



Conference on ‘Sustainable food consumption’

Wholesome Nutrition: an example for a sustainable diet

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‘Wholesome Nutrition’ is a concept of sustainable nutrition that was developed at the University of Giessen in the 1980s. In this concept, health and the ecologic, economic, social and cultural dimensions of nutrition are equally important. In 1992 at the UN-Conference on Environment and Development in Rio de Janeiro the definition of ‘Sustainable Development’ comprised the dimensions environment, economy and society. Additionally to these three ‘classical’ dimensions of sustainability, we included ‘health’ as the fourth dimension because nutrition has far reaching effects on human health. The fifth dimension, ‘culture’, became part of the sustainability dialogue since many years; the respective cultural background influences food habits. Presently, mankind has to cope with huge global challenges such as poverty and food insecurity in low-income countries as well as climate change. Therefore the objective is to identify prospects for actions to respond to these global challenges. The concept of ‘Sustainable Nutrition’ analyses the food supply chain at all stages from input-production and primary production to processing, distribution, preparation, consumption and waste disposal. The present analysis leads to the following seven principles: preference of plant-based foods, organic foods, regional and seasonal products, preference of minimally processed foods, Fair Trade products, resource-saving housekeeping and enjoyable eating culture. This concept is based on holistic thinking and has the potential to reduce the global challenges in the field of nutrition. Scientists, stakeholders, multipliers and consumers are asked to consider environmental, economic, social and cultural aspects in addition to the biological (health) aspects.

Wholesome nutrition: Sustainable nutrition: Dimensions of sustainability: Climate change: Food security

What does ‘Sustainable Nutrition’ mean?

‘Wholesome Nutrition’ (German: Vollwert-Ernährung) is a concept of sustainable nutrition that was developed by Koerber *et al.* at the Institute of Nutritional Sciences at the University of Giessen in the 1980s⁽¹⁾. Wholesome nutrition is a mainly plant-based diet, where minimally processed foods are preferred. The central food groups are vegetables and fruits, whole-grain products, potatoes, legumes and dairy products. Native cold-drawn plant oils, nuts, oleaginous seeds and fruits are also important, but should be consumed in moderate quantities. If desired, small amounts of meat, fish and eggs can be

consumed. This concept includes four equally important aspects: health, ecologic, economic and social aspects⁽¹⁾.

About a decade later, at the UN-Conference on Environment and Development in Rio 1992, ‘Sustainable Development’ was defined by the three ‘classical’ dimensions: environment, economy and society. Sustainable Development is the guiding concept of society: the needs of the present generations should be satisfied without threatening the needs of future generations. That means resources should only be used to the extent as they can be regenerated. Furthermore, there should be equal opportunities for every human being on earth, which

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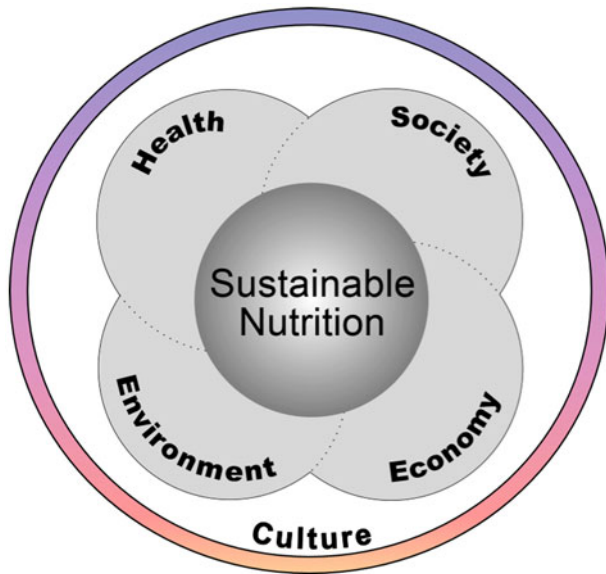


Fig. 1. (Colour online) Dimensions of a Sustainable Nutrition (adapted from Koerber *et al.* ⁽¹⁾; Koerber ⁽⁵⁾).

means that industrial countries need to stop living at the expense of people in the Global South⁽²⁾.

