerer, 2017).

The food loss and waste at the stage of postharvest handling and storage range from 0.02% to 8%, with fish and seafood showing the lowest, and fruits and vegetables showing the highest in Turkey. The total FLW at this step in Turkey was found to be approximately 4.35 million tons, which amounts to 3.75% of Turkey’s food production. Approximately 3.38 million tons of fruits and vegetables were lost in 2016 in Turkey during postharvest handling and storage, which amounts to 8% of production. World food loss from postharvest handling and storage amounts to 293.40 million tons, and Turkey’s loss is approximately 1.48% of the world’s loss. Improper coverage of the trucks during transportation, improper storage conditions, delays in transportation, and low-quality packaging are among the multiple reasons for loss at this stage (Salihoglu et al., 2018).

Table 3: Food Waste in Austrian Retail

	Value (Million €)	Volume (Metric tons)	Percentage of sales food and non-food (Value)	Percentage of sales food (Value)	Percentage of sales food (Volume)
Loss and depreciations	255,3	74.099	1,41	1,51	1,36
Take back of suppliers	11,7	35.607	0,62	0,66	0,66
Sum of food losses in retail	367,0	109.696	2,03	2,17	2,04
Transfer to charity organisations	29,1	6.629	0,16	0,17	0,12

Source: Lebersorger and Schneider, 2014

Data about food waste at the supermarket level is highly reliable. ECR Austria (i.e. Efficient Consumer Response Austria) did a study together with the food retailers REWE, SPAR, HOFER, M-PREIS and PFEIFFER, which cover a market share of 83% of all supermarket sales (Hietler and Pladerer, 2017, 18).

In 2013 the total sum of food waste at the retail level in Austria was 109.696 tons, from which 6.629 tons have been transferred to charity organisations. Based on the volume the biggest share of food waste at retail level concerns fruits and vegetables with 50%, followed by bread and bakery products, processed meat, convenience products, dairy and fresh meat, fish and poultry. Based on value fruits and vegetables amount to 30% of food waste. A significant majority of food in the categories “loss and depreciations” and “take back of suppliers” is edible but due to regulations not saleable. In 2015, a research project called “United Against Waste” estimated 280.000 tons of food waste and losses in out-of-home consumption from which 175.000 are avoidable (i.e. gastronomy, canteens, hotels). Theoretically, these numbers for out-of-home food waste represent a savings potential of 380 million Euro, or on average for each enterprise 5,2 tons or 9.600 Euro.

The total food loss and waste that occurred at the processing and packaging step in the food supply chain in Turkey was found to be approximately 3.44 million tons, which amounts to 2.99% of Turkey’s food production. The food loss and waste from the distribution step were found to be approximately 2.25 million tons, which amounts to 1.96% of the total food production. The highest processing and packaging losses were found in the commodity group of cereals, followed by fruits and vegetables. Food loss and waste from the distribution step were the highest for fruits and vegetables, followed by milk. The global food loss and waste from processing and packaging amount to 147.50 million tons and Turkey’s loss is approximately 3.44% of the global loss. The world food loss and waste from the distribution step are 160.60 million tons (Gustavsson et al., 2013), and Turkey’s loss is approximately 2.25% of the world’s loss. Failure in cold chain rules, insufficient ventilation, and low-quality packaging are among the multiple reasons for the loss at this stage.

Table 4 shows the volume of food waste in the different stages of the Austrian food chain calculated based on Hietler and Pladerer (2017) and Pladerer et al. (2016). From the 878.500 tons, 618.800 tons are avoidable food waste, which represents 70% of the food waste accumulated over all levels in the Austrian food chain.

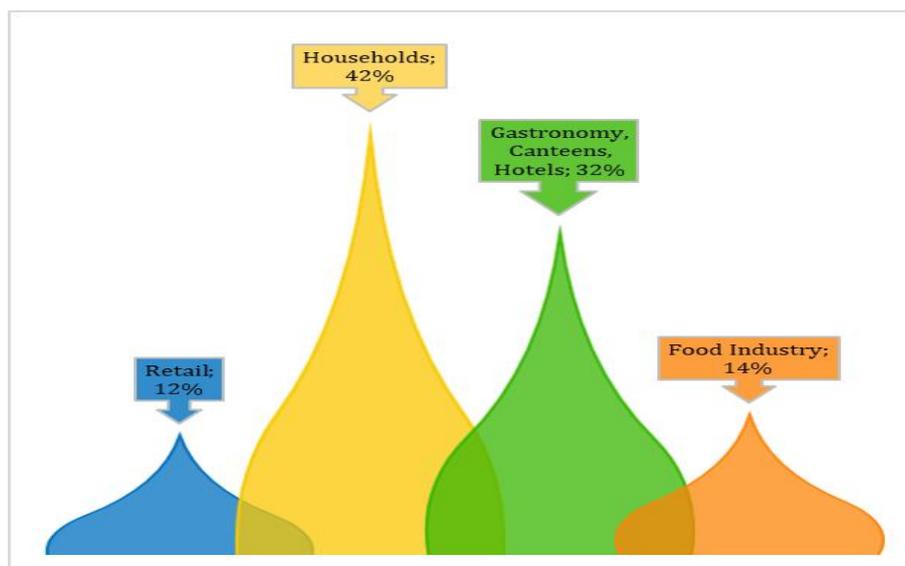
B4.3 Austria

The following table and figure display where food waste is generated in Austria.

Table 4: Food Waste in The Austrian Food Chain (tons)

Food Industry	121.800
Retail	110.000
Gastronomy, canteens, hotels	280.000
Households	366.700
Total	878.500

Fig. 13: Food Waste by Categories in Austria



Source: Hietler and Pladerer (2017); Pladerer et al. (2016)

The figure clearly illustrates the potential of saving food waste on the household level, which has the biggest share with 42%, followed by professional kitchens. The importance of educating adults to change their food consumption behavior becomes evident.

On average a household in Austria throws away food with a value of 300 Euro per year. The most frequent wasted food category is bread and bakery products. The second most wasted category is fruit and vegetables. Milk and eggs are in third place; meat, sausages, and fish in fourth place (Schneider et al., 2012). If the different food waste flows from households are merged, the total amount of food waste (via sewage and waste) amounts to just under 995,000 tonnes. The amount of food and drink that was poured out via the drain corresponds to 23 percent of the total amounts of food waste. The total amount of food and drink via sewage from households is estimated at 26 kg/person in a year.

Table 5 shows the most common reasons for food waste in Austrian households.

Table 5: Reasons Why Private Households Throw Food Away

Purchase related (41 %)	No overview of storage and stocks. People don't know, which food they have at home, stockpiling, no use of shopping lists, food purchase from the partner (when usually the other partner makes the food shopping)
	Best before date has passed
	Special sales offer and advertising: Price promotions, cheaper bulk products, not suitable package sizes
	Food brought by guests
	Seasonal fruit and vegetable harvests from own garden
Attitude (38 %)	During shopping, no attention has been paid to freshness and shelf life
	Reluctance to eat the same food more than once
	Purchase of a lot of different food because the family expects a variety of foods at home
	Cleaning to make room for new stuff
	Freshness and taste: Uncertainty, if food is still edible or not. Believe that after "best before date" food is spoiled
	Health beliefs / shopping for good consciousness: Fruits and vegetables are bought because it would be healthy to eat them
Lifestyle and consumption habits (11 %)	Change of life circumstances like nutrition style changes or number of persons in the household has changed
	Flexible recreational time planning, spontaneous out of home consumption, change of cooking plans
	Portions for children are often too big
	Purchase for specific persons and events
Wrong storage (3 %)	Storage on no suitable places: storage of frozen food in the refrigerator or closet; storage of chilled food outside of the refrigerator, hidden storage at the back of the refrigerator behind other food
	Freezer burn

Source: Selzer (2010)

B4.4 Denmark

The Danish Veterinary and Food Administration (DVFA) report that Danish households have been steadily reducing food waste. In 2017, 14,000 tons less than in 2011 was thrown away. This represents an average reduction of 8 %. Households in single-family homes have not reduced their food waste, while households in apartments have reduced food waste by 24%. According to studies that map Danish consumer's habits, the waste is divided as stated below. The figures are given in proportion to the food waste in Denmark (<https://altomkost.dk/fakta/madspild/>):

- i. Fruits and vegetables: 36%
- ii. Baked goods: 25%
- iii. Long-lasting foods: 16%
- iv. Meat products: 16%
- v. Dairy products: 7%

About 20% discard dinner leftovers 3-4 times a week, which means that dinner is the meal that accounts for the biggest food waste. One-third of all Danes throw food out daily or 3-4 times a week. Frequency of food waste among Danish consumers is distributed as follows (<https://altomkost.dk/fakta/madspild/>):

- | | |
|------------------------------------|-----------------------|
| i. Daily 5% | iv. Rare 18% |
| ii. 3-4 times a week 23% | v. Never throw out 6% |
| iii. A couple of times a month 46% | vi. Don't know 2% |

B4.5 Slovakia

Every fifth Slovak admits that they waste food. An average person throws away 111 kilograms of food a year. The Agriculture Ministry warns that wasting food also wastes natural resources, as well as people and their energy. It is not only irresponsible towards the environment but also immoral towards people who cannot afford quality food. In the list of countries that waste food the most, Slovakia ranks eighth.

In the survey carried out by the AKO agency for the Agriculture Ministry, nearly half of respondents say they try to use the leftovers for further cooking or give them to animals. One-third say they do not throw away any food. The survey suggests that people aged 23-49 years are wasting the most food. The share of wasting in households tends to increase with education and income.

Slovaks mostly dispose of bread and baked goods (35 percent), while 29 percent throw away cooked food leftovers. When asked why they have leftovers, up to 74 percent of respondents said they cooked more than they ate. In 34 percent of cases, the food deteriorated or its date of consumption expired (Slovak Agricultural and Food Commitment, 2018; The Slovak Spectator, 2018; TASR, 2018).

Food waste is not only a problem in households: restaurants may have to discard edible food at the end of the day due to strict hygiene rules. Hungry Slovak, a mobile application by two Slovak women, may help them solve the problem (The Slovak Spectator, 2018).

B4.6 Sweden

Also in Sweden, households are responsible for the largest volume of food waste. About 35 percent of this is classified as unnecessary food waste, i.e. food that could have been eaten if it had been handled differently (SMED 2011).

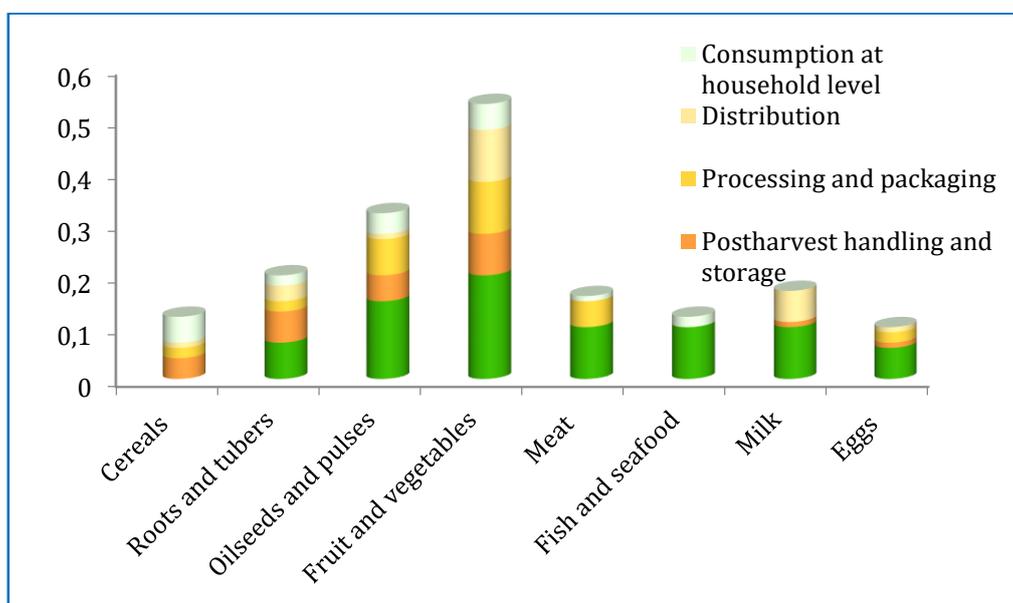
Public policy is directed not only at reducing food waste, but also at minimizing negative effects of disposing of food waste: "Measures are to be implemented to increase resource efficiency in the food supply chain by ensuring that at least 50 percent of the food waste from households, catering facilities, shops, and restaurants is separated and treated biologically so that plant nutrients are utilized, and where at least 40 percent is treated to recover the energy, no later than 2018."

The amount of food waste from households corresponds to 81 kilos per person. When liquid disposal is included, households in Sweden totally throw away 107 kilos of food waste per person per year. The largest quantities of food and drink disposed of via the drain were coffee/tea, dairy products, and other beverages. (Sörme et al., 2014).

B4.7 Turkey

Calculations according to the FAO model in this study showed that the consumption step accounts for 8% of the total food loss and waste in Turkey. The household food waste is estimated as somewhere between 8.6 and 16.5 million tons/year. The distribution of waste in the different stages is shown in Figure 14.

Fig. 14: The Distribution of the Food Loss and Waste in FSC in Turkey



Source: Tatlıdıl et al. (2013)

In total, the annual cost of food waste is estimated at 214 billion TL (34 billion €). With a circular economy, a minimum of 10 percent of this figure, ie an average of 20 billion TL, could be achieved as savings (XTRlarge, 2018).

There is a difference among socioeconomic groups in terms of food waste. Total food waste increases with income. Total food waste per household in terms of grams per person per day was 274 for consumers in the lower-income group, 285 for middle-income groups, and 319 for the higher-income group (Pekcan et al., 2006).

It should be noted that there was a huge bread waste in Turkey. Three comprehensive studies that aimed to reveal the level of bread waste were conducted in 2008, 2012, 2013. The results (CIHEAM, 2014) showed that of the total of 4.9 million loaves of bread wasted daily in 2013,

- i. 3 million loaves (62.1 %) are wasted at bakeries
- ii. 1.4 million (27.7 %) by households
- iii. 0.5 million (10.2 %) at restaurants, hotels and dining halls.

B5. Good Practices in Partner Countries

B5.1 Food Actions!

The Food Action pilot project, funded by Erasmus+ Sweden, engaged five countries (Sweden, Germany, Hungary, Italy, and Spain) in developing and testing a program to enable consumers to adopt more sustainable food habits. The program is designed for a long-term change of habitual behavior; the criteria for action selection are thus different from those for a limited-term

campaign. The principles build on a spiral (rather than linear) model of behavior change that offers multiple intervention points for the program designer. The design principles are taught as part of a workshop on cultural adaptation (<https://ec.europa.eu/programmes/erasmus-plus/projects/eplu-project-details/#project/2015-1-SE01-KA204-012260>; 05.05.2019).

The project was deemed highly successful by the Swedish Erasmus+ National Agency and could make a large and measurable contribution to sustainable development in affluent populations. It also revealed fruitful ground for further research and development, not least in the use of ICT to bring about lasting behavior change.

A workbook was prepared for adult learners, covering three main topics: Waste; Food, Climate and Environment; and Food and Health. Including all three topics is designed to elicit critical thinking and a broadening of perspective that empowers adult learners to make decisions based on what is good for them personally and what is good for society and the environment.

A manual for coaches was also created, enabling competence-building in the general area of empowering coaching as well as specifically for the Food Action Program. An online reference library of documents for further reading was created, embedded in a multilingual food action web site.

Action research has also led to formulating principles for writing text in a style that is most likely to lead to action on the part of the reader. An online interactive course of 14 lessons on 'empowering writing' was delivered to the national program development teams.

The Food Action pilot project aimed to recruit a small number of early adopters as the basis for testing the program. The recruiting strategy was successful. For instance: in Hungary three-quarters of the participants were already part of a CSA group; the Italian responses to the pre-program postulates: "I know the meaning of the different date labels" and "I know the rules of composting in my community" both elicited a response rate of 73%. In the German survey, the response to the same postulates was over 90% (Oppe et al., 2019).

A second phase of the project, Food Talks, has been granted funding by the German National Agency and will begin in October 2019.

