



DGE position statement on a more sustainable diet

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Background

While “sustainability” has become a central aspect of social action and responsibility around the world, its complex and multi-dimensional nature requires further explanation. The Brundtland Report from the World Commission on Environment and Development, which represents a landmark in the understanding of sustainability, describes the term as a development “that meets the needs of the present without compromising the ability of future generations to meet their own needs” [1]. Another milestone was set by the so-called Club of Rome in 1972 who, for the first time, raised awareness on the limited nature of the world’s natural resources and called for an international environmental policy in their publication “The Limits to Growth” [2].

Member states at the 2015 General Assembly of the United Nations agreed on the 2030 Agenda, which linked the necessary transformation of the world to specific ecological, social, and economic goals. The 17 goals and 169 sub-goals described by the agenda are known as the Sustainable Development Goals, or SDGs [3]. The European Union also committed itself to the 2030 Agenda [4], and Germany has since developed a national sustainability strategy that is updated every two years. 231 indicators are used to constantly measure how well the targets are being achieved [5], and the results are published by the German Federal Statistical Office [6, 7].

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Sustainable diets¹ are an essential part of sustainable development. Given its member states’ different situations and conditions, the United Nations’ Food and Agriculture Organization (FAO), together with Biodiversity International, stated that: “Sustainable diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources” [8].

On the European level, sustainable food production and nutrition are embedded in the so-called “European Green Deal”, which aims to make Europe one of the world’s first regions to achieve climate neutrality by 2050. In this context, the central strategy known as “Farm to Fork” was developed to implement the different goal dimensions of sustainable development along the entire value chain [9]. This strategy is part of the discussion on planetary boundaries, which were first outlined by Johann Rockström in 2009 [10–13] and serve as the basis for the UN’s “Pathways to Sustainable Land-Use and Food Systems” report [14] and the Voluntary Guidelines on Food and Nutrition [15]. The Eat-Lancet Commission similarly draws on the concept of planetary boundaries in its recommendations [16] (■■■ compare the section “Status quo: Comparison of the “Planetary Health Diet” recommendations (EAT-Lancet Commission) with the DGE recommendations for a wholesome diet”, p. 148).

The German nutritionists Karl von Koerber, Thomas Männle, and Claus Leitzmann from Giessen University were already calling for a holistic assessment of nutrition at the begin-

¹ The FAO’s final document uses the term “sustainable diets”. A sustainable diet is defined as the transformation of food consumption, including upstream and downstream processes.

ning of the 1980s. They systematically demonstrated the importance of nutrition for health, environment, the economy, and society for the first time in a set of wholesome diet and dietary recommendations that emphasised plant-based foods while strongly limiting the consumption of animal-based foods [17]. The wholesome diet refers to the practical implementation of nutrition ecology – a scientific discipline that considers the whole value chain from agricultural production, storage, processing, and trade to consumption and disposal [18, 19]. Influencing factors such as socio-cultural aspects and questions of governance are also included [20], and the concept's transdisciplinary approach addresses the complexity and multidimensionality of nutrition and food production [21].

In 2020, based on various definitions of sustainable nutrition [23–28], the Scientific Advisory Board on Agricultural Policy, Food and Consumer Health Protection at the Federal Ministry of Food and Agriculture (WBAE²) [22] named health, environment, social aspects, and animal welfare (♦ Figure 1) as the four goal dimensions (the "big four") of a more sustainable diet in its comprehensive report, "Promoting more sustainable food consumption: Developing an integrated food policy and creating fair food environments". The title suggests that, rather than claiming to have developed a comprehensive definition of sustainable food consumption, the report aims to distinguish between less and more sustainable patterns of food consumption for a prosperous country such as Germany [22]. The following therefore refers to a "more sustainable diet".

Goal dimensions of a more sustainable food consumption and diet

Health is a central goal of a more sustainable diet, as our health status, quality of life, and well-being are all influenced by what we eat and drink. However, the importance of eating and drinking extends well beyond the health dimension. The WBAE report [22] therefore includes satisfying people's basic need for socio-cultural participation and self-determination alongside their health-related needs, and rates a diet as more sustainable "...if, on the one hand, it satisfies the basic nutritional needs of individuals living today and, on the other hand, does so in a way that is less detrimental to the ability of people living today and in the future to meet their basic needs than current diets" (WBAE Report ch. 2, p. 21). Focusing on meeting the basic needs of both present and future generations justifies, among other things, the four goal dimensions of health, social aspects, environment, and animal welfare (♦ Figure 1) and protects against interventions in our lifestyles that cannot be adequately justified as legitimate.

Along with the four goal dimensions of a more sustainable diet, the WBAE report [22] systematically and comprehensively describes and analyses the current situation and potential problems in the areas of health, environment, social aspects, and animal welfare (WBAE report ch. 4). It mainly focuses on Germany, but also looks at international aspects. The report identifies numerous conceptual and methodological challenges involved in assessing sustainability (ch. 5), highlights the considerable need for action in all four areas, and proposes suitable measures to meet this need (ch. 9). It particularly highlights the need for an integrative view and strategy for a more sustainable diet.

² WBAE = *Wissenschaftlicher Beirat für Agrarpolitik, Ernährung und gesundheitlichen Verbraucherschutz*