From the beginning in the 1980s, we included ‘health’ as the fourth dimension, because nutrition among others has far reaching effects on human health. In 2005, Leitzmann and Cannon established the New Nutrition Science Project, under the umbrella of the International Union of Nutritional Sciences and the World Health Policy Forum. This project picked up our concept of complementing the biological focus with environmental and social aspects^(3,4).

Some years ago, we added ‘culture’ as the fifth dimension because the respective cultural background influences food habits (Fig. 1). Culture has been part of the sustainability dialogue for many years, especially in the context of Education for Sustainable Development⁽⁵⁾.

The concept of Sustainable Nutrition takes all stages of the food supply chain into account^(1,6): input production; agricultural production; food processing; distribution; preparation of meals; waste disposal.

Global challenges in the field of nutrition

Currently mankind has to cope with immense global challenges, on which food habits have a significant impact. Examples are energy supply and the long-term increasing energy prices, climate change, poverty and world hunger, water scarcity, soil degradation, loss of biodiversity, problems due to livestock breeding and feeding, as well as economic and financial crises⁽⁷⁾. In the following, a closer look is taken at two of those challenges: climate change and food insecurity.

The Intergovernmental Panel on Climate Change states that ‘human influence on the climate system is clear’, which means that it is the responsibility of

mankind to become active to tackle climate change⁽⁸⁾. At the UN Climate Change Conference in Paris in November–December 2015, 195 countries finally agreed to take action in order to limit the global warming to 1.5–2°C above the pre-industrial levels⁽⁹⁾.

Climate specialists call for the following necessary actions, especially in high-income countries as the main contributors to climate change, in order to reduce the greenhouse gas emissions significantly: renewable energy sources instead of fossil fuels, increase of energy efficiency, sustainable soil management, prevention of deforestation and finally the transformation towards a climate-friendly society. Moreover, low-income countries are asked to inhibit an increase in greenhouse gas emissions by climate-friendly technologies⁽¹⁰⁾. This transformation requires a shift towards sustainable lifestyles, including land use, mobility, habitation, nutrition, energy production and other factors. The concept of Sustainable Nutrition considers those factors and contributes to a reduction of greenhouse gas emissions in the field of nutrition by influencing consumer behaviour. Adoption of a diet that follows this concept can ultimately contribute to the limitation of global warming. Therefore it fits into the goal set in the Paris agreement. The following examples show the nutrition-related factors with the potential to contribute in achieving the climate goal.

The land use is responsible for one-quarter of the global greenhouse gas emissions, mainly due to deforestation and soil management as well as fertilisation⁽¹⁰⁾.

The example of Germany highlights three main contributing sectors to greenhouse gas emissions: Transportation of people (mainly cars and airplanes), habitation (including heating) and nutrition; each of these three sectors causes about 20 % of the total emissions (Fig. 2)⁽¹¹⁾.

The different stages of the food supply chain contribute to a varying extent to the total greenhouse gas emissions. In Germany, about half the greenhouse gas emissions in the field of nutrition are caused by agriculture, of which the production of animal-based products such as meat and milk accounts for 85 % (corresponds to 44 % of total nutrition-related emissions, Fig. 3). However, the consumption of animal-based products in OECD (Organisation for Economic Co-operation and Development) countries contributes just one third of the total energy intake⁽¹²⁾. The production of plant-based foods accounts for only 15 % (corresponds to 8 % of total nutrition-related emissions, Fig. 3) of the greenhouse gas emissions, yet it contributes about two-thirds of the total energy intake. This indicates the much lower energy efficiency of animal-based products. In order to limit the climate change, the preference of plant-based foods is the most efficient action in the field of nutrition. Direct consumer activities, such as cooling, heating, cooking, dish washing and food shopping, contribute nearly 30 % of the greenhouse gases. The remaining emissions are caused by retail and transport, as well as food processing⁽¹³⁾. This illustrates clearly the different potentials to reduce nutrition-related emissions by a change of consumer behaviour and shows the importance of the transformation to a climate-friendly society. Those