B5.2 Sweden: Regulation, and Some Civil Society Initiatives

B5.2.1 Food waste regulation

Sweden has not implemented a specific strategy or national plan for food waste reduction. However, reducing food waste is included in the Swedish Waste Management Plan, in the Swedish Waste Prevention Programme as well as in the Swedish environmental policy (in the form of proposed milestone targets for food waste). The Swedish Waste Management Plan 2012-2017 introduced national targets (Elander et al., 2016):

- i. Food waste shall decrease.
- ii. By 2018 at least 50% of food waste from households, canteens, shops, and restaurants shall be collected separately and treated biologically to secure the recovery of nutrients, of which 40% is treated in such a way that also energy is recovered.

The Swedish National Food Agency, in collaboration with the Swedish Environmental Protection Agency and the Swedish Board of Agriculture, has developed an action plan "More to do more", in order to reduce food waste throughout the whole food chain. The plan is part of the government's

commitment to the authorities for reduced food losses and food waste. The assignment extends over three years from 2017 to 2019. The actions presented in the action plan contribute to the global sustainable development goal of Agenda 2030 number 12.3; "By 2030, halve per capita global food loss and food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses". They also contribute to the government's work to move Sweden towards a system of sustainable consumption and production, as well as towards a circular economy. The action plan should be seen as a tool for dialogue and cooperation and may be adjusted to future insights and needs (Swedish Food Agency, www.livsmedelsverket.se).

The Ordinance on Landfill of Waste regulates the waste treatment and forbids landfill of (among other things) organic waste (Elander et al., 2016).

B5.2.2 Healthy eating regulation

The Swedish National Food Agency's "Keyhole" symbol is designed to help consumers identify healthier options when buying food. It identifies healthier food products within a product group. Foods labeled with the Keyhole contain fewer sugars and salt, more fibre and whole grain, and healthier or less fat than food products of the same type not carrying the symbol.

- i. For consumers, the label makes it easier and less time-consuming to find healthier products in food stores.
- ii. For manufacturers, the Keyhole system is intended to stimulate product reformulation and the development of healthier products.

The Keyhole system has a set of criteria for 33 product groups. The Swedish National Food Agency has registered the Keyhole as a trademark and the labeling system is enforced through a regulation (LIVSFS, www.livsmedelsverket.se).

B5.2.3 Some civil society initiatives

The Swedish EPA, in an as-yet-unpublished survey (2019) identified some Swedish and some international examples of good practice. They include

- i. Food Actions! - described aboveLeva Livet (Live Life), Sweden
- ii. Miljövardag (Daily Green), Sweden
- iii. Konsumera smartare (Smarter consumption & climate), Sweden
- iv. Skitlite 2020, Sweden
- v. BeChange, Sweden
- vi. Ökokörök (EcoTeam), Hungary/multinational
- vii. Love Food Hate Waste, UK
- viii. Klimatneutrala stockholmarna (Climate-Neutral Stockholmers), Sweden
- ix. Greenhack GBG, Sweden

B5.3 Denmark: Civil Society, Business, and Standards

In Denmark, there are many good practices in terms of sustainable consumption of food. *Idea Sharing* is one example. On the site, voresomstilling.dk, organizations and institutions – big and small – can share their ideas and initiatives for creating a more sustainable society (<http://voresomstilling.dk/>). Examples:

- i. Some Danish municipalities promote organic communities where organic farmers work together with the focus on sustainable production, sales, bioenergy, environmental and nature protection; and organic consumption is promoted among the consumers.
- ii. The Danish Vegan Society has organized an initiative called “*Food with Compassion*” (Mad med Medfølelse). A big part of the initiative’s focus is on the environment and sustainable consumption

Another example of good practice is the *Menu Box* (måltidskasser): a box containing all that is needed for a specific set of menus and household size, delivered to the door. Formerly only available in cities, Menu Boxes have become increasingly popular among Danish consumers. Now, six percent of Danish consumers buy them, especially families with children (Ritzau, 2019). The main focus is on convenience and healthy foods, but the environment and sustainability are also increasingly emphasized. The focus is usually on the quality of the produce, and sustainability is often promoted through organic and seasonal food, as well as sustainable packaging. There is a lot of vegetarian (and some vegan) options. The boxes are packed with everything that is needed – so the consumer does not on the impulse buy something they do not need (Lisby, 2018).

Even though it is not the intention, the official dietary recommendations, set by the DVFA, also promote sustainable food consumption. The guidelines suggest that consumers should eat less sugar, more greens and whole-grain products, and only a little meat every week (<https://altomkost.dk/>). The recommendations are a clear indicator that health and sustainability go hand in hand (Videnskab, 2019).

B5.4 Austria: Nutrition and Waste

In 2013 the Federal Ministry of Work, Social, Health and Consumer Protection launched a National Nutrition Action Plan, NAP.e. It follows a horizontal “health in all policies” strategy and combines Austria's nutrition policies and strategies for the first time. The primary goals are a reduction of over-, under- and malnutrition as well as a reduction of the rising overweight and obesity rates by 2020.

B5.4.1 Child nutrition

The strategy identified an urgent need for targeted and congruent measures regarding nurseries, kindergartens, and schools, as well as pregnant women. An important project in progress is the elaboration of uniform, feasible guidelines for school catering. One of the first initiatives of the NAP.e was the new national nutrition pyramid for Austria, which has been agreed upon and disseminated to help consumers improve their eating behavior.

“*Start right with healthy eating!*” (“Richtig essen von Anfang an!”) is a health promotion program in connection with NAP.e. It aims to educate pregnant women, mothers with babies, and children up to the age of 10 years. The program provides free education for 'multipliers' all over Austria; by 2017, 2,000 multipliers had been trained (Elmadfa and Freisling, 2017).

B5.4.2 'Fund Healthy Austria'

In 1998 the Austrian government passed a law to promote health in Austria. It has an annual budget of 7,25 m Euro. As a consequence of this law, the “*Fund Healthy Austria*” (Fonds Gesundes Österreich; <http://fgoe.org>) was established. The aim is to exchange information between science, policy and practitioners. It also is a funding agency for small projects (72,000 Euro) and a competence centre to share and disseminate knowledge concerning health. This organization

provides several publications for free download, one is dedicated to healthy nutrition and explains the Austrian Food Pyramid in detail (<http://fgoe.org/index.php/node/92> (22.04.2019)).

B5.4.3 Reducing sugar

WHO recommends a maximum of 25-50 g of sugar per day. Austrians consume 93 g of sugar per day, which corresponds to 24 sugar cubes. One main reason is the hidden sugar in food products.

In April 2019 the Alliance to Reduce Sugar in beverages (Zucker-Raus-Initiative; <https://www.zucker-raus-initiative.at>) was founded with stakeholders from the food industry (Rauch Fruit Juices, Berglandmilch), food retail (SPAR) and public health (Chamber of Medical Profession, Austrian Anti-Aging Society, Society for Gastroenterology and Hepatology, Austrian-Adipositas-Society, SIPCAN Institute).

The aim of this alliance is to gradually reduce the sugar content in food products without replacing it with sweeteners. The supermarket chain SPAR started already in 2017 and plans to remove 1,000 tons of sugar from their brands by 2020. Other companies are following their example.

The SIPCAN Institute (Special Institute for Preventive Cardiology and Nutrition), founded in 2005, publishes an annual list of beverages available in Austrian supermarkets, and their sugar content. SIPCAN recommends a maximum of 7,4 g per liter. From the approx. 700 sampled beverages 64,5% now meet this recommendation: a decrease of high sugar beverages of 18,5% since 2010. In 2019 the average sugar content was further reduced to 6,15 g. In September 2019, a new threshold value will be set: It will be 6,7 g per 100 ml (without sweeteners), instead of 7,4 g (SIPCAN, 2019). Interestingly the Austrian Food Industry countered with an information campaign to inform consumers that sugar is important and was always used in food products. The website is called "Austria eats informed" (<https://www.oesterreich-isst-informiert.at>).

B5.4.4 Alliances to reduce food waste

The Austrian Federal Ministry for Sustainability and Tourism has recently started an initiative called "*food is precious*" ("Lebensmittel sind kostbar"). The aim is, together with partners from the food industry, retail, municipalities, charity organisations and consumers, to reduce food waste in Austria.

In 2017 the four leading retail companies in Austria REWE International AG, SPAR Austria, HOFER and LIDL Austria founded an "action platform between food retailers and the Austrian Association "*Die Tafeln*" to reduce food waste. "*Die Tafeln*" is an organization providing food to people living in poverty (<https://dietafeln.at>). The shared vision is to organize the distribution of edible food, which is not saleable, from supermarkets to charity organisations. The leading food retailers in Austria also offer reduced prices for day-old bread, and for food products that are close to their "best before date" with price discounts of up to 50%.

REWE International established a project to reduce waste for fruits and vegetables called "*Wunderlinge*". The project sells "funny fruit": fruit and vegetables of unusual shapes, or that do not meet commercial standards or have minor surface damage. The company uses social media to reach consumers (https://youtu.be/pYz6z_m_JgE) and since 2013 has sold 5 million pieces of "funny fruit" in Austria; in 2015 they totaled 5,620 tons (Anon, 2016).

United Against Waste started in 2014 and is an intersectoral platform to reduce food waste in professional kitchens (<https://united-against-waste.at>) according to the EU aims to reduce food waste by 2030 by 50%.

B5.4.5 Redistributing food

“Foodsharing – share food instead of throwing it away!” (“Lebensmittel teilen statt sie wegzuerwerfen”): Foodsharing is a non-profit initiative, which coordinates food sharing from private to private people. Electronic food baskets can be posted on their platforms, which are free to be picked up. The so-called “*Fair-Teiler*” are refrigerators in buildings with opening hours. There is one person responsible for each refrigerator, who cleans and fills it. The contents of these refrigerators are posted on the platform’s website (www.foodsharing.at).

In 2014 over 100 social organizations (i.e. social markets and so-called “Tafeln”) were involved in distributing food donations from food retailers, bakeries, wholesalers, food industry, agriculture and private households. In sum, they distributed 11,123 tons (6,630 tons from retailers) (Hietler and Pladerer, 2017).

B5.5 Slovakia: Nutrition, Environment and Localness

Examples of good practice from Slovakia can be divided into several groups based on main aim they try to reach:

- i. To improve eating habits toward healthier and more nutritional food (social and education activities)
- ii. Environmental issues including waste minimization (environmental and educational activities)
- iii. Local economic development while supporting local farmers, slow food and short supply chain (economic and educational/promotional activities)

B5.5.1 Nutrition

Hoverme o jedle (Let’s talk about food) is a project of the non-governmental organization *Centrum rozvoja znalostí o potravinách* focused on improving the level of education regarding food and nutrition. It includes a competitive aspect and addresses mainly primary schools pupils and teachers.

Skutočne zdravá škola (Really healthy school) is another civil society initiative, by *Jem iné*. The main idea is to transform school food and nutrition through several framework activities – for instance

- i. Revision of food balance sheets for school canteens to include more vegetables, less sugar, limited use of pre-cooked products, reduced proteins and milk, limited use of flavourings, bring a choice of meatless food
- ii. Revision of the food pyramid.

Jem iné has also created a platform for healthy food enthusiasts through cooking school and health catering production using local and seasonal ingredients. The main goal is to improve the quality of nutrition at school and hospital canteens and other communities.

The project *Viem čo zjem* (*I know what I eat*) was conducted in 2016-2017 by the multinational company Nestlé in cooperation with the Public Health Authority of the Slovak Republic. The main idea was to show opportunities to prevent ill health resulting from incorrect nutrition and to initiate changing of eating habits. The project produced methodical material for the education of pupils, aimed at introducing food components necessary to ensure a balanced diet, including positives and negatives of alternative approaches to eating and selected food intolerances.

B5.5.2 Environment and education

The second group of good practices in Slovakia refers to environmental issues including food waste reduction (environmental and educational activities). One of these is a grant program *Pomáhame vyrás* (We help to grow). Several grant calls were announced within a programme called *Green school* aimed at supporting practical activities at schools focused on food with the connection to energy and water-saving and waste reduction.

Projects that received grants addressed i.a.

- i. Practical food saving in school canteens
- ii. Implementation of saving steps connected with food preparation and distribution
- iii. Implementation of green management in schools
- iv. Reduction of waste from school canteens
- v. Composting activities
- vi. Innovative education in these fields.

Neplytvaj-Spotrebuj! (Waste no, Consume yes!) is another good example. Food after shelf life is a considerable source of food waste. Students from the University of Trnava conducted a project focused on this problem, to raise awareness that groceries after shelf life could be still fit for consumption and are a huge source of unnecessary waste.

Perfectly imperfect is a strategy of the Tesco retail chain, which can be characterized as the possibility to offer for sale also fruit and vegetable which is not in conformity with standards ("funny fruit") for a lower price, which contributes to the reduction of waste of these perfectly edible products.

B5.5.3 Local food production

Local economic and educational activities while supporting local farmers, slow food and a short supply chain can be mentioned as good practices. For instance,

The *Farmfoods* project is based on bringing 10 separate agricultural producers together into the concept of short supply chain and building common stores. The project is driven by the idea of the possibility to positively influence the problematic position of Slovak producers and the sometimes poor quality of imported grocery. It is based on the following pillars: healthy soil, healthy plants, healthy animals, healthy foods, healthy people, undisturbed landscapes, and production without unnecessary additives and GMO-free.

With a goal to simplify penetration of local producers into large chain stores the project *Chcem dodáva* (I want to deliver) builds on cooperation between the Ministry of Agriculture and Rural Development and chain stores. It aims to simplify contractual terms and conditions in favour of small producers.

Likewise, online portals are aimed at improving access of consumers to small and local food producers.

- i. The main idea of *Lokálny trh* (Local Market) is to offer a complex portal containing information about as many Slovak producers as possible, creating a map of them in order to make it easier for consumers to find them.
- ii. *Svet bedničiek* (World of Boxes) is one of the adaptations of the relatively known box delivery products from small and local producers, functioning as an online store for

combining purchases of products from the current offerings (partly seasonal) of many producers.

There are also initiatives by chains of stores (and indeed petrol stations) to promote local and seasonal produce.

- i. *Starý otec* is a store chain focused on bringing traditional grocery from domestic small and medium producers, counteracting their generally weak marketing support in comparison with well-known brands. The main idea is to offer only high-quality foodstuff produced without artificial sweeteners, unhealthy additives, or colourings.
- ii. The *Moja krajina* grocery stores focus on bringing traditional local high-quality foodstuff to consumers, with the difference that the product is supplied not only by small producers but also by surpluses from local gardeners (and own customers).
- iii. The campaign *Moje najlepšie* (My best) is aimed at creating opportunities for Slovak producers who are not able to bring their food production to traditional retail chains. The project is based on offering these traditional groceries through a well-known chain of petrol stations as a part of improving the strategy and concept of its services for customers.

Finally, the project *Quality from our regions* is aimed to support Slovak products through consumer education campaigns. The main idea is to explain the impact of the preference of domestic food and other products on regional economics and quality of life. The brand name is an essential part of the project. The producers are mainly small businesses (farmers). The sales of local products have great significance both from environmental and economic aspects (Horská and Yespolov, 2013)

B5.6 Turkey: Nutrition and Food Waste

B5.6.1 Nutrition

Excessive salt consumption is an important nutritional problem in Turkey and causes serious health expenditures every year. As a result of public-private cooperation, the Ministry of Health and the Turkey Food Association Federation signed a protocol stipulating that the amount of salt in certain foods will be reduced by 2023. Also, the reduction of salt consumption will also be encouraged through voluntary activities.

Yaşar Group, a Turkish business, defines its vision as "for a better life". In this context, by placing sustainability at the centre of its strategy, the Yaşar Group supports organic farming that protects the ecological system. Together with the Ministry of Agriculture and Forestry, the milk obtained from the farms certified by the international IMO company is also processed in dairies with these certificates. Pınar, which is a food brand of Yaşar Group, presented the first organic milk in Turkey.