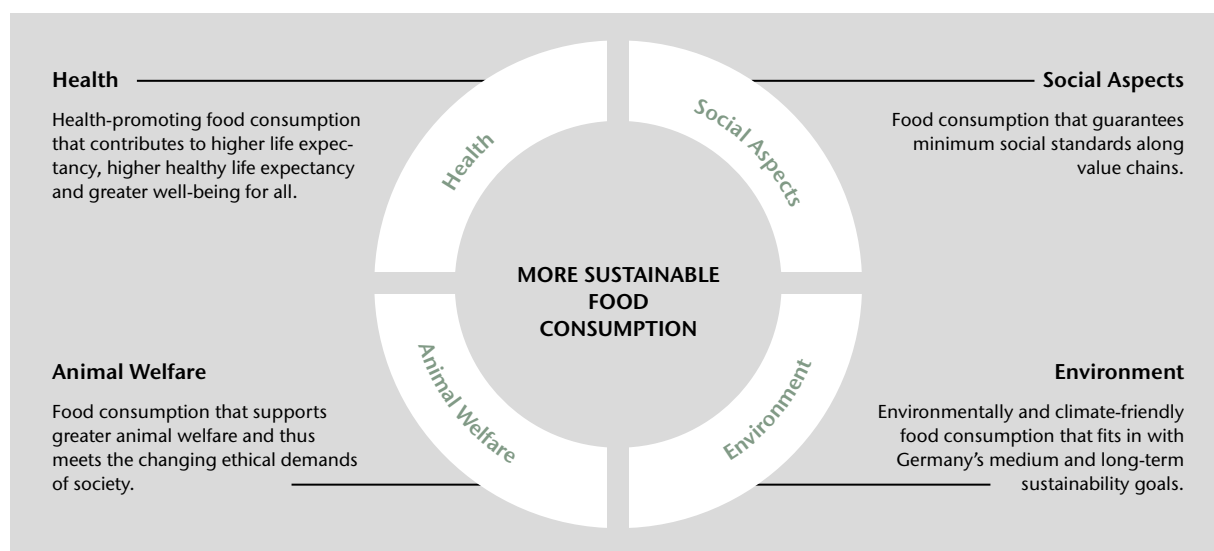


Fig. 1: WBAE's four key goals of a more sustainable food consumption and diet [22, 29]



In accordance with its mission and expertise, the health dimension has been and remains a priority in the German Nutrition Societies' activities (DGE, see statutes of the DGE³). To realise a more sustainable diet comprehensively, the goal dimensions of environment, social aspects, and animal welfare will also be explicitly addressed in the future DGE's activities, as outlined below (♦ Figure 2).

Health dimension

A wholesome diet in accordance with the recommendations of the DGE ensures that the requirement for essential nutrients is covered. The DGE establishes reference values for the intake of energy and the energy-supplying nutrients fats, carbohydrates, and proteins, and of micronutrients, dietary fibre, and water [30]. These aspects will be integrated into the definition of Food-Based Dietary Guidelines (FBDG), which will also include scientific findings on the influence of foods, food groups, and nutrients or food constituents on the development of diet-related diseases [31]. Adherence to the nutritional recommendations prevents under-supply (malnutrition) and over-supply and contributes to the prevention of the development of diet-related diseases. A wholesome diet according to the 10 guidelines of the DGE contains a diversity of foods and emphasizes the consumption of mainly plant-based foods [32].

The understanding of health has been constantly developing over time. In 1986, the World Health Organisation (WHO) set a central milestone with the Ottawa Charter for Health Promotion by postulating mental and social aspects as central key dimensions of health that stand alongside physical health [33]. Health is no longer seen as a fixed "on-off" concept that is defined by the absence of (physical) illnesses, but as a multidimensional process that enables people to shape their own lives and undertake the activities they need and desire within their own life-contexts. Health promotion is therefore understood as a "process that empowers people to increase control over and improve their health" [33–35]. Nutrition and dietary habits – what and how people eat – are fundamental aspects of both physical, mental, and social health and well-being.

This anthropocentric health approach increasingly appears in a broader context. For example, the "One Health" concept stresses the similarities and interactions between human, animal, and environmental health [36–38], focusing strongly on the containment of food-borne zoonoses and emerging infectious threats. The Planetary Health concept is even more comprehensive, focusing on the links between human health and our planet's economic, social, and natural systems [39–41]. What these concepts have in common is the assumption that the health of humans, animals, and the environment are closely interlinked.

Environment/Climate dimension

Our food is increasingly produced in complex and global value chains that range from manufacturing the means of production for farming, through the agricultural production itself, to industrial food processing, trade, and consumption. Aspects of sustainability, such as environmental impacts, can be tracked along these chains (♦ Figure 2), and a comprehensive evaluation of the entire life cycle of foods and products is essential.

Food production and consumption produces 25–30% of the world's greenhouse gas emissions [42–44]. Food production generates greenhouse gases such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), for example through tractors and other machinery, fertilisers, heated greenhouses, intensive livestock husbandry, food processing, cooling or freezing food, transporting food to the point of consumption, and ultimately the preparation of meals. Food waste not only causes a loss of food production resources, but also generates greenhouse gases during disposal.

As well as greenhouse gas emissions, the increasing intensification of agriculture has numerous other impacts on the environment and, as an open system, affects soil, water, animals, and plants. For example, intensive tillage may increase the risk of erosion, lead to soil compactness, and reduce soil fertility in the long term [45]. The excessive use of antibiotics in intensive livestock husbandry carries the risk of developing resistances [46]. The application of fertilisers and pesticides significantly affects the biodiversity of plants and animals [47], and intensive nitrogen fertilisation is responsible for groundwater nitrate contamination [48].

The production of animal-based foods such as meat, eggs, milk, and dairy products (especially those derived from ruminants such as cattle, sheep, and goats) causes particularly high greenhouse gas emissions. In contrast, the share of greenhouse gas emissions deriving from plant products such as grains, legumes, vegetables, and fruits is usually much lower. There are also differences within food groups. For example, vegetables grown in a greenhouse heated with fossil energy cause between 5 and 20 times more greenhouse gas emissions than seasonal vegetables grown in unheated greenhouses or open fields [22].

Overall, the choice between different food groups often has the biggest impact on the environment, as differences between food groups are usually significantly higher than differences within a food or product group. For example, on average, 1 kg of beef causes about 12 kg of CO₂ equivalents, whereas the same weight of lentils causes less than 1 kg of CO₂ equivalents [49].