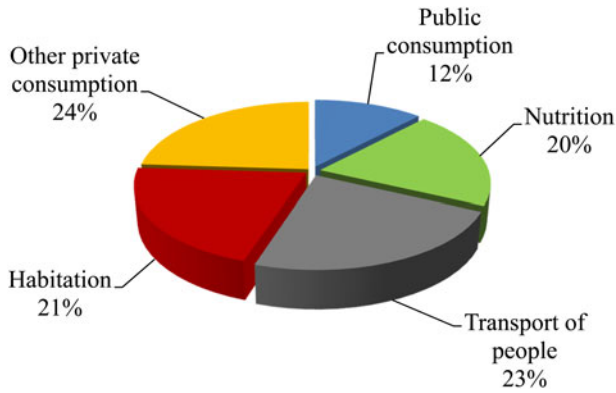


Fig. 2. (Colour online) Greenhouse gas emissions in carbon dioxide equivalents by sector in Germany (calculated from Umweltbundesamt)⁽¹¹⁾.

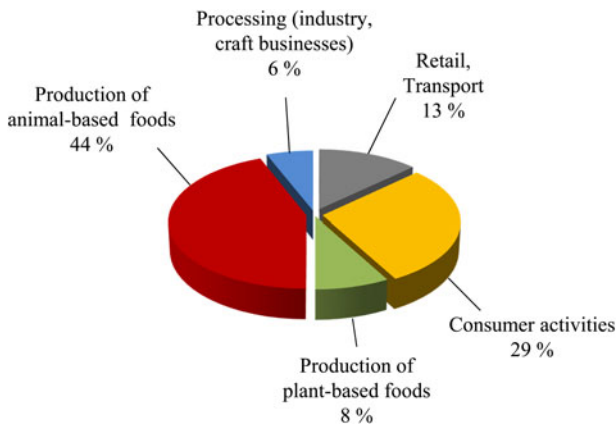


Fig. 3. (Colour online) Sectors of nutrition contributing to the greenhouse gas emissions in Germany (in % of total emissions of carbon dioxide equivalents caused by nutrition)⁽¹³⁾.

potentials are part of the concept of Sustainable Nutrition.

In addition to causing environmental damage on a global scale, climate change especially affects the daily life of people in the Global South. In 2012, about 32 million people worldwide became refugees because of the effects of climate change such as flooding, storms and other environmental catastrophes. This in turn causes food insecurity due to declining crop yields and other factors⁽¹⁰⁾.

According to estimates of the FAO (Food and Agriculture Organization), about 795 million people worldwide are undernourished. The highest absolute number of undernourished people lives in South Asia, followed by sub-Saharan Africa⁽¹⁴⁾. The highest prevalence is found in sub-Saharan Africa (e.g. 35% and more in Zambia and Central African Republic)⁽¹⁵⁾. Additionally, more than 2 billion people suffer from micronutrient deficiencies, known as 'hidden hunger'⁽¹⁶⁾. In total, about 3 billion people, almost half of the world population, suffer from insufficient food supply.

The global income is distributed very unequally. The richest quintile in the world possesses more than 80 %

of the global income; the poorest quintile only about 1 %. Even the second quintile possesses only about 2 % and the third quintile approximately 4 % of the global income⁽¹⁷⁾. Currently billions of people are living in poverty. There is a strong correlation between poverty and undernourishment.

The population of the high-income countries in the northern hemisphere claims much more agricultural land than the people in the southern hemisphere. The reason is that their dietary pattern is largely based on animal-based products. Plant-based foods require much less land for their production compared with animal-based products. This is due to so-called 'food transformation losses' that occur during the low-efficient transformation of energy in plants to energy in animal products. However, a moderate consumption of products from ruminants such as beef and dairy products is suitable because of 'food transformation benefits', which are important for global food security. Ruminants such as cattle, goats and sheep can feed on grassland that is mostly not usable for other agricultural production. This holds true only for extensive and sustainable livestock farming on permanent pastures^(6,18–20).

Moreover, goats are able to digest crude vegetation on land that is not cultivatable⁽²¹⁾. Another sustainable source of animal protein can be pigs that are fed with unavoidable food waste. The amount of soya and other grains used as livestock feeds, which in case of South America are frequently grown on deforested land, can be reduced and agricultural land can be saved at the same time. A widespread adoption of unavoidable food waste as animal feed would require a thorough food safety and disease control strategy⁽²²⁾.

