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DGE-Quality Standard for Meals in Schools

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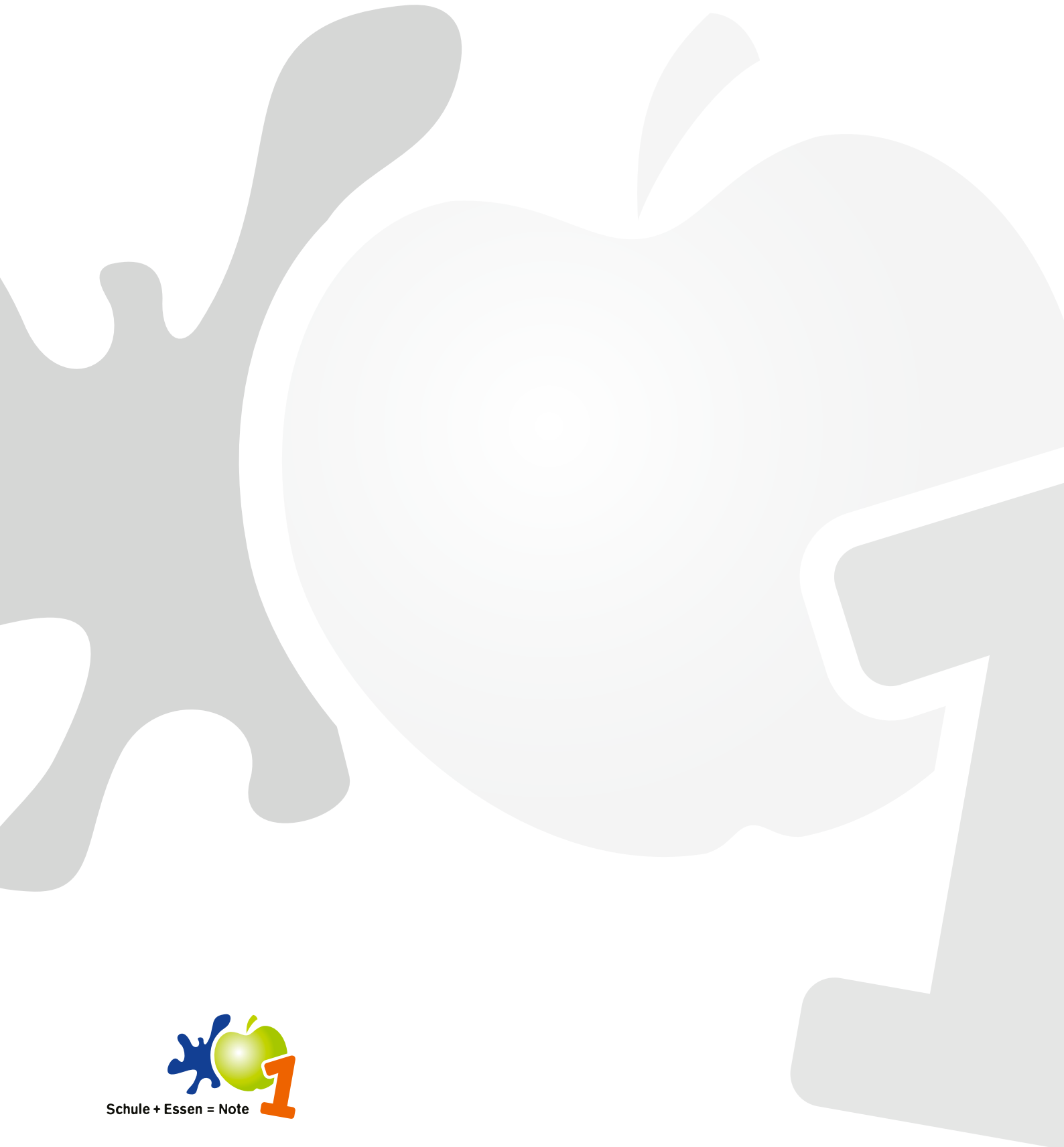

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DGE-Quality Standard for Meals in Schools

5th Edition, 2nd revised and updated reprint, 2023

The photos shown in this DGE-Quality Standard are for illustrative purposes only. As they are not relevant to the comprehensibility of the content, they have not been provided with alternative texts for the (accessible) PDF.

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Message from the Federal Ministry of Food and Agriculture

Dear persons responsible for catering in schools,

good food is vital for the well-being of our children and adolescents. All pupils should have access to healthy, sustainable and tasty meals regardless of their families' social and economic background. Catering in schools offers an excellent opportunity for this.

In fact, the nutritional situation of many young people has deteriorated due to the coronavirus pandemic. Around 15 percent of children and adolescents between the ages of 3 and 17 in Germany are overweight, and almost 6 percent of them suffer from *obesity*. Diseases such as type 2 diabetes or cardiovascular disease, which are partly caused by poor nutrition, are not only a health risk but can also have severe consequences for the quality of life and life expectancy of children and young adults. We can change this – with a holistic approach that includes school catering.

Mass catering also has vast potential to protect the environment and climate. This is because the food production process impacts air, water, soil, climate and animals. Food produced *regionally*, *seasonally* and organically can make a significant difference. Kitchen technology, preparation and the avoidance of food waste can contribute to climate and environmental protection. It is also crucial that minimum social standards are observed in food production.

German Federal Government's Food and Nutrition Strategy aims to ensure good food for everyone in Germany. We want to improve the general conditions to promote healthy and sustainable nutrition. Catering in schools is an important starting impacting a significant number of children.

The Quality Standard of the German Nutrition Society (DGE) for school meals is established and forms a sound basis for well-balanced and environmentally friendly school meals. We are committed to ensuring this Quality Standard is implemented nationwide in all German schools. The Networking Centres for School Catering in the federal states and the National Quality Centre for Nutrition in Daycare Centres and Schools (NQZ) provide support.

Your commitment is of great relevance – for many pupils and the careful use of our natural resources.

Sincerely yours,

Federal Ministry of Food and Agriculture

Preface

Dear readers,

approximately 600 million lunches are served in German schools every year. Including breakfast and snacks, this number increases many times over. The meals should be tasty, nutritionally balanced and sustainable to be well received. More than 10 years ago, the German Nutrition Society, together with numerous experts from science and practice, developed the "DGE-Quality Standard for Meals in Schools" and revised it regularly. Since then, the Quality Standard has provided a framework for the optimal design of school catering services.