³ → www.dge.de/fileadmin/public/doc/wueu/DGE-Satzung.pdf

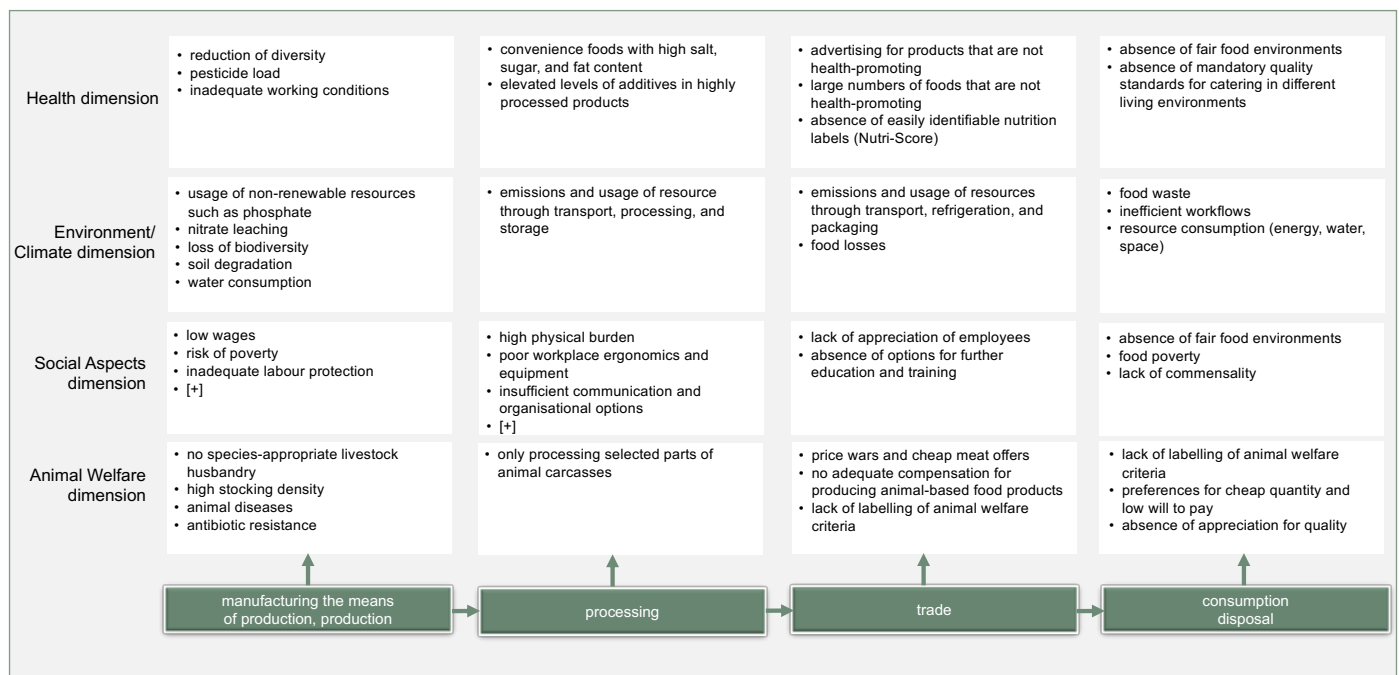


Fig. 2: Examples of problem areas along the four goal dimensions of a more sustainable diet and the value chain (own illustration)

Note: Disposal occurs not only after consumption or intake, but at every stage of the value chain.
 [+] = The examples mentioned also apply to the following part of the value chain.

It is not, therefore, sufficient to base dietary recommendations exclusively on aspects of health promotion. Rather, it is essential to design diets in ways that do not over-use or waste resources. While a predominantly plant-based diet contributes significantly to environmental and climate protection, and many food groups such as vegetables, fruits, and whole-grains promote health, there are also health-promoting food groups which require a higher input of resources and are more climate-intensive (e.g., milk and dairy products, fish) [50]. The challenge is therefore to balance environmental and health goals and find a compromise that takes both dimensions into account.

Social Aspects dimension

Because the monitoring and evaluation of food's social aspects dimension is much less conceptualised than other areas, the "social footprint" generated by food along the value chain is insufficiently assessed and difficult or impossible for consumers to evaluate (♦ Figure 2). It is frequently unclear, both globally, in the EU, and occasionally even in Germany, whether minimum social standards are being met [22].

For example, many itinerant workers are still needed for the cultivation and preservation of vegetables and fruit in domestic agriculture.

Although these people provide a substantial part of the labour needed to ensure regional and seasonal cultivation in Germany, their wages and accommodation often fall below the standards of permanent employees. A specific declaration such as the fair-trade label would therefore be desirable to allow consumers to identify whether social aspects played a role in the production and processing of the food they are buying, minimum requirements for both occupational health, safety and accident prevention were being implemented, and adequate wages were being paid.

Another central aspect of health-promoting and more sustainable diets is that they should be equally accessible to everyone, regardless of their respective economic and social situations. Combating food poverty is therefore a central aspect of the social aspect dimension. The mandatory implementation of the DGE Quality Standards in catering would, for example, create an important prerequisite for access to a more sustainable diet and participation. Practical, hands-on nutrition education in day-care centres and schools would also support participation and access for all children and adolescents.

Commensality – eating and cooking together – is a central social aspect of a more sustainable diet that has not yet received sufficient attention. Most people prefer to eat with others rather than alone [51], and it is part of the basic need for socio-cultural participation and self-determination. Commensality promotes psychological well-being, performance, and social bonds [22, 52]. Cooking (or learning how to cook) may promote knowledge of more sustainable diets in terms of choice, preparation, and consumption, as well as developing corresponding competences [22]. Initiatives such as creating appropriate dining environments and implementing the DGE Quality Standards in public canteens could make an important contribution.



Animal Welfare dimension

Another aspect of a more sustainable diet is livestock husbandry that supports better animal welfare, and therefore meets the changing ethical demands of (western) societies (♦ Figure 2) [22, 53, 54]. Animal welfare includes aspects of physical and mental animal health. In 2015, the Scientific Advisory Board on Agricultural Policy (WBA⁴) identified various problem areas and named nine different guidelines for sustainable livestock husbandry in its report "Pathways to a socially accepted livestock husbandry in Germany" [53]. These included the provision of sufficient space, a halt to amputations, a clear reduction in the use of medicinal products, varying climate zones, preferably including an outdoor climate where possible, and internal audits based on animal-related animal welfare indicators, which form the basis of the animal-related welfare recommendations of the 2020 WBAE report [22]. The "Competence Network for Livestock Husbandry" established in 2019 recommends a fundamental and long-term restructuring of Germany's livestock husbandry towards more animal welfare and environmental protection [55]. A gradual conversion of livestock husbandry systems with an increase in animal welfare standards should be achieved by 2040, along with the implementation of voluntary and state animal welfare labels [54]. While various private suppliers and the trade offer labels that mainly refer to the livestock husbandry system, this does not automatically ensure sufficient animal welfare. The state animal welfare label system which is currently in preparation therefore includes further animal welfare criteria such as animal health and behaviour parameters and genetics [22, 55].

As with farm animals, suitable indicators for fish welfare are also being discussed, but are not yet systematically reflected in food labels [22]. While organic fisheries follow various regulations on aspects such as water quality and stocking rates, the widespread MSC label does not contain any direct statements on animal welfare.