There are additional aspects related to world hunger. It is estimated that the global population will increase to 10–12 billion people by the end of this century, mainly and fastest in Africa followed by Asia⁽²³⁾ where food insecurity is already an immense challenge⁽¹⁴⁾.

However, the absolute numbers are not as relevant, since the FAO data indicate that global agriculture could produce enough food for all people until the year 2050. Therefore, no person in the world needs to die of hunger. However, access to food is limited for poor families, because of missing resources to buy or produce food⁽²⁴⁾. The two main issues of this imbalance are first the use of agricultural land: plant-based foods or animal feed, with very low transformation efficiency into animal-based products, or renewable resources. The export of these agricultural products can increase the problem of unequal distribution. Secondly, the question of land use rights arises: who is allowed to cultivate the land? Land grabbing is a huge challenge in low-income countries that might increase food insecurity⁽²⁵⁾.

In this context, the trend to urbanisation is very important: by 2050, 66 % of the world's population is estimated to live in cities, in 2014 it was 54 %⁽²⁶⁾. The so-called nutrition transition takes place especially in cities, where the food habits change towards an increased consumption of animal-based products, fats and sugars, as well as convenience foods⁽²⁷⁾. These changes require much more agricultural land than traditional plant

foods. If a Western diet was adapted in low-income countries, it would result in a 2- or 3-fold increase of land use⁽²⁸⁾. This trend towards a Western diet can already be observed in some transition countries such as China, Mexico and Brazil⁽²⁹⁾. Emerging middle classes in those transition countries increase the demand for meat. For example, in some Asian countries the meat sector is estimated to grow by 80 % by 2022. Even India, a country known to be mostly vegetarian, records an increasing demand for meat by their growing middle class⁽³⁰⁾. As a result these dietary changes are predicted to cause a much higher land use than the population growth⁽²⁸⁾.

Nutrition transition is not only influencing land use but also impairs the health status of people. Combined with less physical activity, overeating leads to an increase in overweight and obesity and non-communicable diseases still exist in the Global South. This 'double burden of disease' is an additional challenge to the health and economic burden the Global South has to cope with^(27,31).

Principles of a Sustainable Nutrition

Sustainable Nutrition has the objective to identify prospects for action in response to these challenges. In the past 40 years, we developed the concept of Sustainable Nutrition, summarised in the following seven principles: (1) Preference of plant-based foods; (2) Organic foods; (3) Regional and seasonal products; (4) Preference of minimally processed foods; (5) Fair Trade products; (6) Resource-saving housekeeping; (7) Enjoyable eating culture. All principles are phrased in a positive way, since this is more motivating than prescribing restrictions.

In the following, the principles of Sustainable Nutrition are systematically described in terms of the five dimensions health, environment, economy, society and culture^(1,6,7,32–35).

Preference of plant-based foods

Environment. The most important principle is the preference of plant-based foods, which reduces the consumption of animal-based foods. There are different ecological benefits, such as less greenhouse gas emissions. Considering the entire food supply chain, for example in Germany, 72 % of the greenhouse gas emissions in the nutrition sector are caused by animal-based foods and only 28 % by plant-based foods. However, animal-based foods account for only about one-third of the total quantity of all foods consumed⁽³⁶⁾. Furthermore, the virtual water consumption is considerably lower for plant-based foods (virtual water (litre/kg product) e.g. 15 415 for beef, 5988 for pork, 5060 for cheese, 3265 for eggs, 1827 for wheat, 822 for apples, 287 for potatoes and 214 for tomatoes)^(37,38). The land use for the production of plant-based foods is distinctly less than for animal-based foods, because the conversion of plant products into animal products is often low-efficient. For these reasons the preference of plant-based foods enables a less intensive (hence more ecological) production.

Society. Social aspects are very important, for example lower 'food transformation losses' when less meat and dairy products are consumed. Worldwide one third of the arable land is used for animal feed production⁽³⁹⁾ which competes with food production especially in regions where food insecurity already exists. However, ruminants kept on permanent pastures support 'food transformation benefits' which increases the world food security (70 % of the worldwide agricultural land is pasture, which is only usable productively by ruminants). The import of feed and food causes conflicts for land use in low-income countries. Especially the deforestation of tropical rainforest for soya and palm oil production or pasture land is very problematic; for both people and climate⁽⁴⁰⁾.