The food and beverages that schools offer and the experience of solidarity and social bonds shape patterns of taste and action into adulthood. Accordingly, schools can set a decisive path here. Studies show that health-promoting and sustainable food is better perceived and appreciated when its benfits for people and the environment are understood. This is even more important since nutrition accounts for 30 percent of the world's climate gas emissions. The high quality of catering according to the DGE-Quality Standard incorporates these aspects. Therefore, during the last comprehensive revision of the DGE-Quality Standards in 2020, elements of sustainability were incorporated more strongly and have been updated once again in this edition.

With this DGE-Quality Standard, we support *meal providers*, school authorities and schools in designing health-promoting and sustainable catering. Correspondent criteria are presented along the process chain, from planning to disposal. Interested parties can also find out how the criteria are derived and what other aspects contribute to good catering.

Make the school a place that offers health-promoting, sustainable and tasty meals in a pleasant environment. This 2nd revised and updated reprint provides you with comprehensive information. You might find more background information at www.schuleplusessen.de, where details are continuously added digitally. For individual questions, please get in touch with the team of "Schule + Essen = Note 1" who will gladly offer advice and assistance.

Sincerely yours,

Dr. Kiran Virmani
Managing Director of the German Nutrition Society

1

Background, Goal and Design

1.1 School meals: An opportunity for more health and sustainability

Well-balanced, delicious meals and smart snacks. An appealing, future-oriented canteen that provides a pleasant dining atmosphere for pupils of all ages. A menu that perfectly supports all children and adolescents in their development and preserves the limited resources of our planet at the same time. More appreciation for food and the meals made from it. These are just a few of the challenges school catering faces. Not easy! Because many stakeholders are involved in the design and preparation. Different wishes, demands and opinions come together and have to be reconciled. At the same time, there are certain general conditions and structures setting limits.

With its recommendations, the DGE-Quality Standard focuses precisely on these elements and supports all those involved in school catering in designing a health-promoting and sustainable catering offer. After all, school meals are much more than a mid-morning snack. Results of the Robert Koch Institute's long-term study on the health situation of children and adolescents in Germany (KiGGS study) showed 2019 that 84 % of children and 89 % of adolescents in Germany already have the opportunity to eat a warm lunch at school. That is more than 9 million pupils every day [1, 2]. Of these, more than 3.2 million pupils are eligible for a warm lunch as part of all-day school [3]. According to the study, 56 % of children and 32 % of adolescents participate in this offer at least once or twice a week [4]. The All-Day School Support Act "Ganztagsförderungsgesetz" (GaFöG) passed in 2021 stipulates the gradual introduction of an entitlement to all-day schooling for pupils in elementary school from the 2026/27 school year. This is also expected to lead to an expansion of the catering offer.

Health-promoting meals that provide an adequate amount of energy and nutrients **promote both physical and mental development of children and adolescents**. They contribute significantly to the prevention of diet-related diseases like *obesity* or type 2 diabetes.

Data from the KiGGS study on food consumption already showed in 2020 that the majority of 6 to 17-year-olds have unfavourable consumption patterns with too little fruit and vegetables but too much meat, meat products and sausage, as well as tolerated foods such as sugar-sweetened beverages, sweets and snacks [5]. Unfavourable consumption patterns can lead to an inadequate supply of essential nutrients (malnutrition) but also to an oversupply of energy.

The Scientific Advisory Board on Agricultural Policy, Nutrition and Consumer Health Protection (WBAE) points out that poverty, hunger, and associated malnutrition also exist in Germany. In these living conditions and for low-income population groups, a health-promoting diet must also be possible, and this includes free, health-promoting, and sustainable school meals. Accordingly, the WBAE describes school meals as a "safety net" for the health-promoting nutrition of children from households at risk of poverty [6,7]. According to the Advisory Board, daycare and school meals are an element of public services for society as a whole and an important investment in the future [7].

By now, it is well known that it is not enough to focus catering solely on aspects of health promotion. Rather, it is essential to design the diet in such a way that resources are not consumed unnecessarily. In mass catering, all stages of the process can be considered. In this way, school catering can make a major **contribution to climate protection** and act as a **role model**.

In addition to "what" children and adolescents eat, it is also very important "how" they eat. The dining atmosphere, especially eating and drinking together in an appealing environment**, promotes social bonds and solidarity and increases mental well-being and performance** [7–9]. School and eating in community allow direct interactions, shared taste experiences and conversations and children and adolescents may learn from each other together. In the long term, this **shapes eating habits as well as the appreciation food should receive** [7]. Learning through personal experience can be decisively strengthened by food and **nutrition education** activities at school. By closely linking food and nutrition education with health-promoting and sustainable meals, children and adolescents on their way to becoming young adults also learn how to deal responsibly with their health and the limited resources of this earth in the long term. For this reason, **shared meals and catering should be part of the overall educational concept** of daycare centres and schools. The German Advisory Council on Global Change (WBGU) attributes school catering a pioneering role, as it is particularly promising due to its educational effect. The Council calls adequate attention for this topic [10].

High-quality school meals offer **great potential in terms of health promotion and more sustainability because of the following aspects**:

- **Wide reach:** The number of potential meal participants is high, so many pupils may benefit from a health-promoting and sustainable catering.
- **Healthy development for everyone:** A health-promoting and sustainable diet promotes physical and mental development of children and adolescents.
- **A place for everyone:** Eating and drinking together connects pupils from all parts of our society. This promotes social interaction, enables participation as well as emotional and social development of children and adolescents.
- **More sustainability:** Health-promoting and sustainable school meals offer a wide range of opportunities for more sustainability in planning, purchasing, consumption, disposal and cleaning. In this way, "health" and "sustainability" go hand in hand. Children and young people are able to experience and learn on a daily basis.

By offering healthy and sustainable meals in a pleasant dining atmosphere, *meal providers* contribute to creating a ***fair food environment***.

Food environments are places where eating decisions are made. Every *food environment* affects nutritional behaviour: what we see (exposition), what we can access (access), what we choose (choice) and what we eat (consumption). *Food environments* are fair if, among other things, they are tailored to the target group, enable healthy and sustainable choices, and make them easy, i.e. easily available, accessible, and affordable. This means reducing obstacles to a more sustainable diet and offering more health-promoting, socially, environmentally and animal welfare-friendly options.

Appropriate, *fair food environments* support children and adolescents towards a health-promoting and more sustainable diet and can shape their eating habits throughout their school years. School is a central *food environment* and can be designed in a variety of fair ways.

The implementation of the DGE-Quality Standard is key to creating a *fair food environment* by giving children and adolescents access to healthier and more sustainable food offers and changing their selection options accordingly. Offering more *vegetable* and fewer animal-based food can change children's and adolescents' perceptions (exposition) and shape what they perceive as typical and "normal" ("new", social norm). Eating habits are directly influenced by the design of the catering offer, such as quality or portion size, and the environment, such as the furnishings in the dining hall or the eating atmosphere. This forms the basis for health promotion and equal opportunities and has a broad "behavioural impact" [7, 11].