Food choices that followed the recommendations of the DGE would correspond to a significant reduction in the consumption of animal products in Germany, and would thus represent an important step towards a more sustainable diet. "Less" should also correspond to "better", i.e., a lower consumption of animal products should be paired with more animal welfare. An appropriate provision of comprehensive and valid labelling is also a central prerequisite for enabling consumers to decide in favour of more sustainable diets regarding this dimension.

Consideration of more sustainable diets in DGE statements

Nutrition recommendations for everyday life are given at various levels from dietary patterns to individual foods, and from catering to private households.

The DGE's central recommendations for a wholesome diet are summarised in the FBDG. Since these are also an instrument of food and nutrition literacy and nutrition policy, they play a central role in the transformation to sustainable food systems and form the basis on which the DGE has developed numerous recommendations and statements.

Since there are many synergies between the four goal dimensions of a more sustainable diet (health, environment, social aspects, and animal welfare) the DGE's dietary recommendations can make a significant contribution to a more sustainable diet.

Status quo: Comparison of the "Planetary Health Diet" recommendations (EAT-Lancet Commission) with the DGE recommendations for a wholesome diet

The Planetary Health Diet developed by the EAT-Lancet Commission is internationally accepted as the current yardstick for implementing a more sustainable diet. This universal reference diet provides a scope for supplying the future world population, which is estimated to reach 10 billion people by 2050, with a health-promoting diet that remains within the earth's ecological boundaries [16]. Country-specific adaptations of the Planetary Health Diet will be needed to meet these global recommendations. However, it must be noted that the proposed Planetary Health Diet is the result of a systematic review of scientific research on the relationship between diet and health and expert opinions, and there are various points at which the scientific justification for the recommendations remains open to discussion.

As shown in ♦ Table 1 and detailed in [56], the Planetary Health Diet is basically very similar to the recommendations of the DGE for a wholesome diet. Both diets balance primarily plant-based foods with smaller amounts of animal-based foods and limit the intake of saturated fats, highly processed foods, and added sugars [16, 32]. Food quantities in the Planetary Health Diet largely correspond to the DGE's approximate values for a wholesome diet [56] (♦ Table 1), and the recommendations for vegetables, fruit, and meat are very similar. Differences do exist in the recommendations for legumes, nuts, and milk and dairy products, and one reason for the different recommendations for milk and dairy products is the underlying calcium intake. The Planetary Health Diet considers an intake of 500 mg calcium per day to be adequate for the global population [16], while the D-A-CH reference value for an adequate calcium intake for the German-speaking population of 1,000 mg/d for adults is twice as high [30]. Furthermore,

⁴ WBA = Wissenschaftlicher Beirat für Agrarpolitik



milk and dairy products are an important source of other critical nutrients such as iodine and vitamin B₂ in Germany.

The main challenge for both recommendations is the fact that the amounts of food consumed in Germany [58] deviate considerably from these recommendations, as shown in ♦ Table 1, which uses four food groups as examples. As a result, there is a need for a substantial change in the German population's diet, which could make an enormous contribution to a diet that is both more sustainable and health-promoting.

Current revision of the Food-Based Dietary Guidelines (FBDG)

The DGE currently develops a mathematical optimisation model to refine its FBDG for wholesome diets, while simultaneously taking nutritional, health, and environmental aspects into account. Suitable energy intake and a sufficient supply of nutrients create the framework for a health-promoting diet. The revised derivation focuses on reducing the intake of food groups that are associated with

the development of diet-related diseases. Minimising harmful environmental and climate effects (greenhouse gas emissions and land-use) is also a priority in deriving the FBDGs. The social aspects dimension considers current dietary habits in Germany to ensure the FBDG's social and societal acceptance. In addition to the simultaneous consideration of different dimensions of sustainability in the derivation, optimisation models also allow for both target group segmentation and for the FBDG to be individually tailored [58].

Implementation of a more sustainable diet using the DGE Quality Standards for Public Sector Catering as an example

Revised versions of the DGE Quality Standards for Meals in Day-Care Centres, Schools, Companies, Hospitals, and Clinics, as well as for "Meals on Wheels" and Residential Care Homes for the elderly, were published in November 2020 [29, 59–62]. Each of the DGE Quality Standards addressed the effects of the four goal dimensions for a more sustainable diet on the process chain in public sector catering, describing them from planning to disposal and cleaning.

Health is covered by specifying minimum frequencies of recommended food groups such as vegetables, salads, and whole-grain products and maximum frequencies for meat or highly processed and deep-fried products. While the production of nutritionally sig-

Planetary Health Diet, EAT-Lancet-Commission [16]		DGE's wholesome diet [31]		German National Nutrition Survey II [57]	
Food group	Estimate (range) (g/d) (energy intake of 2,500 kcal/d)	Food group	Approximate value (g/d) (energy intake 1,600–2,400 kcal/d)	Food group	mean food intake (g/d) (energy intake 1,968 kcal/d)
vegetables	300 (200–600)	vegetables and salad, incl. legumes	≥ 400	vegetables incl. legumes	124
legumes	100 (100–225)				
fruits	200 (100–300)	fruits incl. nuts	≥ 250	fruits incl. nuts	166
nuts	25				
whole milk or products made from it in milk equivalents (g MEq)	250 (0–500)	milk or dairy products in MEq	596–728 ^a	milk or dairy products in MEq	443 ^a
beef, lamb, or pork	14 (0–28)	meat, sausage	43/86 ^b	meat, meat products and sausages	120
poultry	29 (0–58)				

Tab. 1: Comparison of the recommended intake for vegetables, fruit, milk/dairy products, and meat according to the Planetary Health Diet and the DGE's wholesome diet with the results of the German National Nutrition Survey II

^a The calculation of milk equivalents (MEq) used the ratio of milk to dairy products of the German National Nutrition Survey II (55% to 45%) and the following conversion factors from dairy products to MEq: milk, mixed milk beverages: 1.0; yoghurt/mixed milk products: 1.4; cheese and quark with average dry matter: 7.2

^b The approximate value for meat and sausages for people who eat meat is 300 g per week for adults with low caloric needs and up to 600 g per week for adults with high caloric needs [32].