Health. The health aspects of plant-based foods are the increase in the consumption of complex carbohydrates and the decrease of the consumption of fat, SFA, cholesterol and purines. The content of some vitamins, minerals and phytochemicals in plant foods is higher than in animal products. Dietary fibre, which is only present in plant foods, increases satiety even though the energy content of plant foods is the same or reduced compared with animal-based foods. Studies with vegetarians show several health benefits compared with meat eaters^(41,42).

Economy. Production of animal-based foods requires also more financial resources, due to higher input costs (e.g. higher requirement of energy, fertiliser and working hours). Thus, the expenses for food decrease in parallel with a decreasing consumption of meat and milk products (except products of low quality)⁽⁷⁾.

Culture. Only 60 years ago, meat used to be something special (usually it was consumed about once weekly). Currently high meat consumption has become more and more normal, especially for men⁽⁴³⁾. But new taste experiences are possible with creative vegetarian dishes.

Organic foods

Environment. Organic foods are produced according to natural cycles, which have various ecological benefits. A case study shows that the greenhouse gas emissions of organic farms compared with conventional ones are lower by an average of about 25 %⁽⁴⁴⁾. Further benefits are reduced soil erosion, higher biodiversity and less harmful residues in soil and water such as nitrates, pesticides and animal medication. Among other factors, organic farming avoids the use of mineral nitrogen fertiliser, which requires a large amount of energy for its production, as well as synthetic pesticides. The overfertilisation of soil causes high emissions of nitrous oxide, which have a huge greenhouse potential. Compared with the emission of nitrous oxide by conventional farming, the emission by organic farming is lower by an average of 40 %. Organic farming, moreover, facilitates a greater build-up of humus, which absorbs carbon dioxide from the atmosphere⁽⁴⁵⁾. Organic farming practices animal-friendly husbandry, such as more space and free range for the animals. Last but not least organic farming and organic food processing avoids controversial technologies such as GM plants and animals or radiation treatment of foods.

Economy. Generally farmers get higher prices for organically grown food. Economic security on farms increases the number and security of jobs through higher work intensity, farm-based processing and direct marketing. The price difference from conventional products has to be paid for by the consumer⁽³³⁾.

Society. High standard organic farming generally does not use cheap feed imports from low-income countries⁽⁶⁾. Moreover, in low-income countries, in contrast to high-income countries, organic farming can result in yield increases compared with conventional farming. Organic farming often entails additional services such as teaching farms and the inclusion of people with disabilities.

Health. Organic foods can contain a higher amount of phytochemicals. Usually they contain less pesticides, nitrates, animal medication and food additives. Potentially harmful technologies such as genetic engineering or radiation treatment are not permitted in organic food processing. Moreover, artificial colourings, sweeteners, stabilisers and flavour enhancers are prohibited in organic foods⁽⁶⁾.

Culture. Many consumers perceive organic foods to have a more intense taste. Above all transparency and trust is higher in organically grown and processed foods. Organic farming often fulfils the increasing demand of the consumer for more naturalness⁽⁷⁾.

Regional and seasonal products

Environment. Short distances from the farm to the consumers reduce energy consumption and greenhouse gas emissions⁽⁴⁶⁾. The need for energy and the emissions caused by transportation are extremely high for air-planes, and those for trucks are higher than for trains⁽⁴⁷⁾. Seasonal cultivation in the open causes less emissions of carbon dioxide, since it does not require heating oil for greenhouses or plastic tunnels.

Economy. Regional marketing and cooperation support small and medium-sized businesses. They secure livelihoods through regional networks between farmers, processors, retailers and consumers⁽⁷⁾.

Society. Clear structures create more transparency and trust for consumers and reduce the risk of food scandals or illegal practices⁽⁷⁾.

Health. Due to a prolonged ripening period, regional products can contain more essential and health-promoting substances. Seasonal products, which are not produced in heated greenhouses or plastic tunnels generally contain fewer harmful residues such as nitrates and pesticides⁽⁶⁾.