1.2 Who is the DGE-Quality Standard addressed to?

Providing health-promoting and sustainable school meals on a daily basis is a complex task. The continuous cooperation of different stakeholders is therefore necessary. This includes persons from the following sectors:

- ***Meal providers:*** Anyone who plans, produces and/or provides school meals. These include the kitchen management and team, caterers, tenants and janitors who offer breakfast, snacks and lunch in the *cafeteria*, school kiosk or school canteen.
- **School:** School authorities and sponsors in the administration, school management, school committee, teachers, educational staff.
- **pupils and parents**

This DGE-Quality Standard addresses **everyone who is in charge for school meals in their respective areas. In the following, these persons are referred to as responsible persons for school meals**.

The persons responsible for catering develop the content and criteria of the DGE-Quality Standard for employees in their designated areas if needed. They ensure alignment with other departments, considering on-site structural, personnel, and financial conditions. Additional information and tools for implementation can be found on the website www.schuleplusessen.de.

1.3 What is the goal of the DGE-Quality Standard?

The DGE-Quality Standard supports responsible persons for school meals in designing a health-promoting and sustainable meal offer in schools in at least 1 menu line. This means that primary and secondary school pupils may choose from a range of appropriate breakfast, snack and lunch options.

Based on current scientific data, the DGE-Quality Standard describes the **criteria** for optimal, health-promoting and sustainable school meals. Each school may implement this Quality Standard step by step at its own pace. Every quality improvement of school meals results in healthier and more sustainable diets for children and adolescents. The majority of the criteria relates to the catering design (see chapter 4). Criteria are presented along the process chain with the 5 steps of **planning, purchasing, preparation, serving** as well as **disposal** and **cleaning**. These process steps offer the potential to significantly influence the nutritional quality of food and beverages as well as to set the course for a more sustainable diet.

However, good school meals are more than just offering health-promoting and sustainable dishes. Therefore, the DGE-Quality Standard also focuses on stakeholders and general conditions that influence the quality and acceptance of meals as well as the enjoyment and pleasure of eating and drinking. These general conditions include, for example, legal requirements, staff qualifications, management of interfaces, the environment in which eating and drinking take place, coordination with nutrition education and integration of catering into the school profile or mission statement of a school (see chapters 2 and 5).

Figure 1 shows different aspects of health-promoting and sustainable school catering and, therefore, addressed in the DGE-Quality Standard. The process chain plays a central role as a "pivotal point" for such an offer. Usually, this is preceded by the tender and award procedure and, ideally, also by the development of a *catering concept*. This forms the basis for all process steps in school catering. Ensuring a shared understanding of high-quality school catering among all stakeholders is crucial. It is recommended to establish a catering mission statement unique to each school, aligning with its educational concept. This statement serves to convey the significance of school catering within the school community and externally. The stakeholders and the various aspects have a direct or indirect influence on individual process steps or the entire process chain. This is symbolized by the triangles in Figure 1.

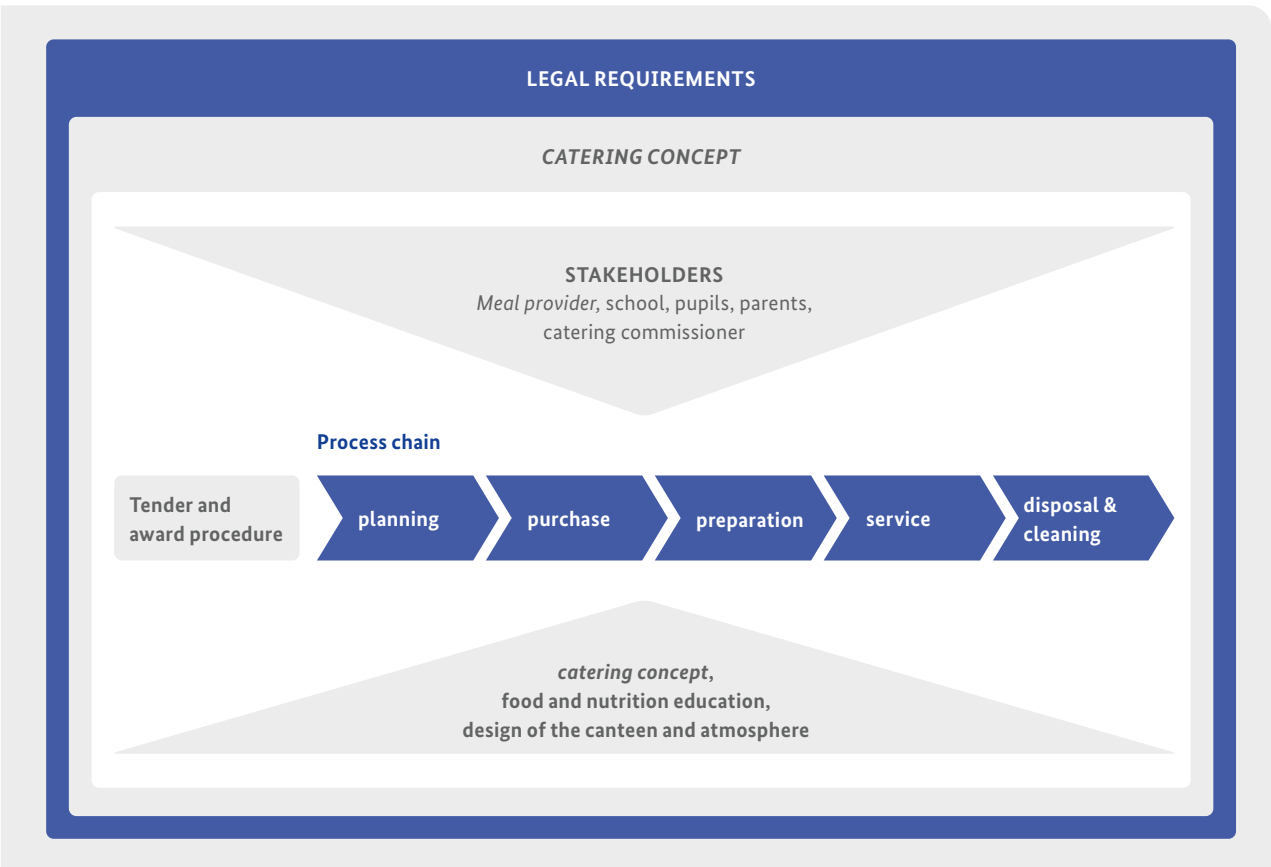


Figure 1: Aspects of health-promoting and sustainable school meals

1.4 How is the DGE-Quality Standard structured?

The DGE-Quality Standard includes 6 chapters with criteria and background information. Responsible persons for school meals find answers to the following questions:

› How does the DGE-Quality Standard support responsible persons for school meals in their efforts to improve the catering quality?
The role of the DGE-Quality Standard as an instrument of quality development and aspects that contribute significantly to more quality in school meals are explained in
↪ **chapter 2**.