Article comparing the Planetary Health Diet with the food-based dietary guidelines of the DGE [56]:

→ www.dge.de/fileadmin/public/doc/fm/dgeinfo/DGEInfo-06-2019-Vollwertige-Ernaehrung.pdf



nificant foods such as milk and dairy products, fish, or nuts could have a negative impact on the environment, such foods should still be integrated into the diet according to the recommended intake frequencies and quantities for their importance in promoting health. Approximately three quarters of the greenhouse gas emissions in mass catering are caused by food choices, and the rest by kitchen technology, preparation, and food waste [63]. Therefore, infrastructure, production planning, and employee behaviour are important influential factors for changing the environmental impact. The dimension of animal welfare is reflected in the area of food quality, for example where the DGE Quality Standards refer to meat that meets certain animal welfare criteria.

Social aspects and fostering participation are addressed by considering the eating habits of different age and social groups within their living environments, purchasing fair-trade products, and specifying criteria for the workplace and human resource management such as education and training, ergonomic workplace design, and employee work satisfaction.

Enable more sustainable diets through fair food environments

Consumers who want to realise a more sustainable diet will have to substantially change their patterns of consumption. While consumers are generally very interested in and motivated to eat more healthily, many fail to realise their goals in everyday life. Nutritional behaviour depends on both conscious, reflected decisions and a combination of the options available, habits and influences of which they might not even be aware [22, 64]. These are decisively shaped by the food environment, which forms the framework for nutritional behaviour. The WBAE [22] defines the food environment as all environmental factors that influence nutritional behaviour throughout the entire behavioural process. The influence of the food environment is far-reaching, affecting not only the actual decisions made in the moment of concrete consumption, but also the entire behavioural process. This process includes the four phases of exposition, access, choice, and consumption, as shown in ♦ Figure 3 [22]. These phases are effective in the different living environments and settings, suggesting that behaviour and food environments are closely linked.

What people see and perceive in their environment every day, and their exposure to food stimuli such as pictures or products, draws attention, calibrates perception, and shapes what is perceived as typical and normal (social norms). The structure and variety of the stimuli exposure implicitly shapes social norms, e.g., the offer of different portion sizes defines what people evaluate as appropriate and normal. An increase in larger portions and the elimination of small portions will change consumers' perceptions of what is "normal" and appropriate.

The food environment also strongly shapes which foods are accessible and acceptable to consumers. Prices and social norms are an important part of the food environment and implicitly define what consumers consider as appropriate behaviour, including which foods are accessible when and to whom. Other key factors are the availability and convenience of information and products.

Standing in front of a store shelf or at the food counter trying to figure out how sustainable the various choices are can be very time-consuming, and can make it much more difficult to access more sustainable options.

The food environment is also decisive in the consumption phase. Consumers are often unaware of the far-reaching influences of the food environment, as preferences and habits are partly learned implicitly and are not always related to the immediate consumption phase [22, 66].

Designing fair food environments – from exposition to consumption and disposal – is crucial for enabling consumers to implement more sustainable diets. In its 2020 report [22], the WBAE defines such food environments as fair when they are "(1) attuned to our human perception, decision-making possibilities and behaviour; and (2) are more health-promoting and have greater social, ecological and animal welfare compatibility and thus contribute to sustaining the livelihoods of the world's current and future generations." (WBAE report ch. 9, p. 653).

The DGE can make a significant contribution to the design and improvement of measures for a more sustainable diet. Some of the measures to which the DGE's recommendations contribute focus primarily on one particular aspect of the behavioural process, e.g., food labelling or food and nutrition literacy. The labelling of products primarily influences access. These primary effects subsequently have a (secondary) impact on other phases of the behavioural process.

However, various DGE recommendations also apply to all phases of the behavioural process, e.g., the Quality Standards for Catering. Catering in accordance with DGE Quality Standards usually implies reduced proportions of animal-based foods and more plant-based foods. Altering the food on offer in this way, e.g., in the context of school meals, leads to changes in exposure patterns in the school environment for children and young people. Increased exposure to higher quality and more sustainable choices helps to recalibrate social norms. At the same time, general access to healthier and more sustainable options, as well as choices for a more sustainable diet, are also altered. Eating habits are directly influenced by the design of the offer (e.g., quality, portion size) and the dining environment (e.g., the equipment in the dining hall). This means that high-quality catering in appropriate eating environments has a broad effect on food choice and eating behaviours.



Behavioural patterns in nutrition (5 major points: what, how much, when, where, with whom)

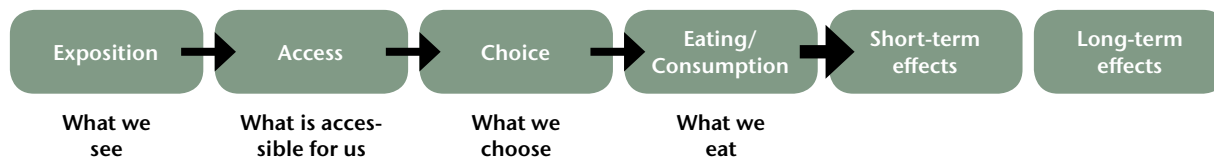


Fig. 3: Food environment [22, 64, 65]

Summary

Our understanding of the term sustainability has evolved considerably over the last 50 years, and is now a key element of social action. An essential part of sustainable development is a more sustainable diet. In this position paper, the German Nutrition Society states that advocating for and promoting a more sustainable diet is an integral part of its activities. Health is a key goal of a more sustainable diet since health, quality of life, and wellbeing are affected by what people eat and drink. The goal dimensions environment, animal welfare, and social aspects are explicitly added to the goal dimension health (in their various definitions).

The food environment is also immensely important for nutritional behaviour. The DGE relies on statements from the report of the Scientific Advisory Board on Agricultural Policy, Food and Consumer Health Protection at the Federal Ministry of Food and Agriculture (WBAE) to present a comprehensive form of the various aspects of a more sustainable diet. The position paper ensures a common basis for developing an understanding of a more sustainable diet, and enables the different fields of nutritional science to pursue a differentiated development from their specific perspectives. This paper should provide the DGE with an orientation and a commitment for its work in the future.

Conflict of Interest

Position papers and statements reflect the views and assessments – i.e. also the interests – of the organization(s) named in the author line. The authors declare that there are no further conflicts of interest in connection with the contents of this publication.