Culture. Regional and seasonal products can taste better because usually they have a prolonged ripening period. The appreciation of regional specialties and the biodiversity increase. The adaptation to seasonal variations leads to a more diverse food choice⁽⁷⁾.

Preference of minimally processed foods

Health. Food processing such as heating and separation of ingredients such as milling of grains can destroy or remove essential and health-promoting substances. Minimally processed foods generally contain more of

these substances and have a higher nutrient density and lower energy density. Convenience products often contain high amounts of fat, sugar and salt; and most likely food additives, such as preservatives, colouring and flavouring substances. Staple foods are usually not processed with debatable methods such as genetic modification or radiation treatment. However, this does not imply that only unprocessed foods should be eaten, rather a mixture of heated and unheated foods is recommended. A few processing methods do increase desirable ingredients, such as fermentation or sprouting of seeds⁽¹⁾.

Environment. Food processing needs a lot of energy and causes pollutant emissions. Additionally food processing requires a high amount of virtual water. Due to less processing stages at different locations the transport volume is reduced for minimally processed foods and the necessity of intermediate packaging is less⁽⁷⁾.

Society. The purchase of minimally processed foods supports traditional, small craft enterprises or on-farm shops since highly processed foods are typically produced by big companies. Thus, jobs are secured and the buyer-seller relationship is improved⁽⁶⁾.

Economy. Staple foods are generally cheaper than convenience products or fast food. Sweets, snacks and alcoholic beverages are more expensive. An exception is highly processed wheat flour, which is relatively cheap⁽⁶⁾.

Culture. Food preparation with natural and fresh products is more ambitious and requires more time. But it can increase the appreciation for these products as well as for the people working in the food supply chain. It enhances cooking skills and the handling of foods strengthens the sensory perception. Moreover, food preparation can raise the pleasure of meals and can be a social event⁽⁷⁾.

Fair Trade products

Economy. Fair Trade products lead to higher income for producers in low-income countries. Local farmers need fair and stable prices that cover their costs. The Fair Trade system increases planning security because of long-term guaranteed purchases and prepayments. The reduction of intermediate trade saves costs, which allows a higher income for the producers⁽⁴⁸⁾. Also the farmers in high-income countries need prices that cover their costs, e.g. the challenge of decreasing milk prices in Europe. The global concentration process to big companies in farming, processing and retailing is a huge problem for small and middle-sized enterprises, because they cannot compete with the low prices⁽³⁰⁾. Fair prices contribute to their livelihood and create new workplaces in rural areas.

Society. In the Fair Trade system, child labour as well as forced labour are excluded. The system offers education of local producers and supports social projects⁽⁴⁸⁾. For example, it stimulates the infrastructure through the construction of schools and hospitals. Furthermore, Fair Trade provides social insurances for workers and facilitates the founding of labour unions.

Environment. Fair Trade usually includes environmental requirements such as the decreased use of chemicals in producer countries, reforestation or drinking water



protection⁽⁴⁸⁾. About two-thirds of Fair Trade products are produced with certified organic quality, which also reduces the ecological impact in comparison with conventional production⁽⁴⁹⁾.

Health. In low-income countries the enhanced health and safety measures, which are implemented in Fair Trade standards, reduce the risk of exposure to potentially harmful pesticides. Moreover, higher wages allow higher expenses by the producers for food and education⁽⁴⁸⁾, which can lead to an improved nutritional and health status.

Culture. In the high-income countries educational work is necessary to explain the higher prices of Fair Trade products, and to increase the sense of responsibility. For example, the price difference between the conventional and the Fair Trade option for a cup of coffee is very small⁽⁷⁾.

Resource-saving housekeeping

For a sustainable management of the households the following aspects are important:

Switching to renewable energy instead of using coal, natural gas and nuclear energy: Production, processing and marketing need a lot of energy as well as household activities such as cooling, cooking, dish washing or the use of electrical appliances. Electricity generated with fossil energy such as coal, oil or natural gas produces high amounts of greenhouse gases. Power generation with renewable energy is generally more climate-friendly and safe⁽⁶⁾.