› Which are the basic principles of the criteria for "designing health-promoting and sustainable meals"?
When talking about nutrition or catering, health and sustainability must be considered together. Underlying reasons and how the criteria described in chapter 4 are developed are discussed in
↪ **chapter 3**.

› How should a health-promoting and sustainable catering offer be designed?
Criteria for the catering design are described according to the process chain in
↪ **chapter 4**.

› What additional aspects need to be addressed?
Good school meals exceed the offer of health-promoting and sustainable food and beverages. Stakeholders and aspects influencing catering quality are described in
↪ **chapter 5**.

› What is legally required?
Anyone who produces and serves meals must observe legal regulations. An overview of the laws and legal requirements that apply to mass catering can be found in
↪ **chapter 6**.

1.5 What to keep in mind when reading?

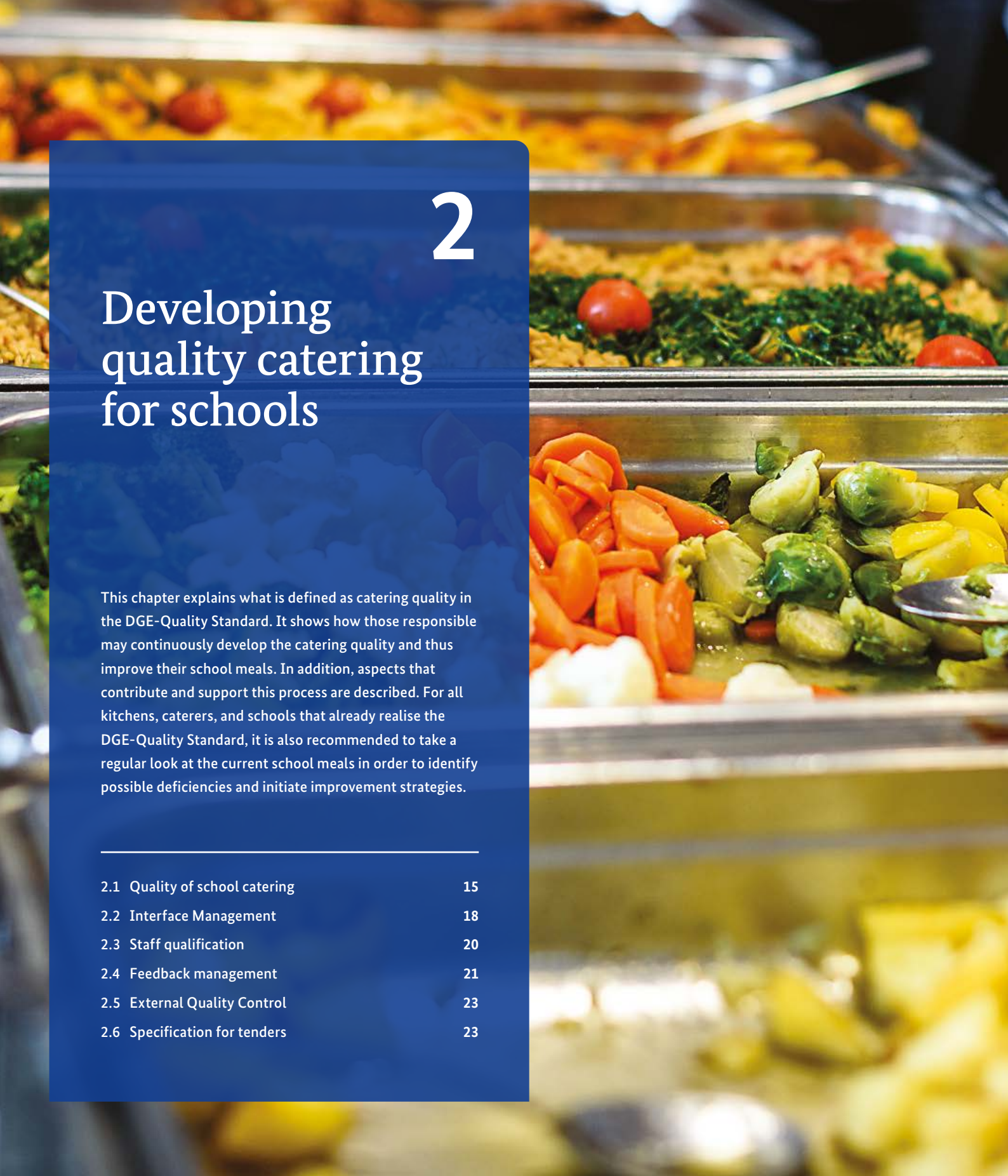
› **Criteria** describing an optimal catering situation are listed and explained in text boxes with this symbol. The **checklist** starting on page 82 provides a criteria summary.

› Background information and advice on **sustainability** are marked with this symbol.

› This symbol additionally indicates **interesting facts**.

› This symbol highlights topics for which **further information** is available on the website www.schuleplusessen.de in the category DGE-Quality Standard.

› **Italic words or terms** are technical terms that are defined in more detail in the **glossary**.



2

Developing quality catering for schools

This chapter explains what is defined as catering quality in the DGE-Quality Standard. It shows how those responsible may continuously develop the catering quality and thus improve their school meals. In addition, aspects that contribute and support this process are described. For all kitchens, caterers, and schools that already realise the DGE-Quality Standard, it is also recommended to take a regular look at the current school meals in order to identify possible deficiencies and initiate improvement strategies.

2.1 Quality of school catering

School meals according to the DGE-Quality Standard promote the health of children and adolescents and are sustainable. All pupils are able to participate in school meals and their needs and wishes should be taken into account.

Thus, the criteria of the DGE-Quality Standard describe an ideal catering situation. Schools may use them as orientation and benchmark for improving their catering service. Importantly, the persons responsible for catering should set priorities for criteria to be implemented first at their school.

DGE-Quality Standard as part of the school's individual *catering concept*

The development of a *catering concept* is an important first step. Each school should develop its own concept. It defines school-specific demands on the catering, describes the meals offered and served and reflects the structures on site. As part of such a *catering concept*, the DGE-Quality Standard defines the criteria for a health-promoting and sustainable diet and thus ensures that an appropriate offer is available for every meal. The question "Who is served where, when and how?" is therefore answered. Ideally, the *catering concept* is part of the school concept.