"Balanced Nutrition," Turkey's most comprehensive and sustainable education project, was launched in 2011 in collaboration with the Ministry of Education with the goal of raising healthy generations. The program educates children about balanced nutrition and lifestyle habits, and is reaching out to 6 million children, parents, and teachers at 500 schools in 10 provinces across Turkey. Balanced Nutrition Education Project was expanded to include pre-schoolers and first-grade students from the beginning of the 2016–2017 academic year. Educational materials from the project were sent to all teachers in accordance with class levels. This year, within the scope of in-house training, teachers began to get basic nutritional education.

Other cooperative initiatives between the government and civil society include the Turkey Healthy Eating and Active Life Program, and the Turkey Diabetes Prevention and Control.

B5.6.2 Food waste

Food banks in Turkey share the objective of raising awareness and engaging people in questions concerning all types of waste, with food waste issue as the first priority. The first food bank in Turkey was established by TISVA (Turkish Foundation for Waste Reduction) in 2004 in the city of Diyarbakır. Today, there are more than 50 food banks (Dölekoglu et al., 2014).

Founded in 2012 with the support of the Istanbul Beyoğlu Municipality and voluntary organizations, Sosyal Market serves as a convenience store of basic necessities, mainly food, for needers.

One of the 9 initiatives chosen by the United Nations Development Program, the technology initiative, Fazla Gıda, has also been accepted into the international Accelerate2030 program. More than 17 cities across Turkey operating in the food, it works with about 100 food banks and associations. The organization, which saved 2 thousand 600 tons of food waste in 1.5 years, reached this amount as a result of 4 thousand 500 transactions with over 2 thousand 500 product types. According to the information given by the 4 institutions distributing these products to the owners of over 200 thousand need more food in 1.5 years, the average amount of aid over 2 million euros.

There are also many campaigns, often engaging both civil society and business. For instance, a campaign to prevent bread waste was launched in 2013, a circular by the Bread Waste Prevention Campaign (Circular no 2013/3) was issued, and research was conducted in this regard. As a result, 384 million loaves of bread were 'rescued' in one year, resulting in a 300 million TL (approx. 121 million €) contribution to the Turkish economy. Moreover, as a result of public awareness raised for not wasting bread, a decrease in bread consumption occurred as well, saving a further 0.98 billion euros. Consequently, the effect of the campaign at a total 1.2 billion euros saving for the national economy was achieved in 2013 (CIHEAM, 2014). After the campaign, stale bread collection boxes were set up in neighborhoods by various municipalities.

The Orange Flag Application in the tourism sector in Turkey began to be implemented in 2018. The application in the program aims to reduce food waste in hotels and restaurants. Within the framework of the project de Orange, purchase, production, consumption, evaluation, sorting and recycling processes of foodstuffs are organized and the excess food will be brought to the needy through the Food Bank to be established. At the same time, about food waste; Purchasing, kitchen and service personnel are given certificates through training. There are also visual materials that will attract the attention of business guests to reduce waste.

The Food and Beverage Industry has taken some initiatives to reduce waste. The industry aims to use 100% agricultural raw materials, for example by using non-edible parts to produce renewable energy or animal feed. The industry is also looking for ways to encourage household waste reduction, such as informing on the expiry date and best-by date. When food is wasted at the end of the chain, all resource investments in the product life cycle are lost.



PART C

CURRENT SITUATION AND NEEDS ANALYSIS – QUANTITATIVE RESEARCH

The quantitative research was based on a questionnaire with the objective of assessing adults' attitudes and behavior on sustainable consumption of food and to reveal any differences among groups.

C1. Methodological Aspects of Questionnaire

Items used in the questionnaire were combined from various studies, reports and expert opinions. The survey can be seen in Appendix 2. It is structured into three different sections;

Section I: Contains 33 statements concerning the attitudes and behavior of adults regarding sustainable consumption of food, to be rated on a scale of 5, from 1: totally disagree to 5: totally agree

Section II: Intended to identify respondents' perception of the environmental impact of the factors, rated on a scale of 5, from 1: lowest impact to 5: highest impact.

Section III: Demographic questions aimed to draw participants' profiles by questions such as age, marital status, country of residence, diet type, etc.

The survey was completed by 388 respondents from the partner countries. The partner countries are divided into two groups: Low-Level Countries and High-level Countries, based on their scores, according to FSI:

- i. Slovakia (Score: 61.4; Rank: 55/67) and Turkey (Score: 60.1; Rank: 58/67) count as Low-level Countries
- ii. Denmark (Score: 73.5; Rank: 6/67), Sweden (Score: 73.4; Rank: 8/67), and Austria (Score: 73.3; Rank: 9/67) count as High-level Countries.

The survey was carried out online through Google Forms, and the questionnaire was published online on 20.02.2019 for completion by 20.04.2019.

C2. Findings from the Questionnaire

C2.1 Demographic Findings

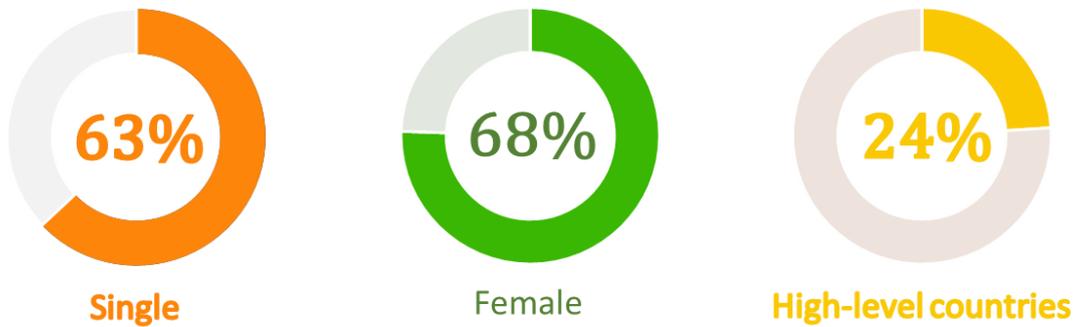
Age. Participants' age range: 18 –83. The average age of the sample is 34.

Marital status, gender, numbers of children, proportions of high-level and low-level country respondents are all shown in the following tables and figures.

Table 6: Distribution of Respondents by Marital Status

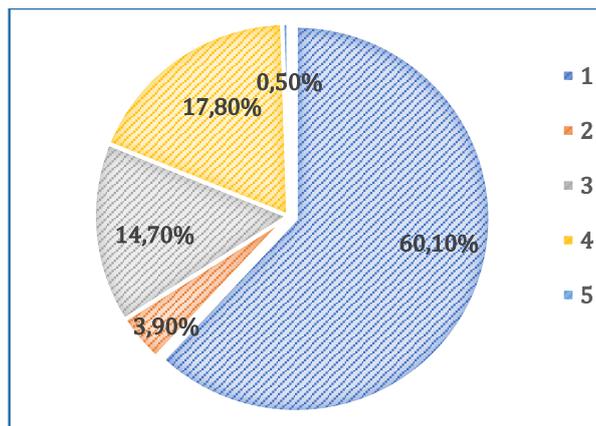
Marital Status	Frequency	Percent
Married	140	37
Single	239	63
Gender	Frequency	Percent
Female	259	67
Male	121	31
Country of Residence	Frequency	Percent
High-level countries	95	24
Low-level countries	293	76

Fig. 15: Distribution of Respondents



More than half of the respondents (60,1%) have no children; 39,9% have at least one child.

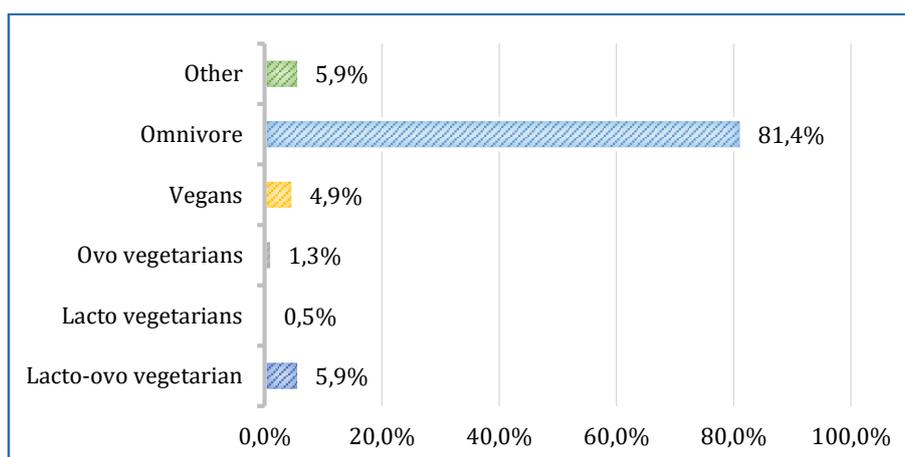
Fig. 16: Distribution of the Respondent According to Number of Child



Dietary habits

Most of the respondents (81.4%) describe themselves as omnivores, while those abstaining from all meat and fish total 12.6% – see Fig. 17

Fig. 17: Distribution of the Respondents According to Diet Type



C2.2 Descriptive and Comparative Findings on Sustainable Consumption of Food

As mentioned before, Section I consists of 33 statements and the respondents answered the questions from 1 to 5 according to their agreement level. Means and medians of the answers have been calculated. The results are presented in Table 7.

Table 7: Statements and Statistics

Statement	Mean	Median
I pay attention to cook the amount of food I will consume	4,18	4,00
I buy more food than we cook/eat at home	2,92	3,00
I keep the rest of the food to cook new food	3,69	4,00
I compare the prices of the places that I shop and choose ones which sell at affordable prices	3,67	4,00
I usually buy vegetables and fruits in the right season	3,62	4,00
I keep the excess food in a deep-freezer.	3,69	4,00
I give the rest of the food to the animals as feed.	2,93	3,00
Before I go shopping for food, I make a list of everything I need	3,72	4,00
I do not buy products that are not my shopping list	2,63	3,00
I use reusable bags when I go grocery shopping.	3,75	4,00
I discard fruits and vegetables before I've had a chance to eat it.	2,14	2,00
I discard bread and pastries before I've had a chance to eat it.	2,12	2,00
I discard meat or meat products before I've had a chance to eat it.	1,97	1,00
I discard milk or dairy products before I've had a chance to eat it.	2,05	2,00
When for a food product the "best-before date" is over, I discard it.	2,90	3,00
I buy from local sources or farmer's markets.	3,05	3,00
I buy disposable/plastic bottled water.	2,73	3,00
I sort and recycle food packaging (e.g. plastics, styrofoam, cardboard).	3,59	4,00
I consider the environmental impact of the food source before making my purchase.	3,09	3,00

I try to eat a variety of food instead of one-sided nutrition.	4,05	4,00
I try to reduce salt, sugar and fat amount in my meals.	3,58	4,00
I change my eating habits according to my current health condition (getting fat, feeling tired, etc.)	3,61	4,00
I eat less meat than in the past.	3,25	3,00
I eat less fish than in the past.	2,75	3,00
I eat less dairy than in the past.	2,70	3,00
I have enough time/energy to cook	3,30	3,00
I have not enough time to educate myself about sustainable food production/consumption	2,70	3,00
I make a point of using natural or ecological food products	3,57	4,00
I prefer to buy unpackaged food	3,40	3,00
Cooking is a task that is best over and done with	3,18	3,00
Shopping for food is like entertainment for me.	3,20	3,00
I know the meaning of the different date labels on the food products	3,90	4,00
If I buy a food product that I am going to consume soon, I take the one from the shelve with the soonest expiration date.	2,82	3,00

Statements in both sections range from 1 to 5, and this range has been divided into three parts:

- i. When the mean is in the range 1,00-2,33 then this statement is classified as lack of agreement (yellow)
- ii. The range 2,34-3,66 is classified as a medium-level agreement (orange)
- iii. The range 3,67-5,00 is classified as a high agreement (green)

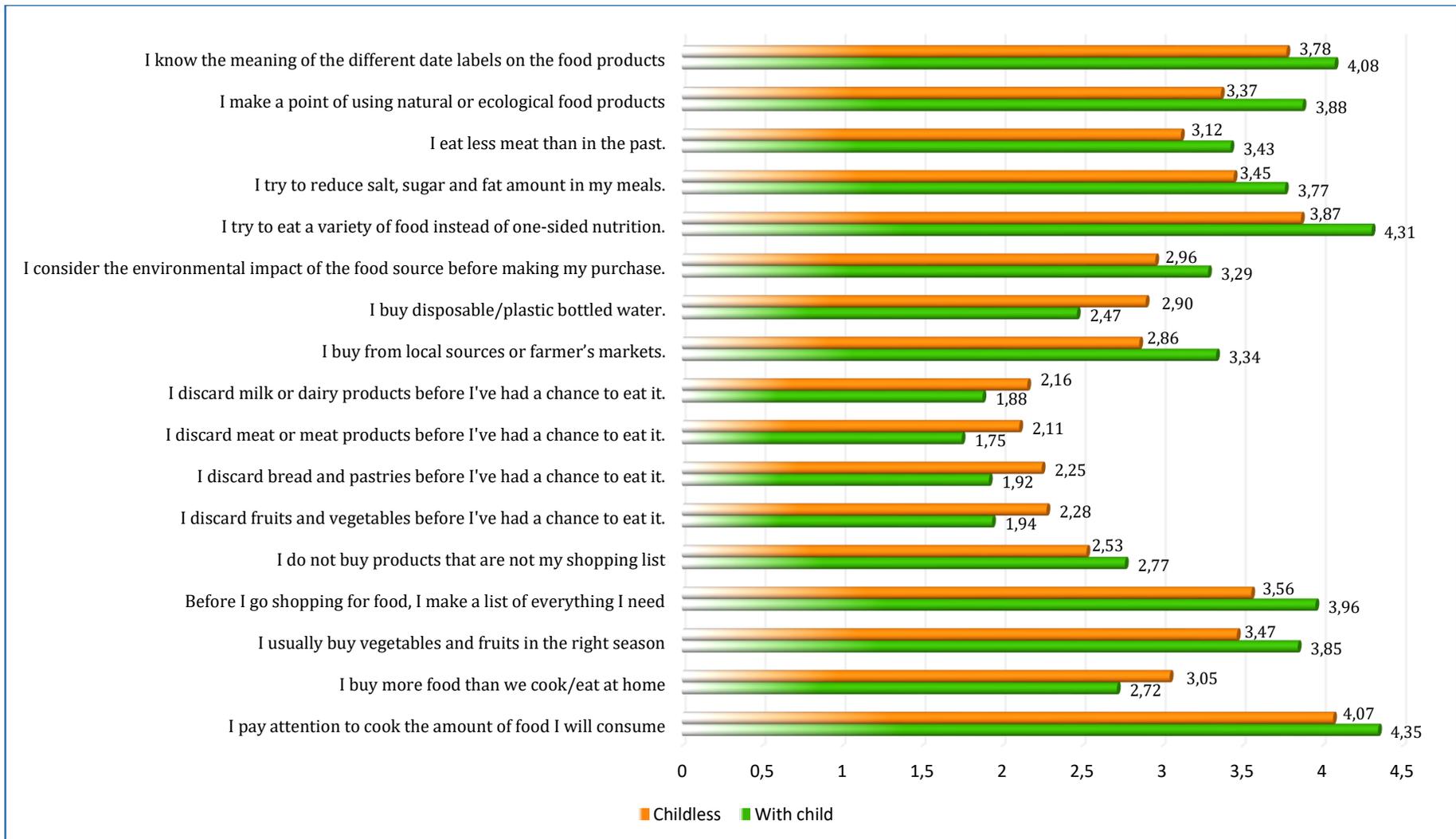
Comparisons among groups in terms of gender, marital status, and having or not having children have been made.

- i. Male and female results have been compared. No statistically significant difference has been detected.
- ii. The data were grouped and analyzed according to the presence or absence of children: 234 respondents have no children, and 134 people have at least one child. Statistically significant items are shown in Figure 18, indicating that adults with children tend to have more positive attitudes and behaviors.
- iii. Married and single respondents were compared. Statistically significant items are shown in Table 8.