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References

1. United Nations: Report of the World Commission on Environment and Development: our common future. Oslo 1987.
2. Meadows D, Meadows D, Zahn E et al.: The limits to growth: a report for the club of Rome's Project on the predicament of mankind [Die Grenzen des Wachstums. Bericht des Club of Rome zur Lage der Menschheit]. Phys Unserer Zeit 4, Stuttgart 1972; 161.
3. United Nations, Department of Economic and Social Affairs: Transforming our world: the 2030 agenda for sustainable development. 2015. <https://sdgs.un.org/2030agenda> (last accessed on 02 September 2021).
4. European Parliament, European Council, European Commission: The new European consensus on development "Our world, Our dignity, Our future". Joint statement by the Council and the representatives of the governments of the Member States meeting within the Council, the European Parliament and the European Commission [Der neue europäische Konsens über die Entwicklungspolitik „Unsere Welt, unsere Würde, unsere Zukunft“. Gemeinsame Erklärung des Rates und der im Rat vereinigten Vertreter der Regierungen der Mitgliedstaaten, des Europäischen Parlaments und der Kommission]. Official Journal of the European Union 2017; 60: C210.
5. The Federal Government [Die Bundesregierung] (ed.): Germany's national sustainable development strategy [Deutsche Nachhaltigkeitsstrategie]. 2021. www.bundesregierung.de/resource/blob/992814/1875176/3d3b15cd92d0261e7a-0bcd8f43b7839/deutsche-nachhaltigkeitsstrategie-2021-langfassung-download-bpa-data.pdf?download=1 (last accessed on 25 March 2021).
6. German Federal Statistical Office [Statistisches Bundesamt] (ed.): Sustainable



- development in Germany. Indicator report 2021 [Nachhaltige Entwicklung in Deutschland. Indikatorenbericht 2021] 2021. www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Nachhaltigkeitsindikatoren/Publikationen/Downloads-Nachhaltigkeit/indikatoren-0230001219004.pdf;jsessionid=C361877BF3034F-D09D8C3FAB4A330D78.live711?__blob=publicationFile (last accessed on 02 September 2021).
7. German Federal Statistical Office [Statistisches Bundesamt] (ed.): Indicators of the UN Sustainable Development Goals [Indikatoren der UN-Nachhaltigkeitsziele. 2021.] <https://sdg-indikatoren.de/> (last accessed on 02 September 2021).
 8. FAO (Food and Agriculture Organization of the United Nations) (ed.): Biodiversity and sustainable diets. United against hunger. International scientific symposium, Rome, 3-5 November 2010. 2011. www.fao.org/ag/humannutrition/29186-021e012ff2db1b0eb6f6228e1d98c806a.pdf (last accessed on 02 September 2021).
 9. European Commission (ed.): Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions. "A Farm to Fork Strategy"- for a fair, healthy and environmentally-friendly food system [Mitteilung der Kommission an das europäische Parlament, den Rat, den europäischen Wirtschafts- und Sozialausschuss und den Ausschuss der Regionen. „Vom Hof auf den Tisch“ – eine Strategie für ein faires, gesundes und umweltfreundliches Lebensmittelsystem]. COM 2020; 381 final.
 10. Chen C, Chaudhary A, Mathys A: Dietary change scenarios and implications for environmental, nutrition, human health and economic dimensions of food sustainability. *Nutrients* 2019; 11: 856.
 11. Steffen W, Richardson K, Rockström J, et al.: Sustainability. Planetary boundaries: guiding human development on a changing planet. *Science* 2015; 347: 1259855.
 12. Poore J, Nemecek T: Reducing food's environmental impacts through producers and consumers. *Science* 2018; 260: 987-92.
 13. Rockström J, Steffen W, Noone K, et al.: A safe operating space for humanity. *Nature* 2009; 461: 472-5.
 14. FABLE Consortium (ed.): Pathways to sustainable landuse and food systems. 2019. www.foodandlandusecoalition.org/wp-content/uploads/2019/09/Fable-interim-report_complete-low.pdf (last accessed on 02 September 2021).
 15. Committee on World Food Security (ed.): The CFS voluntary guidelines on food systems and nutrition. 2021. www.fao.org/fileadmin/templates/cfs/Docs1920/Nutrition_Food_System/Negotiations/NE_982_47_8_VGFSYN.pdf (last accessed on 24 March 2021).
 16. Willett W, Rockström J, Loken B et al.: Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems. *Lancet* 2019; 393: 447-92.
 17. von Koerber K, Männle T, Leitzmann C: Wholesome Diet [Vollwert-Ernährung]. 10., completely revised and expanded ed., Haug: Stuttgart 2004.
 18. Spitzmüller E-M, Pflug-Schönfelder C, Leitzmann C: Nutrition ecology. Eating between pleasure and responsibility [Ernährungsökologie. Essen zwischen Genuss und Verantwortung]. Haug: Heidelberg 1993.
 19. Leitzmann C: Nutrition ecology. *Am J Clin Nutr* 2003; 78: 657S-9S
 20. Hoffmann I (ed.): Nutrition ecology [Ernährungsökologie]. Oekom-Verlag: Munich 2011.
 21. Schneider K, Hoffmann I: The concept of Nutrition Ecology: accepting challenges [Das Konzept der Ernährungsökologie: Herausforderungen annehmen]. In: Hoffmann I (ed.): Nutrition Ecology [Ernährungsökologie]. Oekom-Verlag: München 2011; 38-45.
 22. Scientific Advisory Board on Agricultural Policy, Food and Consumer Health Protection at the Federal Ministry of Food and Agriculture (WBAE) [Wissenschaftlicher Beirat für Agrarpolitik, Ernährung und gesundheitlichen Verbraucherschutz (WBAE) beim BMEL] (ed.): Promoting more sustainable food consumption. Developing an integrated food policy and creating fair food environments [Politik für eine nachhaltigere Ernährung. Eine integrierte Ernährungspolitik entwickeln und faire Ernährungsumgebungen gestalten. Gutachten. 2020]. (2020) www.bmel.de/SharedDocs/Downloads/DE/_Ministerium/Beiraete/agrarpolitik/wbae-gutachten-nachhaltige-ernaehrung.pdf?__blob=publicationFile&v=3 (last accessed on 02 September 2021).
 23. High Level Panel of Experts (HLPE): Food losses and waste in the context of sustainable food systems. 2014. www.fao.org/3/i3901e/i3901e.pdf (last accessed on 02 September 2021).
 24. von Koerber K, Kretschmer J: Nutrition according to the four dimensions. Interaction between nutrition and environment, economy, society and health [Ernährung nach den vier Dimensionen. Wechselwirkungen zwischen Ernährung und Umwelt, Wirtschaft, Gesellschaft und Gesundheit]. *Ernährung und Medizin* 2006; 21: 178-85.
 25. Federal Ministry of Economic Cooperation and Development [Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung] (ed.): The future contract for the world. The Agenda 2030 for sustainable development. [Der Zukunftsvertrag für die Welt. Die Agenda 2030 für nachhaltige Entwicklung]. 2017. www.bmz.de/resource/blob/23366/d52688f07df7a2c9aa78a3970295f5f5/materialie270-zukunftsvertrag-data.pdf (last accessed on 02 September 2021).
 26. Burlingame B, Dernini S: Sustainable diets and biodiversity – directions and solutions for policy research and action. 2012. www.fao.org/3/a-i3004e.pdf (last accessed on 02 September 2021).
 27. Mason PJ, Lang T: Sustainable diets. How ecological nutrition can transform consumption and the food system. Routledge: London 2017.
 28. Clark MA, Springmann M, Hill J, et al.: Multiple health and environmental impacts of foods. *Proc Natl Acad Sci USA* 2019; 116: 23357-62.
 29. German Nutrition Society [Deutsche Gesellschaft für Ernährung e. V.] (ed.): DGE Quality Standard for meals in schools [DGE-Qualitätsstandard für die Verpflegung in Schulen]. 5. ed., Bonn 2020.
 30. German Nutrition Society, Austrian Nutrition Society, Swiss Society for Nutrition [Deutsche Gesellschaft für Ernährung e. V., Österreichische Gesellschaft für Ernährung, Schweizerische Gesellschaft für Ernährung] (eds.): Reference values for nutrient intake [Referenzwerte für die Nährstoffzufuhr]. 2. ed., 6. updated ed., Bonn 2020.
 31. Oberitter H, Schäbenthal K, von Rüsten A et al.: The DGE Nutrition Circle – presentation and basis of the food-related recommendations from the German Nutrition Society (DGE). *Ernährungs Umschau* 2013; 60(2): 24-9.
 32. German Nutrition Society [Deutsche Gesellschaft für Ernährung e. V.] (ed.): 10 guidelines of the German Nutrition Society (DGE) for a wholesome diet [Vollwertig essen und trinken nach den 10 Regeln der DGE]. Detailed version. Bonn 2018.
 33. WHO (World Health Organization): Ottawa-Charta for health promotion [Ottawa-Charta zur Gesundheits-