DGE-Quality Standard – a quality development instrument

Through quality development, the canteen might become the school's flagship. The responsible persons for catering should initiate a joint development process towards health-promoting and more sustainable school catering. With the help of the criteria defined in the DGE-Quality Standard, **all stakeholders are able to improve the quality of school meals gradually together**.

Stakeholders from several areas are always involved in catering (see chapter 5.1). In order to offer good catering and further develop its quality, regular exchanges between those responsible are essential. Joint meetings and discussions, e.g. in the form of a *catering committee* or a "round table", enable all stakeholders and interest groups to get to know the different perspectives and catering tasks, contribute specific expertise, ask questions and address problems. It fosters an environment for creative ideas, preferences, suggestions, and active participation. Incorporating feedback from pupils and parents through the feedback management system is also crucial. A common, future-oriented *catering concept* may be developed and implemented together.

The collaborative, process-oriented quality development involves 5 steps that enable a continuous development towards health-promoting and sustainable meals. These are shown in Figure 2. The DGE-Quality Standard supports each of these steps.

ANALYSIS
In this step, the current catering situation – the **actual situation** – is examined. The catering, beginning with the presentation in the menu catalogue and menu, the transport and distribution of meals and ending with the dining atmosphere in the canteen, as well as individual steps from planning to disposal and cleaning, are examined thoroughly. This requires the cooperation and collaboration of all stakeholders.

The checklist starting on page 82 helps to verify which criteria are already met by the school's catering service and which are not.

Based on the analysis and description of the current catering situation, all stakeholders have the opportunity to discover which points are already implemented and what should and might be changed in the future. It is important that all stakeholders (see chapter 5) assess the situation and reflect on the conditions and structures prevalent at the school.

Checklist criteria on page 82 that have not been implemented in school catering so far may serve as **targets** for further quality development. It is recommended to prioritise and select those that could be implemented first. This way, it is possible to implement targets and the DGE-Quality Standard gradually. The partial implementation of a criteria is also a first positive progress. For instance: if the objective is to offer a meat dish at lunch only **once** a week, while currently it is offered **daily**, resp. **5 times a week**, initially reducing meat to **3 times a week** counts as an important quality improvement.

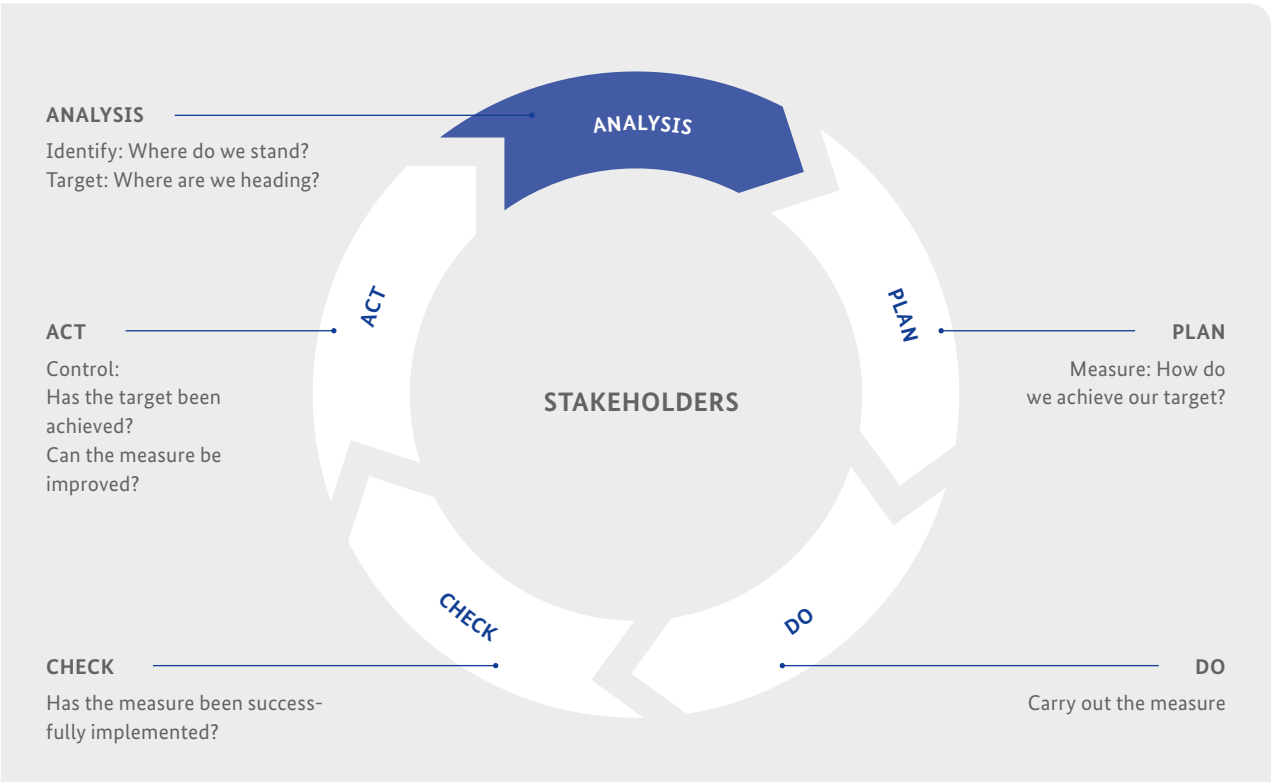


Figure 2: The 5 steps of collaborative, process-oriented quality development (PDCA-model, modified according to [12])

PLAN
Once the targets are defined, specific measures to achieve them might be planned together. **Which** measures should be prioritised, **who** should implement them and **when**, and **with whom** should she/he work together? Therefore it is helpful to prepare a plan describing the measures as precisely as possible. For example, measures may include changes in the food offer and the preparation of dishes, or the remodelling of the canteen. Beforehand, all those involved should be thoroughly informed about the planned steps and the targets they are pursuing.

DO
Afterwards, the planned measures can be implemented in the different areas. At the beginning of the new work process, structures, recipes or products are often unfamiliar for the employees. Therefore, the measures should be guided, and a contact person should be appointed for queries.

CHECK
Once the measures have been implemented, they are systematically reviewed and evaluated with those involved in the process. Could the measures be implemented as planned?

ACT
Has the chosen target been achieved? Are there possible improvements for the future implementation of the measures? Should other measures and targets be adapted?

These experiences form the basis for a joint strategic analysis of the entire catering situation. The collaborative, process-oriented quality development is thereby repeated. Hence, it is possible to implement targets step by step and to continuously improve meals in agreement with all stakeholders.