Table 8: Comparison of Marital Status Groups

Statements	Married	Single
I pay attention to cook the amount of food I will consume	4,35	4,07
I buy more food than we cook/eat at home	2,61	3,13
I usually buy vegetables and fruits in the right season	3,94	3,42
I keep the excess food in a deep-freezer.	3,9	3,56
I give the rest of the food to the animals as feed.	3,21	2,8
Before I go shopping for food, I make a list of everything I need	4,04	3,54
I do not buy products that are not my shopping list	2,87	2,51
I use reusable bags when I go grocery shopping.	3,68	3,76
I discard fruits and vegetables before I've had a chance to eat it.	1,89	2,32
I discard bread and pastries before I've had a chance to eat it.	1,89	2,28
I discard meat or meat products before I've had a chance to eat it.	1,73	2,12
I discard milk or dairy products before I've had a chance to eat it.	1,81	2,2
When for a food product the "best-before date" is over, I discard it.	3,23	2,75
I buy from local sources or farmer's markets.	3,38	2,87
I buy disposable/plastic bottled water.	2,64	2,81
I consider the environmental impact of the food source before making my purchase.	3,24	2,99
I try to eat a variety of food instead of one-sided nutrition.	4,36	3,85
I make a point of using natural or ecological food products	3,89	3,36
Cooking is a task that is best over and done with	3,35	3,11
Shopping for food is like entertainment for me.	3,31	3,12
I know the meaning of the different date labels on the food products	4,04	3,82

Fig. 18: Comparison of Adults with/without Child's Scores



C2.3 Findings on the Impact of Food Consumption

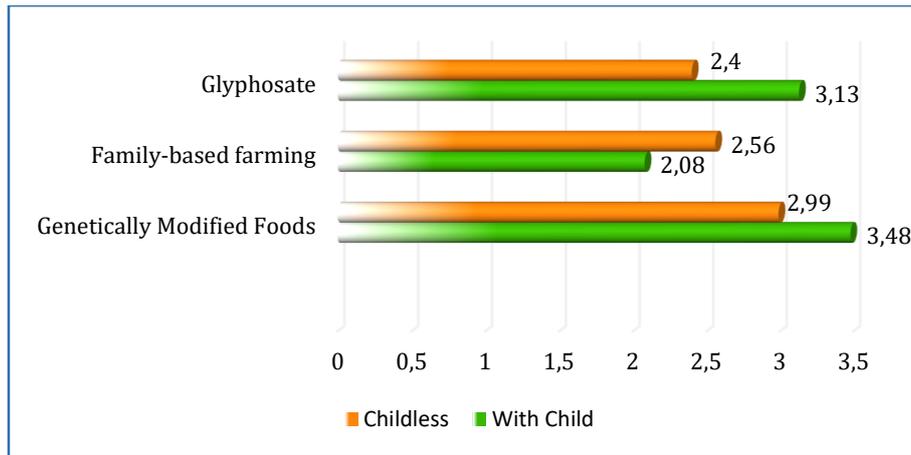
Section II of the questionnaire lists 20 factors designed to illustrate respondents' beliefs about which factors impact the environment at what level. Responses are in the range of 1 to 5, and this range has been divided into three parts, as stated before.

Table 9: Factors and Statistics

Factor	Mean	Median
Genetically Modified Foods	3,19	4,00
Farming Water Run-Off	2,46	3,00
Factory Farming	3,27	4,00
Family-based farming	2,37	2,00
Pesticide usage	3,55	4,00
Glyphosate	2,70	3,00
Food Transportation	3,03	3,00
Packaging	3,33	4,00
Food Waste in the Supermarkets	3,53	4,00
Food Waste at home	3,38	4,00
Food Waste at the Farm level	3,07	3,00
Production of Fruits and Vegetables	2,49	2,00
Production of Dairy and Milk Products	2,80	3,00
Production of Meat and Meat Products	3,04	4,00
Production of Grain and Bread	2,46	3,00
Production of Oilseeds and Legume (i.e. lentils, beans, peas, ...)	2,30	2,00
Production of Organic food	2,38	2,00
Production of Regional food	2,35	2,00
Plastic	3,61	4,00
Genetically Modified Foods	3,19	4,00

Comparison among groups in terms of gender, marital status, and having or not having a child has been made for the factors in Section II. First, the opinion of the adults with/without a child has been compared. Statistically significant factors have been presented in Figure 19.

Fig. 19: Comparison of Adults with/without Child's Opinion

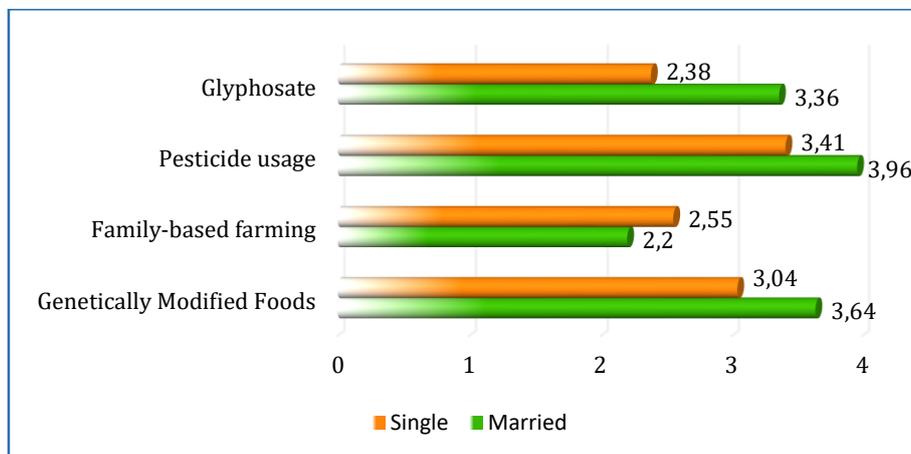


According to the results, adults with children see glyphosates and genetically modified foods as a threat to the environment more than the childless. In contrast, the childless think that family-based farming affects the environment more.

The opinions of male and female respondents have been compared. There is no statistically significant difference.

Finally, to see the difference between married and single adults, statistical analysis has been conducted, and statistically significant results are shown in Figure 20.

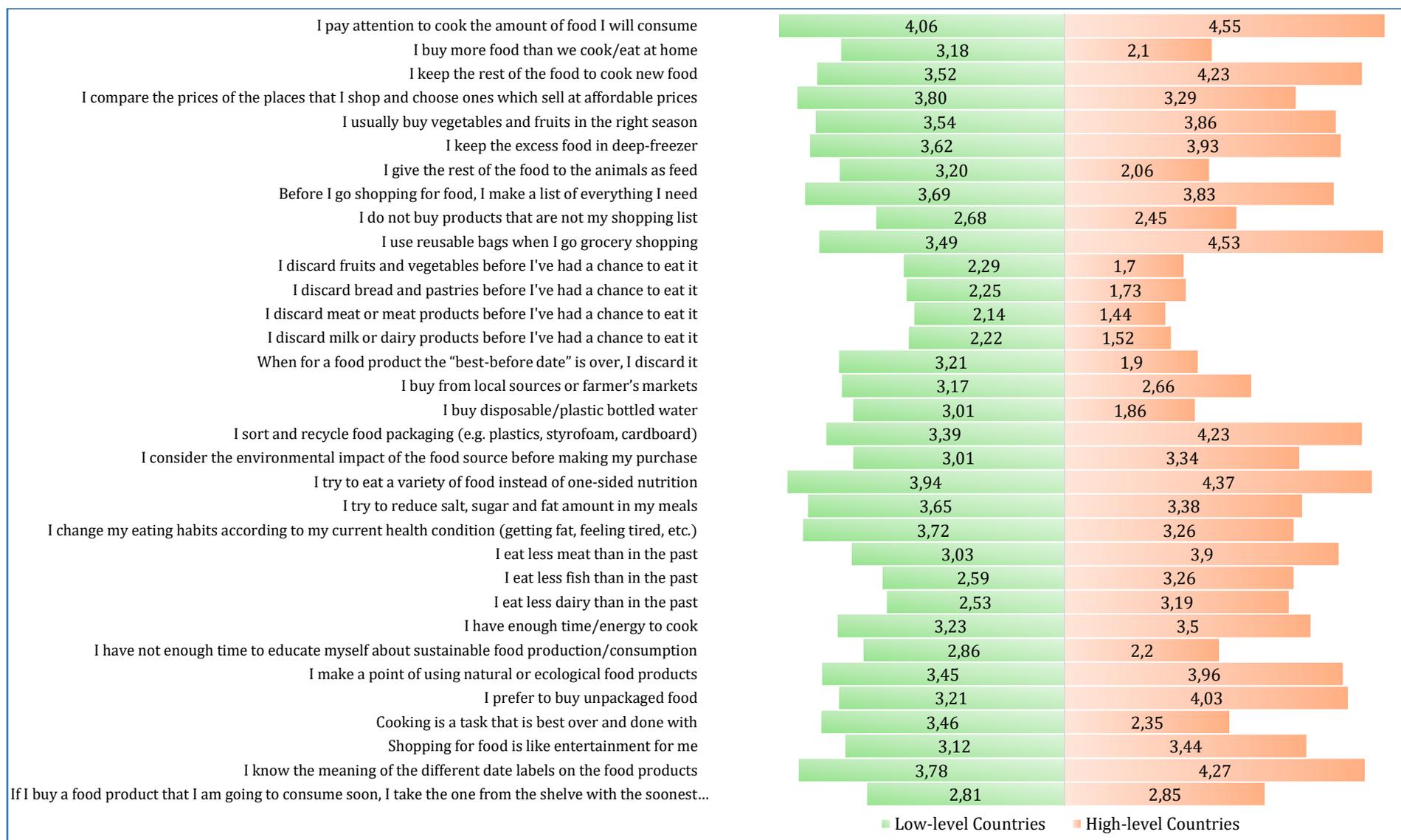
Fig. 20: Comparison between Married and Single Adults for the Factors of Section II



C2.4 Comparison Between High-and Low-level Countries

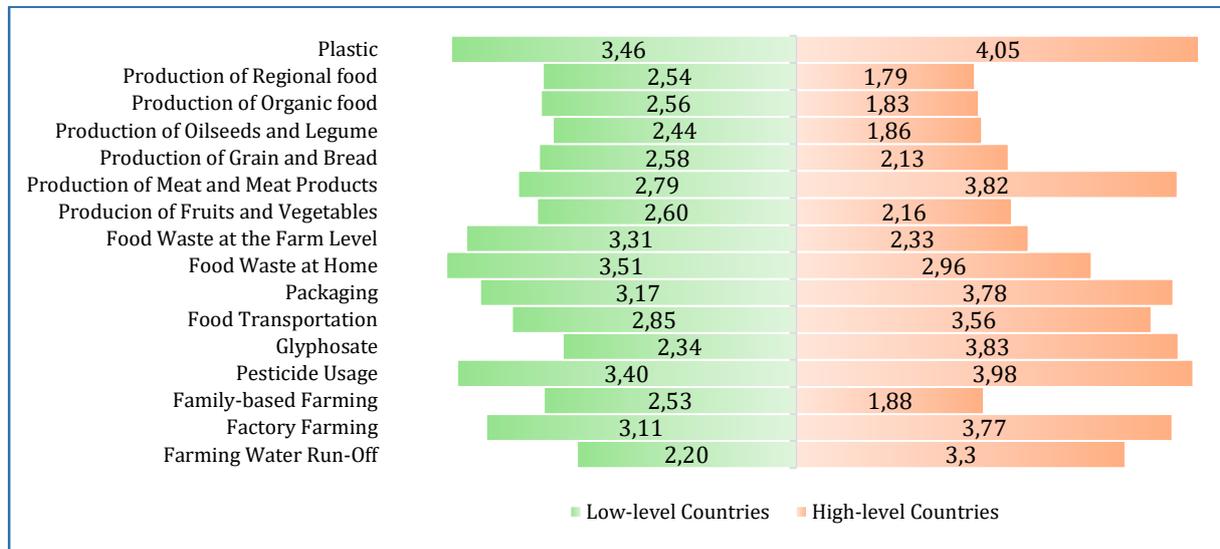
Statistical analysis has been conducted to see the difference between high-level countries and low-level countries. According to the results, adults from high-level countries have more positive attitudes and behaviors than adults from low-level countries in most of the statements – as expected. Item by item findings are shown in Figure 21.

Fig. 21: Comparison between High-and Low-level Countries



Country-based comparisons have also been made for Section II too. The results are shown in Figure 22.

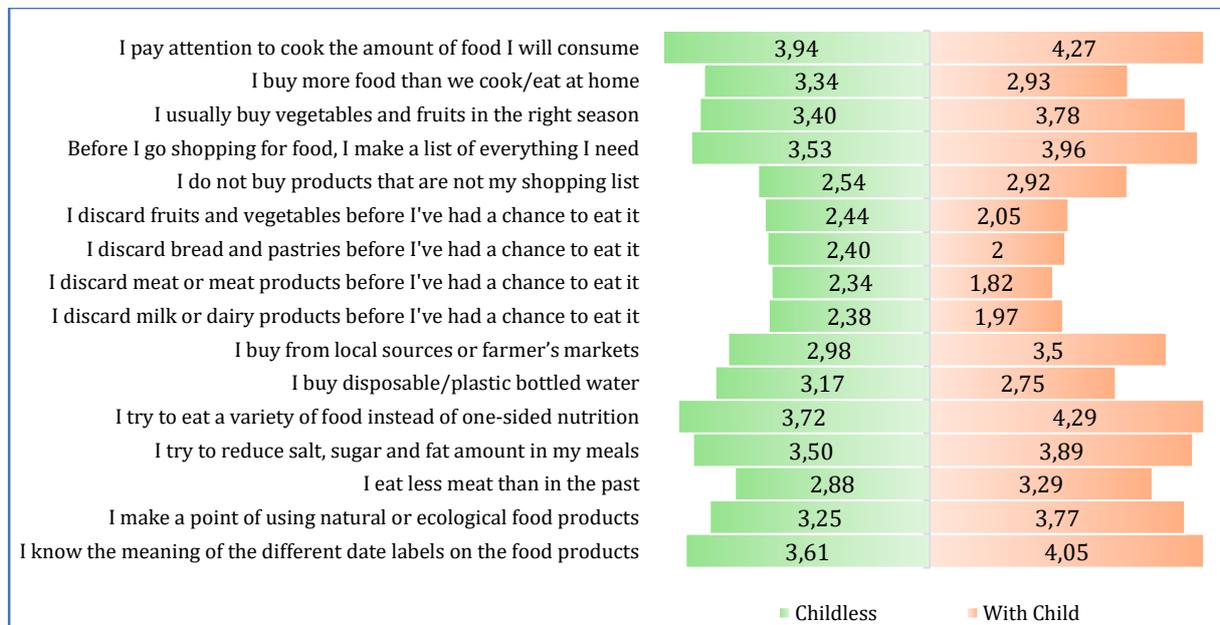
Fig. 22: Country Based Comparison for the Factors of Section II



C2.5 Demographic Comparison in Low-level Countries

Similarly, statistical analyses have been conducted just within adults from low-level countries. First, the statements between adults with/without a child with statistically significant differences are presented in Figure 23.

Fig. 23: Comparison between with/without Child (Low-level Countries)



Secondly, male and female respondents were compared according to their agreement level on statements in Section II. The only statement for which significant difference occurs is “I use reusable bags when I go grocery shopping”. Female adults agree (3,64) more than male adults (3,23) with this statement (Figure 24).

Fig. 24: Comparison between Male and Female Adults (Low-level Countries)



Finally, the agreement level of married and single adults on statements in Section I have been analysed. The statistics are presented in Table 10.