- förderung]. 1986. www.euro.who.int/__data/assets/pdf_file/0006/129534/Ottawa_Charter_G.pdf (last accessed on 02 September 2021).
34. Wilberg A, Saboga-Nunes L, Stock C: Are we there yet? *J Public Health* 2021; 29: 1–7.
35. European Public Health Association, Austrian Society for Public Health (eds.): *The Vienna Declaration*. 2016. https://eupha.org/repository/publications/Vienna_Declaration_final_version_update24102016.pdf (last accessed on 02 September 2021).
36. Lerner H, Berg C: A comparison of three holistic approaches to health: One Health, EcoHealth, and Planetary Health. *Front Vet Sci* 2017; 4: 163.
37. German Federal Institute for Risk Assessment [Bundesinstitut für Risikobewertung]: *One-health-Approach at G20: collaboration between public-health and veterinary-public-health-institutes will be continued and expanded [One-Health-Ansatz bei G20: Die Zusammenarbeit der Public-Health- und der Veterinär-Public-Health-Institute wird fortgesetzt und erweitert]*. 2017. www.bfr.bund.de/de/presseinformation/2017/33/one_health_ansatz_bei_g20_die_zusammenarbeit_der_public_health_und_der_veterinaer_public_health_institute_wird_fortgesetzt_und_erweitert-201858.html (last accessed on 02 September 2021).
38. Gibbs EPJ: *The evolution of One Health*. *Vet Rec* 2014; 174: 85–91.
39. Almada AA, Golden CD, Osofsky SA et al.: A case for Planetary Health/GeoHealth. *Geohealth* 2017; 1: 75–8.
40. Müller O, Jahn A, Gabyrysch S: *A comprehensive health concept [Ein umfassendes Gesundheitskonzept]*. *Dtsch Arztebl* 2018; 115: A1751–2.
41. Whitmee S, Haines A, Beyrer C et al.: Safeguarding human health in the Anthropocene epoch. *Lancet* 2015; 386: 1973–2028.
42. Scientific Advisory Board on Agricultural Policy, Food and Consumer Health Protection at the Federal Ministry of Food and Agriculture (WBAE) [Wissenschaftlicher Beirat für Agrarpolitik, Ernährung und gesundheitlichen Verbraucherschutz (WBAE) beim BMEL] (ed.): *Climate change mitigation in agriculture and forestry and in the downstream sectors of food and timber use [Klimaschutz in der Land- und Forstwirtschaft sowie den nachgelagerten Bereichen Ernährung und Holzverwendung. Gutachten November 2016]*. 2016. www.bmel.de/SharedDocs/Downloads/DE/_Ministerium/Beiraete/agrarpolitik/Klimaschutzgutachten_2016.pdf?__blob=publicationFile&v=3 (last accessed on 02 September 2021).
43. Intergovernmental Panel on Climate Change (ed.): *Climate change and land. An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*. 2019. www.ipcc.ch/site/assets/uploads/2019/11/SRCL-Full-Report-Compiled-191128.pdf (last accessed on 02 September 2021).
44. Food and Land Use Coalition (FOLU): *Growing better: ten critical transitions to transform food and land use. The global consultation report of the Food and Land Use Coalition*. 2019. www.foodandlandusecoalition.org/wp-content/uploads/2019/09/FOLU-GrowingBetter-GlobalReport.pdf (last accessed on 02 September 2021).
45. Federal Office for Agriculture and Food [Bundesanstalt für Landwirtschaft und Ernährung] (ed.): *Reduced tillage – protects soil and climate [Reduzierte Bodenbearbeitung – schont Boden und Klima]*. 2020. www.oekolandbau.de/landwirtschaft/pflanze/grundlagen-pflanzenbau/boden/reduzierte-bodenbearbeitung/ (last accessed on 02 September 2021).
46. Bund für Umwelt und Naturschutz Deutschland e. V. (ed.): *Industrial animal husbandry requires antibiotics – and increases the risk of resistant bacteria [Industrielle Tierhaltung braucht Antibiotika – und erhöht das Risiko resistenter Bakterien]*. www.bund.net/massentierhaltung/antibiotika/ (last accessed on 02 September 2021).
47. Federal Environment Agency [Umweltbundesamt] (ed.): *Pesticides [Pflanzenschutzmittel in der Landwirtschaft Sprühvorrichtung am Traktor]*. 2018. www.umweltbundesamt.de/themen/boden-landwirtschaft/umweltbelastungen-der-landwirtschaft/pflanzenschutzmittel-in-der-landwirtschaft (last accessed on 02 September 2021).
48. Federal Environment Agency [Umweltbundesamt] (ed.): *Nitrogen [Stickstoff]*. 2019. www.umweltbundesamt.de/themen/boden-landwirtschaft/umweltbelastungen-der-landwirtschaft/stickstoff#einfuehrung (last accessed on 02 September 2021).
49. Institut für Energie- und Umweltforschung (ed.): *Climatarian CO₂-Calculator [Klimatarier CO₂-Rechner]*. www.klimatarier.com/de/CO2_Rechner (last accessed on 02 September 2021).
50. Leite JC, Caldeira S, Watzl B et al.: *Healthy low nitrogen footprint diets*. *Global Food Security* 2020; 24: 100342.
51. Fischler C: *Commensality, society and culture*. *Social Science Information* 2011; 50: 528–48.
52. Spence C: *Gastrodiplomacy: assessing the role of food in decision-making*. *Flavour* 2016; 5.
53. Scientific Advisory Board on Agricultural Policy at the Federal Ministry of Food and Agriculture [Wissenschaftlicher Beirat Agrarpolitik beim BMEL] (ed.): *Pathways to a socially accepted livestock husbandry in Germany [Wege zu einer gesellschaftlich akzeptierten Nutztierhaltung. Gutachten]*. 2015. www.bmel.de/SharedDocs/Downloads/DE/_Ministerium/Beiraete/agrarpolitik/GutachtenNutztierhaltung.pdf?jsessionid=3F144F1B341F718804243CA10FA480D9.live851?__blob=publicationFile&v=2 (last accessed on 02 September 2021).
54. Gauly M: *Animal welfare in aggriculture [Tierwohl in der Landwirtschaft]*. In: Lintner MM (ed.): *Human – Animal – God: Interdisciplinary approach to a christian animal ethics [Mensch – Tier –Gott: Interdisziplinäre Annäherungen an eine christliche Tierethik]*. Nomos: Baden-Baden 2021; 317–36.
55. Federal Ministry of Food and Agriculture [Bundesministerium für Ernährung und Landwirtschaft] (ed.): *Recommendations of the livestock farming competence network [Empfehlungen des Kompetenznetzwerks Nutztierhaltung]*. 2020. www.bmel.de/SharedDocs/Downloads/DE/_Tiere/Nutztiere/200211-empfehlung-kompetenznetzwerk-nutztierhaltung.pdf?__blob=publicationFile&v=2 (last accessed on 14 May 2021).
56. German Nutrition Society [Deutsche Gesellschaft für Ernährung e. V.] (ed.): *A wholesome diet according to the recommendations of the German Nutrition Society is also ecologically sustainable [Vollwertige Ernährung nach den Empfehlungen der DGE ist auch ökologisch nachhaltig]*. 2019. www.dge.de/fileadmin/public/doc/fm/dgeinfo/DGEInfo-06-2019-Vollwertige-Ernaehrung.pdf (last accessed on 02 September 2021).
57. Krems C, Walter C, Heuer T et al.: *Food and nutrient intake – results of the National Nutrition Survey II [Lebensmittelverzehr und Nährstoffzufuhr – Ergebnisse der Na-*