The following criteria apply:

☐ **A *catering concept* is in place.**
The *catering concept* defines the school-specific requirements for catering, considering the structures on site. In addition, it contains statements on the organisation, break periods and the number of expected guests. The participation of pupils – e.g., in distributing, assistance with service – or contributions from parents are also included. The mission statement makes the self-image regarding catering transparent, incorporating criteria for the implementation of a health-promoting and sustainable catering. A *catering concept* should be part of quality management.

☐ **All stakeholders are involved.**
Cooperation and continuous exchange between all stakeholders aim to improve the quality of catering together. To ensure the participation and involvement of all stakeholders, a working group in the form of a "round table" or a *catering committee* which meets at regular intervals might be established. Ongoing communication helps to clarify questions and problems, but also to develop a *catering concept*. This increases acceptance and appreciation and ensures the continuous development of the catering.

2.2 Interface Management

Health-promoting and sustainable school meals are a joint task in which several professions and groups of people participate (see chapter 5.1). Interfaces are points at which one person or group of people completes their work process and passes the outcome to another. To ensure that the joint goal is achieved smoothly and reliably, it is advisable to:

- describe individual activities and work processes as precisely as possible (what, how, when, with what goal),
- to define competences and responsibilities as well as rules for substitutes for the work processes (who),
- identify and regulate interfaces in work processes (who is responsible, who participates, to whom is information passed on).

Proper interface management improves the workflow, promotes communication and cooperation and ultimately saves time.

Examples of interfaces in school catering:

- **Kitchen team or caterer – serving staff:**
  The *meal provider* delivers the food to the desired extent and informs the serving staff e.g., about the offer, portion sizes and allergens. The serving staff informs the caterer about the pupils' wishes and suggestions. The kitchen team or the caterer receive information from the staff on site about possible food returns for a better calculation and reduction of food waste. This exchange and mutual motivation are an essential aspect for a successful and sustainable food waste reduction [13].

› **Serving staff – pupils:**
The serving staff fills the buffet or distributes the meals on plates and serve them. They are the contact persons at the food counter and support pupils in choosing their meals. To ensure that a health-promoting and sustainable menu is accepted, communication between the staff and the pupils is crucial. The interface between the serving staff and the pupils is particularly important when new or unfamiliar food components or dishes are introduced, e.g. when switching to *plant-based* catering. Competent and friendly communication improves the atmosphere at mealtimes and is essential for the acceptance and appreciation of the offer.

Each school should have a catering commissioner for internal quality assurance. This person is not only the contact person for all stakeholders, but also mediates the interfaces. This challenging task demands knowledge about the requirements and wishes for catering and the *dining environment*. In addition, these requirements and wishes must be coordinated in the interest of all and in consideration of the general conditions in the respective school.

For instance, the following persons or groups of people may be considered as catering commissioners:

› a person responsible for catering, like a representative of the school authority or the kitchen management,
› an external consultant with appropriate professional qualifications in the field of nutritional science, dietetics, home economics or catering,
› an employee of the *meal provider*,
› a teacher or educational specialist. To enable this person to focus on the school meals, he/she should be partially released from his/her other duties.

The following criterion applies:

☐ **A catering commissioner exists.**
The number and variety of people responsible for catering and stakeholders from different areas requires central coordination. The catering commissioner should be aware of all requirements and wishes regarding nutrition and the *dining environment*, combine them with the prevailing conditions at the school and coordinate them in the interest of all. This may be the school authority or an appointed person.

2.3 Staff qualification

In order to provide health-promoting and sustainable meals, employees with different professional qualifications, each with their own input, are required. The DGE-Quality Standard focuses on the management of the catering sector as well as on the kitchen and serving staff. The job profiles differ depending on the field of responsibility:

Catering Management
The catering management requires a specific professional qualification. This includes professions and qualifications like:

- (operations) manager of home economics,
- home economist,
- chef,
- cook,
- nutritionist or dietician, if necessary, with additional business qualification,
- food service business economist.

Preparation and serving of meals
Staff skills and knowledge help to ensure consistent catering quality. Kitchen and service staff should therefore preferably have adequate vocational training. However, kitchen and service staff may also be employed without such qualifications, as long as they are instructed by qualified staff.

Service staff members contribute significantly to the meals acceptance by pupils through their appearance and their communication. They should be able to provide information about the offered meals, their composition and allergens, name individual components and point out the health-promoting and sustainable choice (see also chapter 5). A friendly manner, communicative skills, willingness to help and educational skills are therefore crucial.

Further education and professional advanced training promote the staff's competence, update the knowledge and give confidence in the daily work. The catering manager should regularly attend training courses in the areas of nutrition and sustainability in order to put new insights into practice. Topics that are suitable for all catering staff are, e.g.:

- basics of a health-promoting and more sustainable diet,
- regeneration of "Cook & Chill" or "Cook & Freeze" dishes/components,
- basic knowledge of ways to avoid food waste,
- preparation of creative vegetarian/vegan recipes,
- ways to implement and increase the percentage of organically grown food in mass catering as well as organic certification,
- allergen management and labelling,
- planning and implementation of *nudging* techniques,
- feedback management along with,
- communication and dealing with children and adolescents of different age groups and their treatment as guests.

Further information:
www.schuleplusessen.de
Keyword: Fortbildungsangebote

Mass catering staff carries a high responsibility regarding food hygiene. Regular instruction, e.g., on the Infection Protection Act, is obligatory for all employees who work with food (see chapter 6).

The following criteria apply:

- [ ] **Catering staff receive continuous training.**
  Staff skills and knowledge help to ensure consistent catering quality.

- [ ] **Ergonomic workplaces and workflows are in place.**
  This includes, for example, back-friendly working heights, heat and noise protection as well as variety in tasks. Ergonomic workplaces and work processes maintain health, performance and satisfaction of employees.

- [ ] **Employees are valued.**
  Appreciation promotes satisfaction and motivation. Valuing employees is expressed through fair payment, open and objective communication and constructive interaction with each other.