Table 10: Comparison of Married and Single Respondents' Scores in Low-level Countries

Statement	Married	Single
I pay attention to cook the amount of food I will consume	4,29	3,92
I buy more food than we cook/eat at home	2,76	3,45
I compare the prices of the places that I shop and choose ones which sell at affordable prices	3,88	3,65
I usually buy vegetables and fruits in the right season	3,86	3,34
I keep the excess food in a deep-freezer.	3,9	3,44
I give the rest of the food to the animals as feed.	3,43	3,06
Before I go shopping for food, I make a list of everything I need	4,06	3,46
I do not buy products that are not my shopping list	2,94	2,53
I discard fruits and vegetables before I've had a chance to eat it.	1,97	2,49
I discard bread and pastries before I've had a chance to eat it.	1,93	2,45
I discard meat or meat products before I've had a chance to eat it.	1,79	2,36
I discard milk or dairy products before I've had a chance to eat it.	1,87	2,44
When for a food product the "best-before date" is over, I discard it.	3,5	3,03
I buy from local sources or farmer's markets.	3,47	2,99
I buy disposable/plastic bottled water.	2,87	3,09
I consider the environmental impact of the food source before making my purchase.	3,11	2,95
I try to eat a variety of food instead of one-sided nutrition.	4,32	3,7
I try to reduce salt, sugar and fat amount in my meals.	3,88	3,51
I change my eating habits according to my current health condition (getting fat, feeling tired, etc.)	3,88	3,61
I eat less meat than in the past.	3,15	2,96
I eat less fish than in the past.	2,4	2,7
I have enough time/energy to cook	3,34	3,16
I make a point of using natural or ecological food products	3,84	3,2
I prefer to buy unpackaged food	3,35	3,12
Cooking is a task that is best over and done with	3,6	3,38
Shopping for food is like entertainment for me.	3,36	2,96
I know the meaning of the different date labels on the food products	3,99	3,65

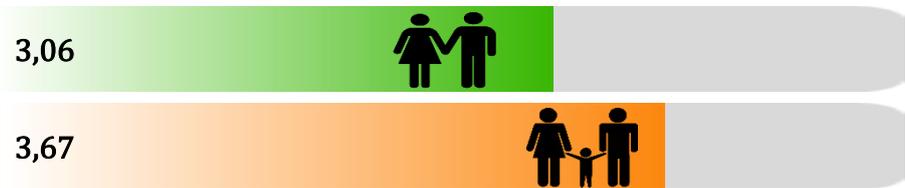
According to the results, married adults have more agreement levels than single adults for almost all statements. It could be said that married adults have more positive attitudes and behaviors.

C2.6 Demographic Comparison in High-level Countries

In this part, statistical analyses have been conducted just within adults from High-level countries.

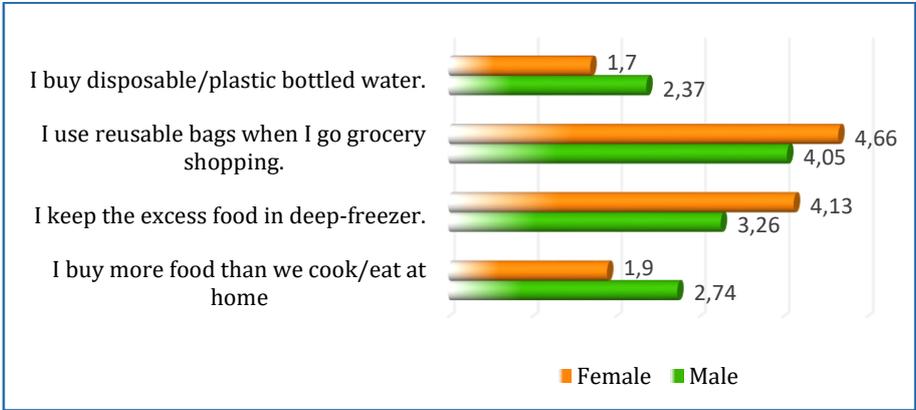
First, statistically, significant differences have been searched between adults with/without children. The only statement, where the significant difference occurs is “I consider the environmental impact of the food source before making my purchase”. Adults with children agree (3,67) more than adults without (3,06) (Figure 25).

Fig. 25: Comparison between with/without Child Adults (High-level Countries)



Secondly, male and female adults in High-Level countries have been compared for the statements in Section I. The results are presented in Figure 26.

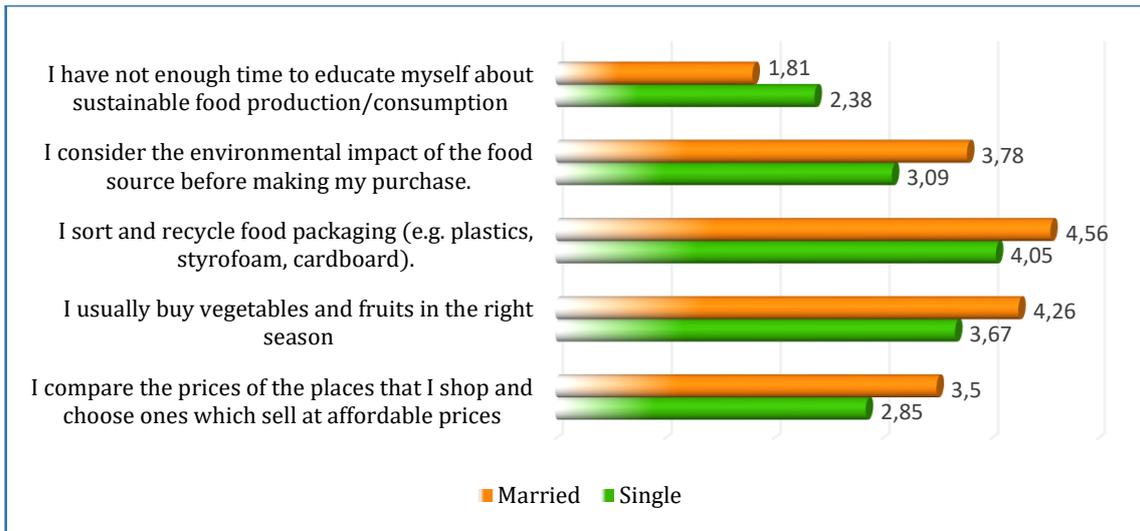
Fig. 26: Comparison of Gender Groups in High-level Countries



As shown, female respondents in high-level countries have more positive scores on sustainable consumption of food. Male respondents buy more bottled water, use fewer reusable bags, are less likely to freeze surplus food, and buy more food.

Finally, the comparison between married and single respondents has been investigated. Statistically significant statements are presented in Figure 27.

Fig. 27: Comparison between Married and Single Respondents (High-level Countries)





PART D

CURRENT SITUATION AND NEEDS ANALYSIS – QUALITATIVE RESEARCH

D1. Methodological Aspects of Expert Interviews

Interviews with the experts were semi-structured; in addition to the pre-determined questions, researchers could add new items according to the progress of the interview or elaborate on the relevant issues in order to reach new findings.

The pre-determined questions were based on relevant literature and on the personal experience of the researchers from partner institutions. After a discussion at the kick-off meeting (Izmir, 2019), the questions were finalized during many discussion rounds via e-mail.

There were 15 open-ended questions for all participants, plus specific questions for interviewees from different countries. The questions are listed in Appendix 3.

In total, 73 experts were interviewed, chosen from relevant departments of different firms and institutions. They include governmental institutions of agriculture, educational institutions, agricultural networks, journalists, academics from the field, keynote speakers of relevant conferences, consumer associations, food organizations, as well as independent experts in the field of agriculture, nutrition, and behavior change.

The interviewees were contacted via e-mail and telephone. They were given general information about the project and their expert input was requested. The actual interviews were mainly face-to-face, a few by telephone and e-mail due to time constraints and geographical distance.

Additionally, at the conference “Fødevarer i et ændret klima” (Food in a changing climate), held by Aarhus University’s Interdisciplinary Centre for Climate Change (iClimate) on 18 March 2019, several experts expressed and debated views and opinions on food-related sustainability issues. The findings from Denmark are partly based on the information shared at the conference. After the conference, some of the experts were asked to elaborate, so as to fully answer the pre-determined questions.

In most cases, the experts mentioned a large number of different relevant factors. Although the study is a qualitative study, it also has quantitative characteristics, since it identifies the frequently-cited aspects. The present report focuses on the most representative factors/data, i.e. on the most often-mentioned data, thus representing a combination of qualitative and quantitative analysis.

D2. Findings from the Expert Interview

Question 1:

How do you define the concept of “sustainable food consumption”?

Summary of answers:

The main goal of sustainability and sustainable food consumption, according to Austrian experts is to secure the global availability of sufficient food not only at present but also in the future. This understanding of the most important goal follows the definition of sustainability of the “Brundtland-report” of 1987 (Brundtland, 1987). Similarly, the Turkish experts said the most

important issue is the realization of food consumption in a way that will not prevent future generations from meeting their needs. Sweden proposed: Habitual consumption of food that promotes the health of the consumer while being beneficial (or at least neutral) to ecosystems seen totally throughout the whole chain of production and consumption.

At a narrower level, the concept was also described as, for instance,

- i. Consumption of food which has a low impact on the environment
- ii. Wasting as little as we can in all aspects of the food chain
- iii. Trying to eat foods that don't negatively impact the environment that much
- iv. Not buying more food than we need

Another issue raised by the experts is the concept of food security, which was defined as ensuring the continuity of consumers' access to healthy, nutritious, safe, and adequate food. Other definitions are as follows:

- i. Safety of food from production to consumption
- ii. Balancing production and consumption by using raw materials and natural resources effectively,
- iii. Appropriate preparation and consumption of food that is least harmful to the environment
- iv. A waste preventing diet
- v. The closed life cycle of food
- vi. Providing a better quality of life
- vii. Minimizing water and energy consumption and waste

Sustainable consumption includes satisfying customer needs and improving quality of life without jeopardizing the needs of future generations (with a view to minimizing the amount of natural resources, toxic materials, emissions and waste throughout the product lifecycle). Sustainable food consumption refers to people's lifestyles, shopping habits, and the way people use and dispose of products and services. One expert stated that "*the essence of sustainable consumption, in my opinion, consists in the preference of so-called eco-products and in the consumption of renewable amounts of natural resources and products*".

One of the main conclusions drawn by the experts from Denmark was that people need to reduce the production of animal products, as this is associated with more substantial emissions of greenhouse gases, and also requires larger production areas than vegetable production. A change in the agricultural system is, however, believed to be conditional on consumer demand for climate-friendly, plant-based produce.

Although the question is related to consumption, many experts from all partner countries emphasized the consideration of environmental and ecological effects of food products from the production stage onwards. It was underlined that sustainable food consumption started at the production stage.

Similarly, under the concept of sustainable food consumption, Austrian experts mentioned a huge number of influencing and important single descriptive factors. These factors vary, especially regarding their relevance to superior explanatory dimensions of the concept.

The main dimensions of sustainable food consumption, according to experts, are the ecological/environmental, economic, and social dimensions. Some include cultural and health aspects of their definitions.

Regarding the *ecological dimension* the most frequently mentioned factors were resource-efficient agricultural production, protection of water-air-soil, consumption of seasonal, regional and organic food (but, "... organic does not always mean sustainable and vice versa..."), low CO₂-emissions, protection of biodiversity, stop using heavy pesticides, environmental protection, the planning of purchases, less convenience food, animal welfare, few shopping kilometers by private car, less meat consumption, trying to grow organic fruits and vegetables and the avoidance of waste.

Several interviewees believed that although the environmental impacts of food consumption cannot be neutral, food consumption should be carried out in a way to do the least harm to the environment. One of the suggestions they offered was the consumption of local and seasonal products.

Factors like energy-efficient production, reasonable prices, circular economy were mainly used to describe the *economic dimension*. According to experts, higher-income consumers are much less sensitive to sustainable food consumption.

The social dimension was represented by factors such as fair working conditions (e.g. fair payment), fairness, fair trade. Experts emphasized that sustainable food consumption can be realized by changing dietary habits, and they stated that new habits acquired should be compatible with the culture. It is stated that there is a need for consumers who have digested the sustainability concept at the cultural level to achieve sustainable food consumption.

Although the definition of the concept was requested in this question, the experts made some suggestions for sustainable food consumption along with the definition. The most emphasized ideas were the prevention of food waste.

Question 2:

Which dimensions of sustainable food consumption should be used while evaluating the concept?

Summary of answers:

Interviewees responded in two different ways.

- i. One group defined dimensions broadly as ecological, economic, social, and health
- ii. Another group divided them further into sub-dimensions

When interpreting the answers, dimensions and sub-dimensions were evaluated together. Evaluations revealed that:

- i. The ecological impact is rated as the most important by almost all experts. Essential issues are natural resources - not least soil - and energy use, waste management, carbon footprint, water footprint, packaging of food (recycled packaging, etc.), positive impacts of consumption of seasonal products, and local producers' supply.
- ii. Next came the economic and social dimensions. Economics included having more appropriate, higher quality, and healthy food products that can be afforded by everyone.

Moreover, the current imbalance of food distribution and wastage is often mentioned. It is believed that more sustainable food consumption will entail the following:

- i. Regional development will accelerate, and distribution costs will be reduced, and the value of the products will decrease with the intensification of purchases from local producers
- ii. It will have significant economic effects for all stakeholders involved in food production and consumption.
- iii. It will create more informed and conscious consumers, which in turn will eliminate the injustice in societies with high food wastage and those where people go hungry.
- iv. It will lead to food safety in production, harvesting, storage, transportation, processing, distribution of food.
- v. It will also enable individuals to have healthy eating habits, more healthy generations to emerge, and chronic and nutritional diseases to be reduced.

Many experts defined complex dimensions, generally the combination of environmental and health. For instance: *"A reduced meat intake will not only be more climate-friendly, but it will also be better for our health, which will reduce the cost of the health system. There seems to be an agreement that we need to change our diets both for the sake of the environment and for our health."*

A researcher from the Department of Agroecology at Aarhus University pointed to the following quote from the EAT-Lancet report (2019): "A diet that includes more plant-based foods and fewer animal source foods is healthy, sustainable, and good for both people and planet."

From a broader perspective, experts identified 66 evaluation criteria.

Question 3:

How much are adults aware, and how much do they know about sustainable food consumption? Please answer this concerning the knowledge and awareness of different social classes

Summary of answers:

Almost all interviewees believe that the knowledge and awareness levels of adults about sustainable food consumption are insufficient. Although the experts did not specify sharp differences between social classes, they pointed out the difference between the levels of knowledge and consciousness of consumers with demographically different characteristics.

One comment concerned the *level* of knowledge and awareness: "We find a vociferous minority engaged in often aggressive debates about the respective environmental merits of meat and vegetables, usually with little or no understanding of the underlying concepts; for instance, with no appreciation of the essential role of ruminants in healthy, diverse ecosystems, nor of the essential question of HOW the grain, vegetables, or meat are produced".

Young adults vs. older adults.

Two points are mentioned. a) Awareness of food waste. Older adults are said to avoid waste and try to use their products in different ways – more than young adults. b) Young adults have more fast food habits, and older adults have more cooking and consuming habits at home.

However, there is no consensus. Austrian experts stated that younger generations have more knowledge and awareness than the older generations, that there can be observed a slight rise of awareness in all social classes. Similarly, an expert from Slovakia stated that *“I work mostly with Millennials (aged 25-42). Younger Millennials (aged 25-30) are well aware of sustainable food consumption.”*

Households with and without children

Interviewees tend to believe that adults with children seek more information and are more sensitive to food safety, healthy nutrition, production processes, and environmental impacts.

Social class and gender

Third, there is perceived to be a higher level of awareness and knowledge the higher the social class (social class defined by factors like education, income, profession). Some responses:

- i. The lower the income, the lower the interest in sustainable food consumption.
- ii. People with higher income and higher education are more aware of this problem, but in my opinion, in general, Slovaks care more about the price of food than sustainability
- iii. People with higher income can afford eco products with added value for which they are willing to pay more money
- iv. Higher-income means a higher amount of bought food, but higher preferences to buy the products packed in recycling packs.
- v. When it comes to translating awareness into action, our studies indicate that the most active (several European countries) are generally educated, middle-income women of 50-55. Younger women are often stressed by the demands of family and so-called 'work-life balance'. Poorer women are often painfully aware, for instance, of adverse health impact but can't afford or lack access to better alternatives. We have no studies of wealthy families.

Some Austrian interviewees say that there may exist a higher level of awareness in lower social classes, mainly because of lower-income and the struggle for existence. This may sound counterintuitive, but the experts explained it that because of their difficult situation, those people have a higher awareness of sustainability.