- tionalen Verzehrsstudie II]. In: German Nutrition Society [Deutsche Gesellschaft für Ernährung e. V. (DGE)] (ed.): 12. Nutrition Report 2012 [12. Ernährungsbericht 2012]. Bonn 2012; 40–85.
58. Schäfer AC, Schmidt A, Bechthold A et al.: Integration of various dimensions in food-based dietary guidelines via mathematical approaches Report of a DGE/FENS Workshop in Bonn, Germany, 23–24 September 2019. *Br J Nutr* 2020; 1–18.
59. German Nutrition Society [Deutsche Gesellschaft für Ernährung e. V.] (ed.): DGE Quality Standard for meals in companies [DGE-Qualitätsstandard für die Verpflegung in Betrieben]. 5. ed., Bonn 2020.
60. German Nutrition Society [Deutsche Gesellschaft für Ernährung e. V.] (ed.): DGE Quality Standard for meals in daycare centres [DGE-Qualitätsstandard für die Verpflegung in Kitas], Bonn. 6. ed., Bonn 2020.
61. German Nutrition Society [Deutsche Gesellschaft für Ernährung e. V.] (ed.): DGE Quality Standard for catering in health care [DGE-Qualitätsstandard für die Verpflegung in Kliniken]. Bonn 2020.
62. German Nutrition Society [Deutsche Gesellschaft für Ernährung e. V.] (ed.): DGE Quality Standard for „meals on wheels“ and for meals in residential care homes for the elderly [DGE-Qualitätsstandard für die Verpflegung mit „Essen auf Rädern“ und in Senioreneinrichtungen]. Bonn 2020.
63. Scharp M, Engelmann T, Muthny J et al.: KEEKS- guideline for climate-friendly canteens in schools [KEEKS-Leitfaden für die klimaschonende Schulküche]. 2019. www.izt.de/fileadmin/publikationen/KEEKS_Leitfaden_2019.pdf (last accessed on 02 September 2021).
64. Renner B: Nutritional behavior 2.0. Changes by explicit and implicit interventions [Ernährungsverhalten 2.0. Veränderungen durch explizite und implizite Interventionen]. *Ernahrungs Umschau* 2015; 62(1): M36–46.
65. Renner B: Mobile technologies and nutritional behavior [Mobile Technologien und Ernährungsverhalten]. November 14th – 15th 2019, Vienna (2019).
66. Renner B: Why we eat, what we eat – or why we need fair nutritional environments [Warum wir essen, was wir essen – oder warum wir faire Ernährungsumgebungen brauchen]. 2020. <https://youtu.be/n25rMhHb378> (last accessed on 02 September 2021).