2.4 Feedback management

Dealing professionally with praise and criticism – feedback management – contributes to the evaluation of measures and to set targets in a joint quality development. It is important that praise and recognition as well as wishes, complaints and suggestions may be voiced by all stakeholders. Nevertheless, in mass catering it is certainly not possible to satisfy every wish of pupils and staff. Therefore, it is even more important to listen to all stakeholders and to discuss wishes and possibilities in a constructive way, as well as to develop realistic solutions. This increases mutual understanding and the willingness to reach a consensus. Feedback management means also a continuous process that includes the following steps:

Step 1
Receive praise and criticism
Feedback on meals is often unrequested and always an opportunity to improve the offer. Moreover, feedback should also be actively asked for at regular intervals. It is important to have the opportunity both to report appreciation and praise as well as to criticise and give suggestions for improvement in order to optimise processes. Often no negative feedback is equated with praise. Thereby, an opportunity to motivate staff and stakeholders is missed. Appreciation and praise may mean a lot, lack of praise can be frustrating. Possible ways are the personal dialogue, which can take place in the canteen, at the "round table" or by telephone, as well as written or digital feedback, for example by using evaluation forms and/or post boxes. Especially in school catering, a "smiley system", for example, might be beneficial because it is easy to use and a quick way to start asking for opinions. In addition to praise and criticism, the reasons behind them and specific suggestions for improvement should also be asked for.

Step 2
Document and evaluate feedback
All feedback should be systematically documented and evaluated. If necessary, interventions for improvement are planned together with those involved. Praise is passed on to the addressed catering staff members.

Step 3
Implement interventions and inform about them
The interventions in response to the feedback and the achieved results should be made visible to all. Pupils are happy to be involved in the process, and employees are proud of their efforts and feel that their work is valued.

The following criterion for feedback management applies:

☐ **Feedback on the menu is regularly obtained, evaluated and measures are derived.**
The pupils should be given the opportunity to express wishes and criticism about the food. This feed-back provides helpful suggestions on the meal design as far as possible in line with the requirements and thus ensure that the food is well accepted. This may be done, for example, by distributing questionnaires or by setting up a mailbox for feedback.

2.5 External Quality Control

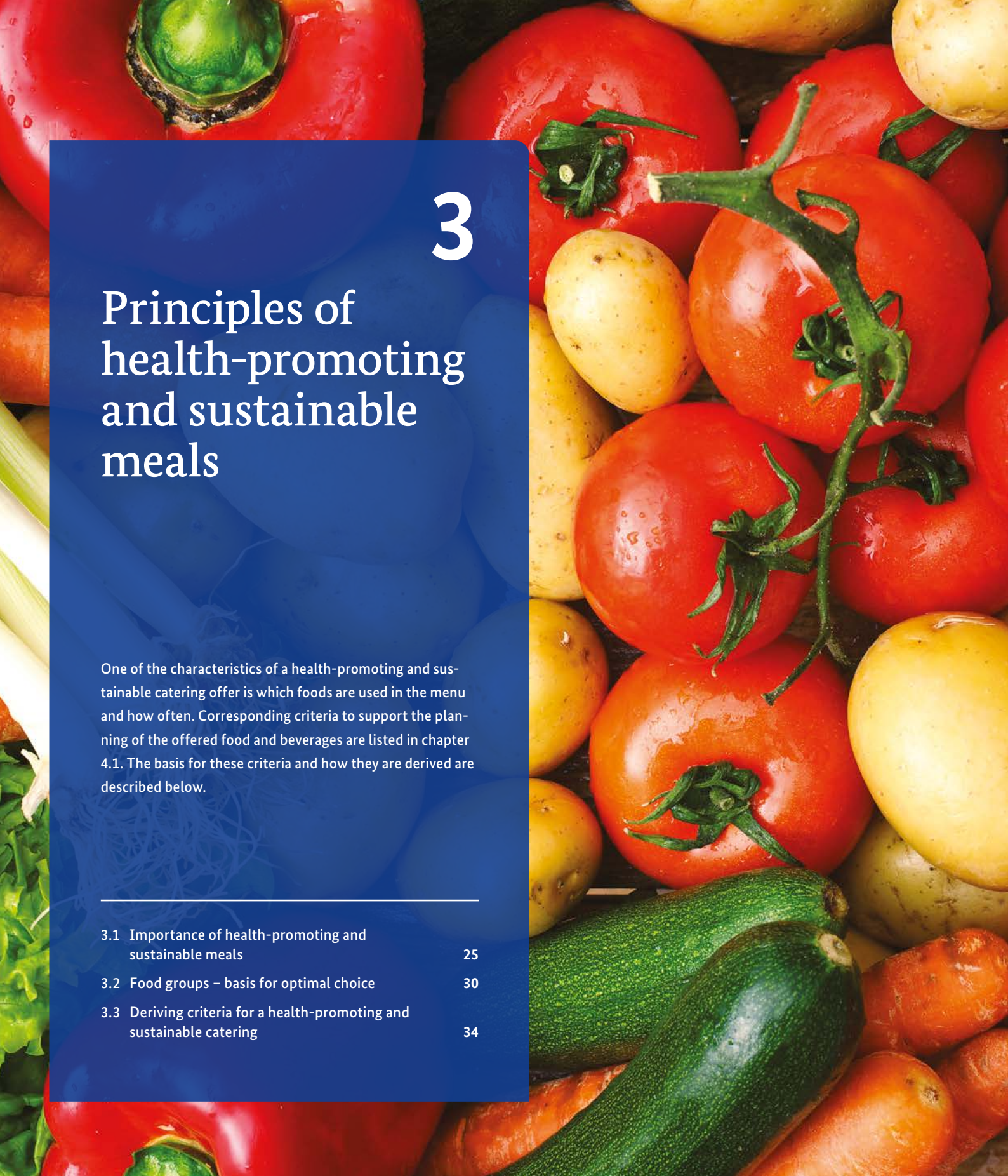
Whether the offered meals meet the set goals may be verified in an independent quality control. Usually, this is carried out by an external institution on the basis of different audit systems and audit criteria. In this way, the responsible persons for catering ensure the quality of the offer and are able to demonstrate the performance publicly with an external seal of approval.

Further information:
www.schuleplusessen.de
Keyword: Externe Qualitätsüberprüfung

2.6 Specification for tenders

When a school's catering is not organised and prepared by the school itself or by its own staff, but is outsourced, a specification must be established within the context of public tenders. This serves as the basis for the tender process and defines the type and scope of the catering service. For the compilation of a specification, the DGE-Quality Standard may serve as a reference. The more detailed the requirements like preparation methods, serving system or the use of qualified staff, the easier it is to compare different offers. It is not recommended to demand the implementation of the DGE-Quality Standard in general, but to describe in detail which of the individual criteria have to be fulfilled. The specification is fundamental for the contract between the contracting authority (e.g. school/school authority) and the contractor (e.g. caterer). It is recommended to write a specification supported by external professionals who might also assist in the tender process.