Education is the other social factor that has an impact. Higher education is believed to correlate with caring about the environment and more conscious behavior. For example, *“People with strong feelings about ecology and environment as well as strongly educated people have higher awareness”, “I think that higher educated people are more aware of this topic than less educated.”*

Beyond these, one interviewee emphasized the role of residence: *“People living in rural areas, with some animals in their household, are usually more accustomed to reducing their food consumption. In this way, they behave more sustainably than people living in town or cities.”*

As a social factor, interviewees also highlighted eating habits: *“Eventually, I suppose that the awareness of sustainable food consumption depends on eating habits. For instance, consumers who are vegetarian or vegans have significantly higher awareness than consumers who are omnivores.”*

Furthermore, there is an agreement that in every social class, there can be identified marginal groups with deviant and different characteristics.

Information sources

Although information sources on sustainable food consumption have increased with academic studies such as theses, articles, and research reports, they are still regarded as insufficient. On the other hand, unreliable sources on the internet and rumors about the issues are prevalent. It seems clear that increasing the number of reliable sources of information and sharing them effectively with consumers will raise the level of awareness. However, even if the level of consciousness increases, the fact that not everyone can afford to buy these foods is defined as an obstacle for the consumer to turn this into purchasing behavior.

Question 4:

What are the effects of food consumption on the environment, in your opinion? And what are the consequences of a lack of awareness about environmental issues?

Summary of answers:

Almost all interviewees agree that food consumption has strong effects on the environment, most of them emphasizing a direct correlation between food consumption-agriculture-environment; while a few of them claim that other areas, like transportation, industrial production, and the energy industry have the most important effects.

Published data should be questioned critically. In fact, interviewees emphasized the effects of unconscious food consumption, rather than the effects of food consumption, and highlighted that environmental impacts of food consumption could be considerably reduced through sustainable food consumption.

The most emphasized issue is that demand exceeds needs. The excess demand leads to excess production of food, unnecessary use of scarce resources used in production, unnecessary energy consumption, and more carbon emission. Consequently, interviewees emphasized the loss of natural resources (even irreversibly) and the negative impact on living and plant species in every environment, such as sea, land, air, including the climate crisis.

It is also stated that consumers' preference for packaged food products is effectively reducing the number of small agricultural businesses as well as agricultural land. The increase in the number of concrete buildings replacing agricultural land contributes to climate change. This problem reveals the effects of unconscious food consumption in the social, economic and ecological dimensions.

Especially experts working in the food production departments of agro-based industrial enterprises brought up the adverse effects of pesticides and harmful chemicals used in the production process. It is further contended that the intensive consumption of packaged food had a significant impact on the increase of plastic wastes. They recommend the consumption of products with low environmental impacts (grain, legumes, vegetables, fruits, etc.) rather than products with high environmental impact (red meat, processed products, etc.).

The Ecological Council consultant from Denmark, like the other experts, pointed to meat reductions when asked what will have the most significant climatic impact – but he pointed to other important factors, such as buying vegetables that are in season and grown locally (or as close by as possible), and he points to organic production as being necessary for biodiversity and

the quality of our drinking water. It is also emphasized that food and agricultural policies should have a constructive effect on environmental impacts.

A lack of awareness or careless handling leads to a lot of negative consequences for environment issues summarized under heavy loads/burden of ground, water, and air, for instance, climate changes, increase in greenhouse effect and CO₂ emissions, decreasing biodiversity, negative impact on the humus balance, decreasing soil fertility, deterioration of social conditions, decreasing water quality, decreasing availability of food, forest decline, displacement of small farms, increase in soil erosion, toxic materials, etc. ...just to mention a few of all the negative consequences experts named.

At the Danish Society for Nature Conservation, sustainable food consumption is related to the use of land, what we grow, and how. Sustainability is linked to biodiversity, environment, and climate. There should be room for nature, fewer emissions polluting the water, the air, and the climate, the representative says. The Danish Society for Nature Conservation is of the opinion that change primarily needs to happen at the production level. The representative stated that “*agriculture in itself is a violent invasion of nature – but we all need food, and at the same time we all need to take care of the planet*”. Their answer to how best to do this is organic farming. “*The answer is simple: Buy organic*”, she said. Aside from the advantages of not spraying the food with synthetic pesticides, organic farming also leads to a reduction in meat intake because of the prices. It is far more expensive to buy organic meat than non-organic, and so, if you only eat organically produced food, you will likely eat less meat due to the pricing.

An expert from Organic Denmark, of course also advises people to choose organic products. She states that “*...food can never be sustainable without being organic*”. The representative does, however, point out that things that are organic are not necessarily sustainable. The representative from Organic Denmark also underlines the importance of buying seasonal food.

Some statements about the environmental impact of food consumption are:

- i. The amount of consumed meat and animal products and profit-driven activities have a strong negative effect on the environment
- ii. The direct cause of the negative environmental impact of food is in production. In particular, the large-scale, monocultural, high-chemical production that has come to be regarded as usual in many European countries is not only changing the landscape; it is destroying the soil
- iii. It is very well known that cow gases (cattle production) have a significant impact on global warming
- iv. The number of vehicles needed to farm and transport food is definitely a factor that also impacts global warming (and transportation in general)
- v. Food packaging from non-reusable plastics also has an effect on the amount of waste we produce and it ends up in oceans or large landfills

A notable expression explaining the environmental impact of food consumption is “*...low government promotion, no seminars, information leaflets, and events at the national level and in individual cities and villages, low perceived availability of sustainable products explains why intentions to buy remain low, although attitudes might be positive.*”

Interviewees also referred to the impact of consumer behavior such as

- i. While the substantial environmental impacts from food occur in the production phase (e.g. agriculture and food processing), consumers influence these impacts through their habits, respectively dietary choices. This consequently can affect the environment through food-related energy consumption and waste generation.
- ii. The consumer's role is critical. Only conscious consumers can build a vigorous market for better alternatives. Only conscious citizens can support effective legislation.
- iii. Consumers consume certain types of food (for example meat, vegetables, fish, drinks) more than in the past. The most severe environmental impacts from food occur at the beginning of the production chain, but consumers influence these impacts through their choice of food and demand for food-related services.
- iv. Consumers also have a direct impact on the environment through energy consumption related to food preparation and waste production (for example, waste of food, purchase of food in packaging).
- v. If consumers do not have enough information about sustainable food consumption and the associated negative environmental impacts, they will not change their behavior (for example, will constantly buy food in non-recyclable packaging).

Question 5:

What are (if any) the obstacles that hinder adults from changing their food consumption habits?

Summary of answers:

An interviewee from Sweden, referencing experience in numerous European countries, points out:

“Food habits are a strong component of cultural identity. This does not mean they cannot be changed: on the contrary, European eating habits have undergone a radical transformation over the past few decades. Grandparents of the current generation would hardly recognize their descendants' food habits. The changes have been both good and bad: theories of hygiene and nutrition have translated into the almost total elimination of child malnutrition in Europe (UNICEF, 2019); while a focus on convenience and a prioritization of 'economies of scale' have led to habits that are highly detrimental to the environment as well as causing other health problems.

The most positive aspect of this is that radical change can happen. Part of the change to date can be attributed to public education (eg the food pyramid) and legislation; part of the huge influence of large companies using their marketing and lobbying skills to create markets for often unhealthy and unsustainable products. If it can be done once, it can be done again.

The 'old' European food cultures, especially in western Europe, were based on the existence of housewives, with time and responsibility to shop and cook. The transition to convenience foods has partly mirrored the mass entry of women into the workforce as well as the growth of single-person households. Proposals for change need to take account of the actual situation of today's households.”

More specific obstacles

A professor at Aarhus University's Department of Environmental Sciences pointed to meat as the most important food habit to change. He stated that evaluating/measuring sustainable food consumption is best done by looking at the CO₂ footprint. According to an expert, meat is one of the main "issues" that need to be looked at in relation to sustainable food consumption. Of course other issues, such as food waste, organic food, packaging, and transportation, are addressed, but the main conclusion among the experts was that if we really want the consumer behavior change to have an impact on the environment, we need to focus on reducing meat and dairy production and consumption; and in particular to focus on *how* food is produced.

This does not mean that we all have to stop eating meat altogether. Just like the tweet by Anne-Marie Bonneau @ZeroWasteChef: "We don't need a handful of people doing zero waste perfectly. We need millions of people doing it imperfectly." A consultant from the Ecological Council also stated that for many people, it is difficult to do without meat, but that it is important to point out that you do not have to become vegan – or even vegetarian; simply reducing meat consumption goes a long way.

According to our experts, there are a lot of obstacles that hinder adults from changing their habits. The mentioned obstacles can be classified into *personal/psychological obstacles* and *external obstacles*.

Under the heading of personal/psychological obstacles, "spread of consumption culture", "the consumption of individuals in order to socialize", "lack of knowledge about proper nutrition", and "lack of reading habits" are indicated as the prominent issues. Interviewees also named mainly habits, values and attitudes, comfort, lack of interest and responsibility, addictive behavior, taste and in general a lack of education and knowledge about the meaning of expiry date, kitchen knowledge, food storage, missing planning of purchase and related topics.

According to the Danish Society for Nature Conservation, common challenges are, first of all, their established habits. Convenience and price are two of the main concerns. The representative stated that food is one of the most important factors in the quality of life. For most people this probably includes eating a lot of meat; for others, the quality indicators could be home-cooked meals or something else.

In addition to the difficulty of changing mindsets about meat, meat is also an easy way to achieve satiety – and it is cheap. Vegetables are difficult and not always popular with children, the Danish Society for Nature Conservation representative said.

Some further quotes from interviews:

- i. The most important obstacle in this regard is that consumers do not define their bad habits in food consumption as a problem due to their low level of knowledge and awareness about food consumption.
- ii. In my opinion, a lot of people are used to a particular lifestyle and they are not willing to change. A lot of people are also very ignorant when it comes to this important topic, and they don't care about the problem enough to change their food habits. Food habits can be changed, but very slowly, it cannot be a radical change."

As can be seen from the statements, overcoming the personal/psychological obstacles requires changing the mindset of adults.

According to the experts, there is still a lot that can be done, and there are still a lot of challenges as well. Even though people are aware of the issues and want to change, it is not always simple. One of the main challenges, according to an interviewee, is the gap between attitude and behavior. She also pointed to the “mental rebound effect”: when people do something they consider to be sustainable, they are better able to justify another less sustainable choice later on. Perhaps the main focus of sustainability advocates should be to establish more sustainable habits.

The most common external obstacles are; lack of time especially when preparing food due to intense work pressure, social expectations, few offer of sustainable food in local supply and out-of-house consumption, the existence of too many inconsistent food labels, economic reasons such as expensive prices of more sustainable foods, a loss of appreciation of food, quantity discounts, big offer of convenience products, population growth, the effect of capitalism, marketing and advertising policies of enterprises and their effect on consumers, lifestyles that lead to rapid and poor quality food consumption, household income and higher accessibility of foods with negative effects on environment and health obstacles.

Question 6:

What are the most effective reasons that cause food waste (unconsumed food) by the adults after purchasing of food products?

Summary of answers:

Unplanned shopping or impulse buying is indicated as the first reason for many interviewees. They believe that individuals go shopping without planning their purchases and therefore risk buying more than they need, even products that they don't need at all. According to a wide consensus view, another important reason behind food waste is too little planning, quantity discounts, lack of knowledge about cooking food and alternative uses of food, loss of appreciation of food, and intemperance.

A mistaken belief that 'best-before' dates are indicative of health risks is frequently cited. Also mentioned; lack of skill in reusing leftovers in creative ways; infrequent shopping (sometimes because of inaccessibility of shops) leading to unplanned, 'just in case' buying.

Further statements concerning excess buying: *“...a lot of people buy more food than they can consume and then throw it out. Maybe they do not plan their purchases effectively, they are not able to estimate the real amount of food they need, and they do not consider costs for food as very high so they buy not only rationally but emotionally.”* *“The purchasing and eventual disposal of more food than is consumed”, “An incorrect estimate of how much they actually consume and also being tempted by a good offer.”*

More than half of the interviewees believe that consumers do not store food products under appropriate conditions or that they do not know the appropriate storage conditions for products. Moreover, the size of the packaging of the products, the size of the servings, the lack of sufficient effort to make use of leftovers, and the deterioration of the food purchased, expiry of shelf-life, loss of food during preparation, missing nose-to-tail usage, buying emotionally, out-of-house consumption, 24-hour availability of food products, and influence of advertising were stated as other reasons.

Some less mentioned but potentially important comments are: *“Easy access to food”, “Low state intervention in recycling food leftovers”, “Legislation and restriction of food donation”, “Buying for stocking”.*

Question 7:

When you compare the recommendations for sustainable food consumption with everyday food consumption habits, where is the biggest discrepancy between recommended food consumption and actual food consumption? Or In other words, what food habits should consumers change first to have the biggest positive effect on sustainability?

Summary of answers:

Animal-based products

The most significant discrepancy between recommended and actual food consumption is by far in the consumption of meat and animal products, which have a high degree of negative impact on the environment and need to be reduced (according to 80 % of interviewees). One commented: *“The biggest discrepancy between recommended food consumption and actual food consumption is in the consumption of meat and meat products. The consumption of beef is very low, but the consumption of pork and poultry is higher compared to recommended intakes. The worst situation is in the case of pork, where the consumption of this type of meat is higher by 60 % compared to recommended levels. Consumers should be more aware of the positive and negative effects of meat consumption and increase consumption of beef and lamb, and decrease the consumption of pork.”*

A CSR representative for COOP, the largest retailer of consumer goods in Denmark, stated that we need new “framework conditions”, and that we need to create value in non-animal-based products. An Environmental Science professor agreed that there is a lack of and need for incentives among the consumers. We need the consumers to realize the impact of their behavior, and we need them to realise that they can make a difference by changing this behavior.

A representative for Arla Foods stated that the responsibility is also with the industry. The industry needs to make sustainable options more accessible for the consumer to be able to live and eat more sustainably. If the best way to do so is by eating and drinking less animal-based products, then there needs to be some good plant-based alternatives available.

Highly processed food

The second issue is defined as reducing the consumption of products that are packaged, processed, and include an additive which threatens both human health and the environment. For instance: Too much sugar, salt, and (wrong kinds of) fat; usually hidden in soft drinks, snacks, and heavily processed food.

Interviewees also emphasized that individuals should be aware of the nutrients they need and change their eating habits through balanced and healthy nutrition programs. Thus, the daily share of consumption of both healthy and less environmental impact products like a legume, cereal, fruit, vegetables can be increased in overall food consumption. On the other hand, "Too little attention to/awareness of individual differences in nutritional needs" was also cited.

It is found that regarding the composition of food, too fat, too one-sided diet, too many carbohydrates, too few fruits and vegetables were primary issues that should be taken into consideration.

Local and seasonal- in moderate, planned portions

In addition, experts stated that there should be a change in issues such as consumption of local and seasonal foods, avoiding fast food and processed food, decreasing the serving size, increasing the welfare of the society for access to healthy food, balanced nutrition, slow eating, planned shopping, re-utilization and minimization of waste.

Education

Some interviewees highlighted the importance of education. For instance,

- *People should first of all try to eat healthily. [So they will learn] what is good and what is bad for their body, they will learn and they will gain motivation also for sustainable consumption.*

In order to compare the behavior of youth and adults regarding the discrepancy between recommended and actual food consumption, one interviewee said:

- *The only possibility to bring them to think and act more sustainably is to teach them and to bring them to change their mindsets. This is a long term activity, which, as it is indicated by many different studies is more possible in the case of young people, more specifically teenagers, who will in time become the actual consumers and heads of families. In the case of adults, it is more difficult, because they are used to do their shopping as before, and maybe the only possible thing to bring them to act differently is to show them the impacts on their health and on the earth and maybe if they realise that there are more pros than cons, they will start to think more sustainably.*

In business, interviewees pointed out the role of marketing activities as follows: *"...impulse purchases, as well as promotional activities, affect excess consumption.", "Discrepancy: business-marketing tools directly in stores, which increase our impulse buying, urge to buy more, to buy into the stock, lower awareness about non-packaged food, fewer possibilities to buy local food."*

Question 8:

Do you think sustainable food consumption has favorable effects on human health? In both cases, please tell us why?