Saving energy in the kitchen: Large electrical appliances such as refrigerators, ovens, dishwashers, washing machines and tumble driers can be very energy intensive. In addition to using energy from renewable sources, energy-efficient appliances are required. In the EU, there are labels for appliances that range from A+++ for high efficiency to G for low efficiency. These labels provide information on energy and water consumption. There are many recommendations to save energy in households such as choosing a burner or hot plate that is appropriate for the size of the bottom of the pot. An extensive overview about further measures is provided elsewhere⁽⁶⁾.

Shopping trips better on foot or by bike, rather than by car: For grocery shopping, cars are the most environmentally harmful mode of transportation. Using a car regularly can offset all efforts for a climate-friendly diet, e.g. by eating less animal products and more ecological foods and local and seasonal products. Walking, cycling or public transportation is better for the climate and cheaper⁽⁶⁾.

Prevention of food waste: About one-third of globally produced foods is wasted. For example in Germany, people also waste one-third of all edible foods; two-thirds of this is caused by private households. In some countries, it is even higher. The food waste is ethically irresponsible, taking into account that globally 795 million people are undernourished especially in low-income countries⁽¹⁴⁾; raising awareness is absolutely crucial here⁽⁶⁾. However, unavoidable food waste can be fed to pigs as an efficient recycling strategy that could significantly contribute to a land use reduction of pork production⁽²²⁾.

Prevention of packaging waste: In Germany, every person uses 145 kg packaging per year, most of this comes from foods. Unpackaged products or reusable packaging should be preferred. Generally, products in reusable packages are better for the environment than those in disposable packaging. Minimum-sized containers are not recommended⁽⁶⁾.

Enjoyable eating culture

Enjoying tasty meals and generally enjoying eating culture is our final recommendation. This is no contradiction to meeting the above health, ecologic, economic and social requirements for sustainability. Pleasure is fundamental for the implementation of increased sustainability, not only in the field of nutrition⁽⁶⁾.

Obstacles for transforming the principles into reality

The described principles raise the question of how consumers can transform this into reality. There are a lot of challenges concerning sustainable behaviour. One of the biggest is the higher prices for sustainable products and the lack of willingness to pay more. As the 'true costs' of non-sustainable production are hidden, the sustainable products cannot be offered for the same low price. In addition, convenience and old habits are obstacles consumers have to overcome. The availability and the information about sustainable production and the political and economic conditions are not always the best. Sometimes economic interests of a growth-oriented society and policy can inhibit progress⁽⁷⁾.

To break down these barriers all stakeholders can promote the realisation of an increase in sustainability. The development of frameworks is important to support consumers in their behaviour. Producers could provide more sustainable foods. Retailers could increase the availability and transparency. There are different political and economic instruments to promote sustainable products such as tax incentives and the internalisation of external costs, which means honest prices. Clear labelling is also crucial to motivate consumers towards more sustainable consumption behaviour.

Conclusions

The concept of Sustainable Nutrition is based on holistic thinking and considers the multi-dimensional interactions in the food supply chain. It is an important communication tool to put scientific findings into practice. It has the potential to cope with some of the global challenges in the field of nutrition.

Sustainable Nutrition promotes different goals in five dimensions: preventive health protection; fair economic relationships; social justice; clean air and water, healthy soils; enjoyable eating culture. These benefits and the high quality of sustainable products cannot come for free. It is necessary to increase the appreciation of our food. To reach this goal all scientists, stakeholders,

multipliers and consumers should support 'Education for Sustainable Development'. This is one of the new 'Sustainable Development Goals' that the United Nations agreed upon in September 2015. It will play a crucial role in the transformation towards a more sustainable society, respectively, a more sustainable way of life.

Acknowledgements

The authors are grateful to the 12th European Nutrition Conference FENS 2015 organisers for the invitation to present this paper. We thank Julian Waldenmaier for his help in translating the text and for his literature research and comments about several topics. We thank Lorenz Hartmann and Dorothee Harrison for their proofreading.

Financial Support

None.

Conflicts of Interests

None.

Authorship

K. v. K. drafted the paper to which Nadine Bader contributed in many respects. C. L. has been involved in the conception of Wholesome/Sustainable Nutrition for 40 years and provided his broad knowledge to the paper.

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