Summary of answers:

More than 75% of the experts are convinced that the consumption of sustainable food would have positive effects on human health. Sustainable food consumption implies balanced nutrition, less meat, less cholesterol, organic food free of residues, fresh and low-processed food, more fruit, and vegetables, and leads to better health. This is however not automatic: "... organic nutrition is not in any case sustainable nutrition and vice versa; the direct effects have to be questioned...", according to some of the interviewees.

Interviewees tend to agree that *“eating more plant-based food of organic quality (which is not as harmful to the environment) has favorable effects because it gives more nutrition and fewer chemicals.”*

- i. Definitely yes - enhance environmental quality and the natural resource.*
- ii. It does in many ways – reduction of costs, better awareness about nature and climate, a healthier world, there are many why it has a good effect on human health...”*

Some interviewees stated that sustainable food consumption would increase agricultural practices without medicines, reduce consumption of food products with high environmental impact, and reduce the demand for processed products. One stated that *“[Healthy] food does not contain all the chemicals, harmful substances, salt, fat and sugar as the laboratory prepared food. All of this food is organic, it comes from organic farming and so it is healthier.”* They also stated that all these would have significant positive effects on public health in the long term.

Sustainable food consumption has beneficial effects on human health because a healthy and sustainable diet depends on a varied diet. Rational nutrition is not based on special, but on ordinary foods. A diet must contain sufficient protein, proper carbohydrates and fats. In terms of nutrition, the average consumption of fruit and vegetables should increase, and consumption of animal fats should decrease. Rationalization of diet is, therefore, one of the basic preconditions for the elimination of the most significant mass diseases, which largely determine the health of consumers, as well as their consequences.

Many interviewees believe that vegetarian (or at least low-meat) food is the most sustainable, with health benefits in terms of vitamins, minerals, fibre, healthy carbohydrates, and antioxidants. Therefore, consumers should consume natural food products and more vegetable food, which will be useful in reducing such risks as cardiovascular diseases, digestive system diseases, and cancer. Supporting this, an expert specified that *“consumption of less meat (not no meat at all) has a proven positive effect on human health. Pesticides are just bad (there is a lot of research about it), consumption of dairy is disputable...”*

Question 9:

Do you think that sustainable food consumption of adults has an impact on fighting hunger in the world?

Summary of answers:

Most interviewees consider that sustainable food consumption could have a significant impact on starving people in developing countries, in the short term. In the long term, more attention should be paid to how to shift surplus food from developed to developing countries.

According to interviewees, with the help of sustainable consumption and reduced waste, consumers will demand less food and this will lead to decreased production with less production space needed. Additionally, reduced production will have reduced environmental impacts, and production resources will be distributed more fairly throughout the world.

Specifically, one interviewee asserts that *“...when people will stop buying to stockpile and will start to buy only what they will really use and eat, there will be less food waste and thus food could be distributed among all parts of the world in a more even manner (adequate to the population and its needs).”* Another striking claim is that: *“Individual action on sustainable food*

consumption can be effective in combating the hunger problem in the world if it is persistent and consistent enough to mobilize public action. However, if individual movements do not turn into social movements, they are not effective."

Some pointed out that sustainable food consumption does not mean that people suffering from hunger will automatically have food to eat, hunger is a more complex problem which cannot be solved just by better choices by privileged consumers: "In some aspects, yes. For instance, when Europeans shift to eating more locally produced food, imports will decrease. This will, in theory, liberate food for consumption at the place of production, which would be a huge improvement since, worldwide, 80% of all hungry people are either farmers or farmworkers. However, there is no guarantee that this shift will take place. The land use could, for instance, be switched away from food production."

One possibility to reduce hunger in the world is open to companies, especially retail chains. They can collect food which is not bought and which can be still used and eaten, and send it to the places where it is needed (e.g. shelters, orphans, homes, clubs, etc.) This procedure is also used by some restaurants, many of which are developing waste-reduction strategies. However, this kind of application is not legally possible in some countries.

Another actor in FSC is seen as governments. Some interviewees declared that hunger in the world is a problem or issue of distribution that can be primarily solved on a political level. In this sense, it will be ensured that individual efforts will be transformed into a movement of society and cause changes in food and agriculture policies by influencing policymakers.

Among the mentioned aspects why sustainable food consumption has an impact are the following, sustainable nutrition needs less agricultural area, maintains soil health, improves social working conditions, means less burden and exploitation for ground-water-air, secures the availability of food, reduces the amount of waste.

Question 10:

What are your suggestions to enhance the current food consumption habits of adults?

Summary of answers:

Most interviewees stated that awareness should be raised on food waste, the effects of food on the environment, and the importance of local foods, and education programs should be organized on these issues.

The most important suggestions, to name a few of them, are early nutrition education and comprehensive knowledge transfer about all related topics for all social groups but also for special interest groups (e.g. pregnancy), awareness-raising among adults and organizations, better offer of sustainable food in social institutions and out-of-home consumption (gastronomy), increase appreciation of food products, cooking and eating in society, incentive systems (e.g. reduction in health insurance), to offer more experiences than mere information to the adults, less convenience and highly processed products, less discounts and balanced nutrition.

In order to achieve a higher awareness level, experts recommended the preparation of public spots on sustainable food consumption, informative documents for consumers at food outlets, and healthy product advertisements through producer and government cooperation. A mechanism is needed to control the advertisements that encourage waste and unbalanced nutrition.

Furthermore, they suggested the consumption of animal products at the minimum level while increasing the consumption of vegetables.

Having information about the nutritional values of the products and the nutrients they need, and transforming healthy and balanced nutrition into the lifestyle were among other recommendations. They also stated that families and education policymakers have essential tasks in this matter. Given the importance and priority of the issue, the following opinion of an expert is remarkable; *“...in my opinion, this is a long term activity, which is not very easy. It is needed to educate the adult in the way of sustainable consumption. We need to learn them how to seek for and read the information about sustainable consumption; how to buy only that food which will be really consumed in the household; how to create the shopping list and how to buy only those things which are on it; how to separate the waste; how to consume only the products from ecological production and only those fruits and vegetables only in the right season; how to follow the information about the ways of waste’s recycling; and last but not least how to think more about the environment because we leave it to our future generations.”*

Changing the behavior and habits of consumers is another issue that stands out. *“...to eat healthily, more encouragement is needed from the media. I also think that shops have a large impact on what consumers end up buying (marketing actions, communication, leaflets, price discounts). So if they push products that are made in a sustainable way and are healthy it could enhance the current food consumption habits of adults. Also, making environmentally friendly products at least the close priced with their not so eco-friendly alternatives would be a great thing for changing food habits. And important is to show health impact, if any and also impact on local life. Make appropriate planning for buying food-what we really need. Purchase and preparation of so much food as we really can consume. Food recycling. Sterilize or to freeze food that we know we don't consume. Adults should reduce their high food consumption and teach their children how to handle food.*

Perhaps the issue is not a lack of alternatives, but rather a lack of knowledge; the environmental science professor advised people to try a vegetarian menu box with recipes as a way to experiment. This way, the consumer will gain knowledge and inspiration, and (hopefully) acquire a taste for the meatless meal options.

For other actors than consumers;

- i. For food producers: education about how to care for the soil, and its crucial role as the resource base for all food production.
- ii. For food processors: They know about the pernicious effects of high consumption of sugar (and its often equally bad sweetener alternatives), salt and fat; what is needed is a commitment to better practice (already beginning to happen) plus their investment in building a market for healthier products.
- iii. For food distributors: Review pricing policy for organic food. Often their mark-up is in percentage. They could (like the Swedish coop, at least at one time) decide to make the mark-up as a fixed amount: organic and non-organic carrots all generate a surplus of the same value per kilo, thus lowering the price of the organic produce. Review policy concerning sub-standard produce. Instead of trashing, if still safe, offer at a lower price (also happening in many places, eg 'funny fruit') or donate to charity.

Question 11:

What are your suggestions to adults to achieve sustainable food consumption;

- i. before purchase,
- ii. during preparation and consumption
- iii. and after the consumption of food products.

Summary of answers:

i. Before purchase

In order to achieve sustainable food consumption before purchase, the majority of experts (approx. 75 %) agreed that adults should plan their purchases, use a shopping list, and should gather more, respectively, better information before their food purchases. Additionally, experts suggested to adults to buy seasonal, regional, low-processed, little-packed, biological and plant food products, using ecological bags, and pantry shopping (try cooking based on what you already have at home). They stated that they should make a weekly diet plan and buy enough quantities of food products according to this plan. They emphasized the need for water and carbon footprints; in other words, the environment to be taken into consideration when choosing the products. Apart from these, they suggested to purchase local products and seasonal products from the local producers (from small farmers), to ensure that the products are stored correctly and to gain the habit of reading the labels.

The suggestions were rounded off with a lot of individual answers, e.g., to decide which regular items you will ONLY buy if they are organic/local (and affordable) - and stick to your decision, bring your own shopping bags, use less discount offers, pay attention to food labels, buy direct from farmers, to mention just a few.

ii. During preparation and consumption

At this stage experts suggested making the appropriate portion of the amount of food to be cooked according to the number of people, to develop the creativity of cooking by making new trials to minimize the waste generated, and to keep the prepared products under the right conditions.

Energy-efficient cooking, gentle preparation of food, consumption of less high-processed/convenience food, stress-free eating in company and the use of recipes and information of related cookbooks and cooking shows are some more of the named proposals. Other suggestions are shown below:

- i. Don't cook a ton of food (cook for one max two days) calculate the amount of portion-prepare so much as you can really consume,
- ii. Prepare and consume as much as you really can.
- iii. Try to use and consume all of the food you bought so that there are not a lot of leftovers. To use all the usable parts of the fruits, vegetables, and meats so that there will be "no waste"; do not rely on consumption time and do not take it as a law because it is only from the recommended time and these foods can still be consumed.
- iv. Focus what they need to buy, prefer recyclable and reuse packs, planned what to eat and cook, consume firstly what they bought and then go to the store again, consume local food, prepare the meal from fewer ingredients.
- v. Suggestions to adults to achieve sustainable food consumption during preparation and consumption are to recycle used food packaging, to separate waste, to consume all

- prepared food, not to waste electricity and water, to decrease using of preservatives in food
- vi. Practice self-service: small(er) plates, take a little at a time from the dishes, take second or third helping if desired.

iii. After the consumption of food products

Experts very much agreed on suggestions referring to the period “after-consumption. The re-use of leftovers leads the list of proposals, accordingly the gathering of information regarding ways of re-use, storage and stockpiling of food and especially information about expiry dates is of most importance. The main goal is the avoidance of food waste. One of the main issues targeted in sustainable food consumption is zero waste. Therefore, appropriate measures should be taken before and during consumption. If there are redundancies, they should be delivered to those in need when they are primarily consumable (e.g.: neighbours, social housing, social institutions, animal shelters, etc.). However, if they are not consumable, then they should be buried in the soil to take advantage of them as fertilizers or should be disposed of. It is also stated that the municipalities that collect waste have a high duty and responsibility and that energy and fertilizer from food wastes can be produced and large economic outputs can be provided. It is also mentioned that the packaging materials of packaged food products should be recycled. Finally, some experts expressed that major policies and projects on zero waste in Turkey were carried out in recent times. Some specific suggestions are;

- i. recycle the food packaging
- ii. to separate the waste; think about that, what will be cooked in the oncoming days and purchase accordingly to that.
- iii. nutrition benefits on healthy, daily recommended consumption, knowledge of emulsifier and dangerous type of sugar added, ecolabeling.
- iv. suggestions to adults to achieve sustainable food consumption after the consumption of food products are to wash used dishes in the dishwasher, to consume non-consumed food later.
- v. community living becomes very popular in some countries, enabling the sharing of surplus food.
- vi. if food is left in the package, protect it in the way to prolong utility.

Question 12:

In which aspects of sustainability and nutrition (food) do you feel to have sufficient knowledge?

Summary of answers:

Because the experts in this study have different professions with different occupations, they made different classifications about their competencies in these two concepts. The people working in the field of gastronomy considered themselves adequate in the preparation of foods, while the food engineers and the experts in the food production processes stated that they were competent in the field of production and processing, and those who had expertise in nutrition and diet considered themselves to be healthy and sustainable. Only one person has mastered the concept of sustainability but stated that there are deficiencies in the nutrition section. A nutritionist also said that although nutrition and food concepts are presented as synonyms in this question, they are actually quite different concepts, and their expertise will be different, and even though they are nutritionists, they cannot be defined as food experts. Some experts stated that they care about

what needs attention beyond their expertise field during and after the purchase of food products and try to make it a part of their lives.

Many experts asserted that they can always need to learn more. Some expressions are; *"I would especially like to learn practical tips which could be used in everyday life", "I have the knowledge of the subject, but everybody has to learn and improve. Not for free, it is said "repetition is the mother of wisdom" and "no one has fallen to the earth learned". I know what the term "sustainable consumption" means, what food can be considered as "sustainable food", how to behave "sustainably", how to buy and consume in this way, but I think we can still learn and that's why I keep looking for up-to-date information and researches to know how it is not only in Slovakia but also abroad." "I would like to know more about the political and commercial driving forces that are hindering radical improvement."*

Question 13:

On which aspects of sustainability and nutrition (food) do you want to know more?

Summary of answers:

Question 13 is similar to question 12, with even less agreement among the experts. The answers reflect an inconsistent opinion. Almost the same number of experts claiming in question 12 to have sufficient knowledge in all areas wish to know more in all areas of sustainability and nutrition.

Individual mentions refer to a variety of relevant aspects, e.g. CO₂ balance, balanced food, the role of the microbiome on gut health and psychological moods, alternative food as protein source (e.g. insects), how to change habits of consumption, ecological footprint, evaluation methods for sustainability, data about energy expenditure, how is data calculated, how to manage recycling of the food packaging materials and how to compost food leftovers, information about fake food, maturity versus paternalism, food labelling, health values, effects of technological developments on sustainability, industrial food production processes and their effects on the environment and all processes from field to table and many more.

Question 14:

Which communication channels do you think are more effective in sharing information about sustainability and food?

Summary of answers:

In this question, the communication channel proposed by 80% of the experts was social media. When considering the frequency of using social media by both young and older adults, this is not a surprise. It is stated that social media (especially YouTube) can be useful, especially for young adults. Word-of-mouth (WOM) and e-WOM, influencers, content, and emotion marketing were listed by some experts. Food blogs and new media, such as mobile apps. Moreover, classical instruments/channels like print media, television, brochures, journals, and other written and visual press and outdoor advertising elements were listed. Movies and cooking shows on tv are also named very often. Academic studies on sustainable food consumption and seminars to be organized were also defined as essential tools for information sharing.

The extensive agreement can also be found regarding the preferred kind of information transfer using different channels. Communication channels that offer a 2-way-communication (interactive communication) with the consumers are far more critical than 1-way-channels. Consumers should be served primarily with experiences rather than cognitive information, is mostly the tenor of the experts. Individual answers named communication channels like information on food labeling and menus, well-known persons (testimonials such as cooks, journalists, celebrities, etc.) as influencers and multipliers and schools at farms.

Also mentioned:

- i. Schools: at least in some countries, parents react more positively to messages brought home by their children, trusting teachers more than media or marketing or politicians.
- ii. Civil society organizations, like faith groups (our responsibility for stewardship of the planet), environmental and nature-protection groups (the less aggressive ones), keep-fit groups.
- iii. In northern Europe, 'folk' education: adult education organizations.

When talking about the most effective communication channels the environmental science professor pointed to the importance of personal experiences as being an essential factor for behavioral change. Another point worth mentioning is the ripple effect. To advocate change we need to encourage people to share their knowledge; share interesting posts on social media, talk to your neighbour about local groceries, share tips and recipes with your friends, etc.

Aside from the mentioned tools, experts have pointed to the target audience as the most important element to consider when choosing the most appropriate media channel.

Question 15:

Are you aware of training opportunities in adult education on the topic of sustainable/healthy food consumption in your country?

Summary of answers:

Unfortunately, the results for Turkey and Slovakia are tragic. The majority of the experts participating in the research answered this question as I do not know. Experts indicating the existence of these training; from the in-house training of the public health units, by Sabri Ülker Food Research Institute, from the in-service training organized annually by the Ministry of National Education, Utrecht Summer School-Futuring For Sustainability, HERBALIFE, mention about scientific congresses and seminars in this field, and YouTube channels of nutritionists. However, it is concluded that most of these events are focused on healthy consumption rather than sustainability and that some of the training we encountered during the survey studies were insufficient to be heard. In this sense, it can be said that there is a significant lack of education in low-level countries.

In high-level partner countries, Austria, Denmark, and Sweden, interviewees are more aware of training activities. For instance, a majority of experts (64 %) are aware of training opportunities in adult education on relevant topics in Austria. Only two experts stated that they don't know any training opportunities. On top of the named educational programs for adults are programs of the chambers of agriculture ('Landwirtschaftskammern') and rural training institutes of the chambers of agriculture ('LFI-ländliches Fortbildungsinstitut'), as well as seminars of the University of Agricultural and Environmental Education ('Hochschule für Agrar- und

Umweltpädagogik`)). There are many more different institutions, communities and programs for adult education on the topic of sustainable and healthy food consumption in Austria. An overview is given in Appendix 1.

A Swedish interviewee mentioned:

- i. 'Folk' education groups in various guises. For instance, in Hungary the widespread 'Food Action Team' program, also functioning in Italy and to some extent in Spain, will shortly be upgraded and introduced into more countries.
- ii. Study circles and apps focused on more sustainable lifestyles are available in several countries, including some with narrower focus like reducing waste or protecting water.
- iii. The most significant international phenomenon is probably Weight Watchers. Previously focused almost exclusively on weight reduction, it now offers a broader education about healthy lifestyles and eating habits.

Danish experts listed many examples. As mentioned in part about "Good practices", Danes do have an increasing interest in sustainability, and so different initiatives emerge. A representative from the Danish Consumer Council mentioned the phone application, "For Resten", developed by the Danish Consumer Council in cooperation with the organization, Stop Wasting Food, and the Danish Agriculture and Food Council with the support of the Ministry of Environment and Food of Denmark (Knutsson, L., "App: Undgå madspild med For Resten- appen"). In the app, you can find different types of food products and information about how to store them, their durability/shelf-life, when to throw them away, recipes they can be used in, and tips on avoiding food waste.

Other apps, such as "TooGoodToGo", "Red Maden" and "Mad skal spises" have also become increasingly popular in Denmark. These are apps that allow you to purchase leftover food from restaurants and/or almost expired food from supermarkets.

Other (perhaps less prominent) initiatives, such as Bugging Denmark, Denmark's first urban cricket farm, could also impact the future of food-related consumer behavior. "Edible insects are a source of social as well as environmental sustainability and, until proven otherwise, we believe their potential is endless." (Bugging Denmark, "Spiselige-insekter"). The representative from the Danish Society for Nature Conservation states that we have had plenty of people involved in and initiatives concerning sustainability, for at least 30 years now, that have guided us toward more sustainable food consumption. We have different labels, indicating if a product is healthy, organic, etc. Perhaps the next step is a sustainability label, she suggests.

CONCLUSION

The findings of this need analysis/current situation report have revealed that adults' food consumption behavior is not sufficiently sustainable in partner countries, especially in Slovakia and Turkey, which are labeled as low-level countries. Some of the food consumption behaviors have a higher sustainability level and some behaviors have lower. For instance, adults pay high attention to cook the amount of food they will consume and they try to eat a variety of food instead of one-sided nutrition. However, behaviors such as buying products that are not in the shopping list, buying disposable bottled water, having not enough time to educate themselves, buying more food that they cook or eat at home, and discard food products which best-before date is over, are found to be low in terms of sustainable consumption. These findings, as expected, emphasize the need for adult education. In support of this, in interviews with experts, almost all experts state that adults' awareness and behavior about the sustainability of food consumption is insufficient.

Participants' responses showed that adults with children and married adults tend to have more positive attitudes and behaviors. These findings are almost the same in both high and low countries. Therefore, it can be said that child ownership and marital status are influential factors in the overall sustainable food consumption behavior of adults in all partner countries. It is important to highlight the impact of demographic factors such as age, gender, education level, etc. Findings from data gathered from consumers and opinions of experts emphasized the importance of the level of knowledge and consciousness of consumers with demographically different characteristics. However, there is no consensus in terms of some demographic

characteristics. Although some experts specified that older adults avoid food waste, some stated that young adults have more knowledge and awareness than older adults. Similarly, some experts claimed the higher level of awareness in lower social classes, while more experts believe that adults with higher income and education are more aware of the sustainable consumption of food. Therefore, these controversial arguments reveal that it is necessary to measure the behavior of adults in different countries using a single index, and the importance of creating an intercultural competence map with the addition of demographic factors.

Adults are aware of the importance of the sustainability of food consumption and the impact of food consumption on the environment. Participants believed that plastics, pesticide usage and food waste in supermarkets are the factors that have a negative impact on the environment. It was determined that consumers think that the production of oilseeds and legume, family-based farming, organic foods, and regional foods are the least negative factors on the environment. Interestingly, food waste in supermarkets found more important than food waste at home and farm level. More interestingly, food waste at home specified as low important by adults from high-level countries than low-level countries. On the other hand, experts emphasized the effects of unconscious food consumption, rather than the effects of food consumption. They highlighted the difference between consumers' food needs and demand.

Unplanned shopping and impulse buying, mistaken belief about 'best-before' dates, improper storage, lack of knowledge about cooking food, and alternative uses of food are

found to be the critical factors behind food waste, according to the experts. These reasons, which cause food waste as a priority, are behaviors that can be prevented by consumers. For this reason, the necessity of educating consumers about these behaviors and changing habits and behaviors can be seen once again. Changing adults'

habits and behavior starts from the change in their mindset. Therefore, this is a long term activity. Based on this, it is recommended to create various educational materials and activities.

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APPENDIX

Appendix 1: List of Institutions and Programs That Offer Adult Education on the Topic

	Institutions	Programs
1	<i>Chambers of Agriculture</i>	- seminar countrywomen - "school at the farm" (program for children and youth) - "adventure alpine pasture"
2	<i>Research Institute of Organic Agriculture of the Chambers of Agriculture in Austria</i>	- seminar countrywomen - "school at the farm" (program for children and youth) - "adventure alpine pasture"
3	<i>University College for Agrarian and Environmental Pedagogy</i>	- various seminars, e.g. - "climate protection and nutrition-a topic for schools", - "regional and fresh on the table, nutrition-seasonal and sustainable " - "All organic or what"
4	<i>Austrian Paying Agency for Agriculture and Rural Development</i>	- "Eggs-perts" - school programs - "everything about ... milk, beef, pork, sheep, poultry" (multimedia information) - "Organic treasure chest" (educational materials)
5	<i>Eco Counselling (Advisory service of the Vienna Adult Education Centers)</i>	- various counseling and training programs for schools, e.g. - "nutritional care coach"
6	<i>BIO Austria-Association for the Promotion of Organic Farming (association of Austrian organic farmers)</i>	- "Biola" – the knowledge database for organic farming (educational materials)
7	<i>Economic Development Institute (WIFI) of the Chamber of Commerce Vienna</i>	- "nutrition screening coach"
8	<i>Adult Education Centres (VHS)</i>	- various training offers
9	<i>Vienna Health Promotion (WIG - non-profit association)</i>	- Viennese School Fruit Program
10	<i>Chamber of Agriculture/Lower Austria</i>	-- nutritional counseling programs
11	<i>Chamber of Agriculture/Upper Austria</i>	- "after-work at farms"
12	<i>Environmental Education Austria</i>	- various events
13	<i>Land Federal State Lower Austria</i>	- health promotion program "IS GOOD" - education map (online information on educational opportunities on sustainable development in Austria)
14	<i>Österreichische Austrian mountain and small farmer association – Via Campesina</i>	- - Initiatives and educational work on agricultural policy and food sovereignty
15	<i>The Austrian Ecolabel (national seal of quality)</i>	- information base for environmentally friendly purchasing decisions
16	<i>Eule Wien EULE Vienna</i>	-- The Environmental Education Program of the City of Vienna

17	<i>Energy and Environment Agency of Lower Austria</i>	<i>- Advisory and educational measures to raise awareness for sustainable living, caring for resources and conscious consumption</i>
18	<i>"Bread for the world"(NGO of Diakonie Austria) = Organization for development cooperation against poverty and hunger in the world</i>	
19	<i>"SOUTH WIND" (development-NGO - Association for Development Policy and Social Justice)</i>	<i>- "Fair Trade"</i>
20	<i>LEADER projects (links between actions to support the rural economy - a joint initiative of the European Union)</i>	<i>- "Sauwald Erdäpfel" - a cooperation of Austrian potatoe farmers and the association for consumer information</i>
21	<i>NGO's</i>	<i>- information events</i>
22	<i>Rural Youth - a network for the concerns of young people in rural areas</i>	<i>- harvest festivals</i>
23	<i>Institute for education and counseling (IBB)</i>	<i>- workshops, lectures in schools and kindergarten</i>

Appendix 2: Questionnaire Form Used in the Study

Please indicate your approval to the following statements					
1: "totally disagree", 5: "totally agree"					
	1	2	3	4	5
I pay attention to cook the amount of food I will consume.					
I buy more food than we cook/eat at home.					
I keep the rest of the food to cook new food.					
I compare the prices of the places that I shop and choose ones, which sell at affordable prices.					
I usually buy vegetables and fruits in the right season.					
I keep the excess food in a deep-freezer.					
I give the rest of the food to the animals as feed.					
Before I go shopping for food, I make a list of everything I need					
I do not buy products that are not my shopping list					
I use reusable bags when I go grocery shopping.					
I discard fruits and vegetables before I've had a chance to eat it.					
I discard bread and pastries before I've had a chance to eat it.					
I discard meat or meat products before I've had a chance to eat it.					
I discard milk or dairy products before I've had a chance to eat it.					
When for a food product the "best-before date" is over, I discard it.					
I buy from local sources or farmer's markets.					
I buy disposable/plastic bottled water.					
I sort and recycle food packaging (e.g. plastics, styrofoam, cardboard).					
I consider the environmental impact of the food source before making my purchase.					
I try to eat a variety of food instead of one-sided nutrition.					
I try to reduce salt, sugar and fat amount in my meals.					
I change my eating habits according to my current health condition (getting fat, feeling tired, etc.)					
I eat less meat than in the past.					
I eat less fish than in the past.					
I eat less dairy than in the past.					
I have enough time/energy to cook					
I have not enough time to educate myself about sustainable food production/consumption					
I make a point of using natural or ecological food products					
I prefer to buy unpackaged food					
Cooking is a task that is best over and done with					
Shopping for food is like entertainment for me.					
I know the meaning of the different date labels on the food products					
If I buy a food product that I am going to consume soon, I take the one from the shelf with the soonest expiration date.					

Please give a score between 1: lowest impact - 5: highest impact to the following factors based on the environmental impact they have ("0" means "I don't know")	
Farming Run-Off	
Factory Farming	
Family-based farming	
Pesticide usage	
Glyphosate	
Food Transportation	
Packaging	
Food Waste in the Supermarkets	
Food Waste at home	
Food Waste at the Farm level	
Fruits and Vegetables	
Dairy and Milk Products	
Meat and Meat Products	
Grain and bread	
Oilseeds and Legume (i.e. lentils, beans, peas, ...)	
Organic food	
Regional food	
Plastic	

How important are the following criteria when you make food choices 1="very Unimportant" 5="very important"					
	1	2	3	4	5
Cost					
The distance of food transportation (food miles)					
Packing					
Seasonal food (i.e. buying fruits & veggies when they are harvested in your country of residence)					
Fair trade (fair prices for farmers, etc.)					
Animal welfare					
Genetic Modification of plants					
Hormones, Antibiotics fed to animals to increase their performance					
Menu planning to avoid food waste					
Regional food					
Organic food					
Clean food (i.e. food without artificial aroma, and without preservatives)					
Free from (lactose, gluten, ...)					
Protected Denomination of Origin / Protected Geographical Indication (examples: Parmeggiano Reggiano, Prosciutto die Parma, Kalamata Olive oil,)					

How old are you?

What is your marital status?
Married
Not Married

What is your gender?	
Male	
Female	
Other	
Please specify your country of residence	

How many children do you have?

How do you define yourself?	
Lacto-ovo vegetarian (Vegetarians who avoid all animal flesh, but do consume dairy and egg products)	
Lacto vegetarians (Vegetarians who avoid animal flesh and eggs, but do consume dairy products)	
Ovo vegetarians (Vegetarians who avoid all animal products except eggs)	
Vegans (Vegetarians who avoid all animal and animal-derived products)	
Omnivore (eats a variety of food of both plant and animal origin.)	
Other (Please explain)	

Appendix 3: Expert Interview Form Used in the Study

DECLARATION by participant: Please tick (X or \checkmark) and provide your initials

I have read the information for this project study and I understand the contents.	Yes [<input type="checkbox"/>]	No [<input type="checkbox"/>]	Initials [<input type="text"/>]
I have had the opportunity to ask questions and all my questions have been answered to my satisfaction.	Yes [<input type="checkbox"/>]	No [<input type="checkbox"/>]	Initials [<input type="text"/>]
I fully understand that my participation is completely voluntary and that I am free to withdraw from the study at any time (prior to publication) without giving a reason	Yes [<input type="checkbox"/>]	No [<input type="checkbox"/>]	Initials [<input type="text"/>]
I understand that I will be given an opportunity to review the transcript from this questionnaire to confirm the accuracy	Yes [<input type="checkbox"/>]	No [<input type="checkbox"/>]	Initials [<input type="text"/>]
I agree that the information I provide during the questionnaire may be stored and used for the purpose of future research which is related to this project within an ethical framework.	Yes [<input type="checkbox"/>]	No [<input type="checkbox"/>]	Initials [<input type="text"/>]
I understand that the information from this project and questionnaire will be published; however, I will not be identified as a participant in this research in any publication.	Yes [<input type="checkbox"/>]	No [<input type="checkbox"/>]	Initials [<input type="text"/>]
I freely and voluntarily consent to participate in this questionnaire	Yes [<input type="checkbox"/>]	No [<input type="checkbox"/>]	Initials [<input type="text"/>]

PARTICIPANT'S NAME: _____

Contact Address: _____

Phone Number: _____ **E-mail:** _____

Participant's Signature: _____ **Date:** _____

Interview Questions

1. How do you define the concept of “sustainable food consumption”?
2. Which dimension would you apply to evaluate the concept of sustainable food consumption?
3. How much are adults aware and how much do they know about sustainable food consumption? Please answer this with respect to the knowledge and awareness of different social classes (ABC classes; i.e. a combination of income, education level, professional status).
4. What are the effects of food consumption on the environment in your opinion? And what are the consequences of a lack of awareness about the environment issues?
5. What are (if any) the obstacles that hinder adults to change their food consumption habits?
6. What are the most effective reasons that cause food waste (unconsumed food) by the adults after purchasing of food products?
7. When you compare the recommendations for sustainable food consumption with the everyday food consumption habits, where is the biggest discrepancy between recommended food consumption and actual food consumption? Or in other words, what food habit should consumers change first to have the biggest positive effect on sustainability?
8. Do you think sustainable food consumption has favorable effects on human health? In both cases, please tell us why?
9. Do you think that sustainable food consumption of adults has an impact to fight hunger in the world?
10. What are your suggestions to enhance the current food consumption habits of adults?
11. What are your suggestions to adults to achieve sustainable food consumption;
 - i. before purchase,
 - ii. during preparation and consumption
 - iii. and after consumption of food products.
12. In which aspects of sustainability and nutrition (food) do you feel to have sufficient knowledge?
13. In which aspects of sustainability and nutrition (food) do you want to know more about?
14. Which communication channels do you think are more effective in sharing information about sustainability and food?
15. Do you know any training courses for adults about sustainable/ healthy nutrition?



This report was prepared as Output 1 of the project “Assessing and Changing Adults’ Behaviour on Sustainable Consumption of Food” (Project No: 2018-1-TR01-KA204-058739), which is implemented in the frame of the Erasmus+ KA204 Strategic Partnerships for Adult Education.



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Assessing and Changing Adults’ Behaviour on Sustainable Consumption of Food
Erasmus+ KA2 Strategic Partnership for Adult Education
[2018-1-TR01-KA204-058739]

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