Further information:
www.schuleplusessen.de
Keywords: Ausschreibung und Vergabe
and Beratung und Coaching



3

Principles of health-promoting and sustainable meals

One of the characteristics of a health-promoting and sustainable catering offer is which foods are used in the menu and how often. Corresponding criteria to support the planning of the offered food and beverages are listed in chapter 4.1. The basis for these criteria and how they are derived are described below.

3.1 Importance of health-promoting and sustainable meals

We affect our health, quality of life, and well-being through what we eat and drink. A wholesome diet according to the recommendations of the German Nutrition Society (DGE) provides an adequate amount of energy and sufficient fluids. This diet ensures a balanced supply of the energy-supplying nutrients fat, carbohydrates and protein. Ingredients like vitamins, minerals, dietary fibre and phytochemicals are also contained in sufficient quantities. As a result, both malnutrition and overeating might be prevented. A wholesome diet also makes a decisive contribution to the prevention of diet-related diseases such as *obesity*, type 2 diabetes and cardiovascular disease. The wholesome diet is diverse and highlights the consumption of vegetable food [14–16].

However, eating and drinking is more than just the intake of energy and nutrients. How we eat affects not only our own well-being, but also the well-being of present and future generations. The so-called Brundtland Report already characterised "sustainability" in 1987 as a development "that meets the needs of the present without compromising the ability of future generations to meet their own needs" [17], p. 43. In 2015, the United Nations adopted the UN 2030 Agenda, with 17 Sustainable Development Goals (SDGs).

The EAT-Lancet Commission Report [18], published in 2019, uses a global reference diet (Planetary Health Diet) to show the supply for a future world population of 10 billion people in 2050 while respecting planetary boundaries. This could prevent around 11 million cases of early death worldwide each year due to malnutrition. In a strict sense, the Planetary Health Diet is not a nutritional recommendation; it merely provides a framework for orientation. It is, therefore, necessary to realize country-specific adaptions of the food choices and quantities, as well as the locally available resources [18, 19]. The food-based dietary guidelines for Germany are issued by the DGE. In this DGE-Quality Standard, these are transferred to mass catering (see chapters 3.3 and 4) and are largely consistent with the statements of the Planetary Health Diet [20].

Further information:
www.schuleplusessen.de
Keyword: Planetary Health Diet

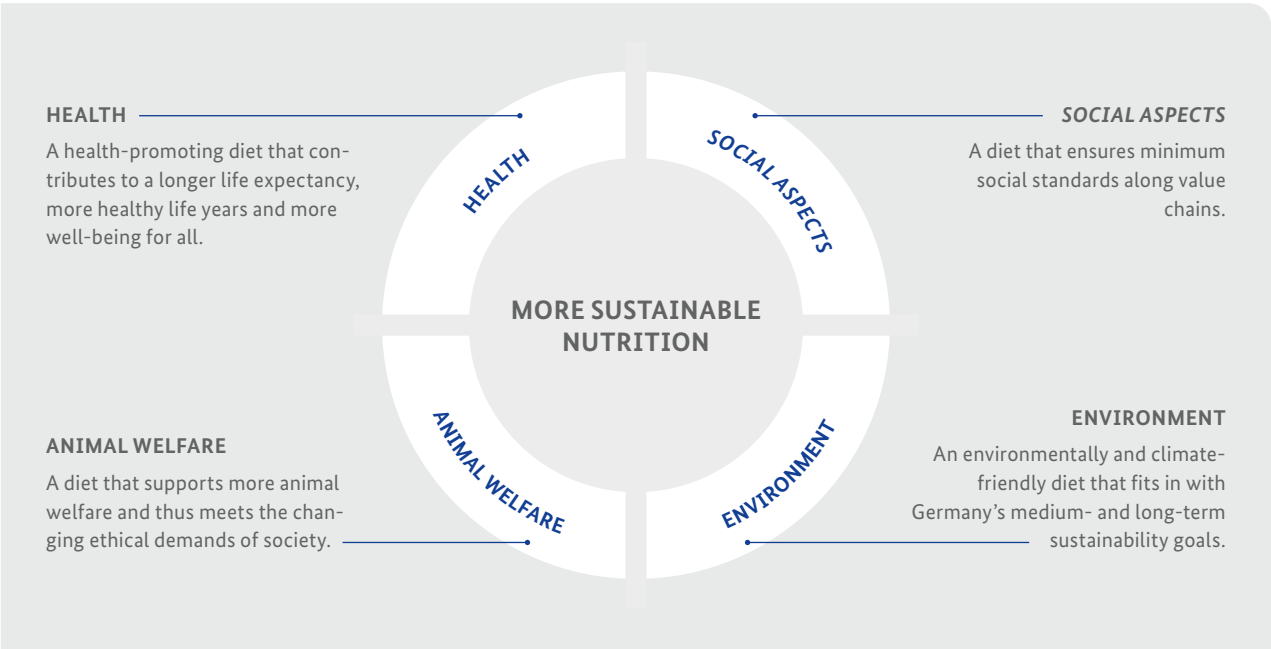


Figure 3: Goal dimensions of a more sustainable diet [7]

Based on different definitions of sustainable nutrition [21–24] the Scientific Advisory Board on Agricultural Policy, Food and Consumer Health Protection (WBAE) has [7] formulated 4 central goal dimensions – health, environment, *social aspects*, animal welfare – for a more sustainable diet, which are explained in Figure 3. The DGE aligns its activities with these 4 goal dimensions, as set out in the "DGE position statement on a more sustainable diet" [11]. Accordingly, this DGE-Quality Standard follows these principles.

Many foods we consume cause a significant "footprint" in terms of environment, climate, *social aspects* and animal welfare [7]. Increasingly, our food is produced in complex and global **value chains**. The food value chain covers the input factors for agriculture, the agricultural production, up to processing, trade, and consumption. Aspects of sustainability, like environmental impact, can be tracked along these chains (see Figure 4). Therefore, the **entire life cycle of a product** must be considered in the evaluation of food.

The carbon footprint is one indicator of the environmental impact of food. It quantifies the amount of *greenhouse gas emissions* generated along the food value chain. It therefore represents its climate impact. In view of the limited availability of certain resources and the loss of biodiversity, other ecological footprints of food production, such as water, land, or biodiversity footprints, are also increasingly being considered [25, 26].

One-third of the worldwide *greenhouse gas emissions* are caused by the food system [27]. Food production generates emissions of greenhouse gases like carbon dioxide (CO_2), methane (CH_4) or nitrous oxide (N_2O), e.g. through tractors or harvesting machines, fertiliser for the fields, heated greenhouses, and animal stables and by the animals themselves, food industry, through cooling or freezing food, its transport and ultimately the preparation of meals. In addition to *greenhouse gas emissions*, intensive agriculture has numerous other impacts on the environment and, as an

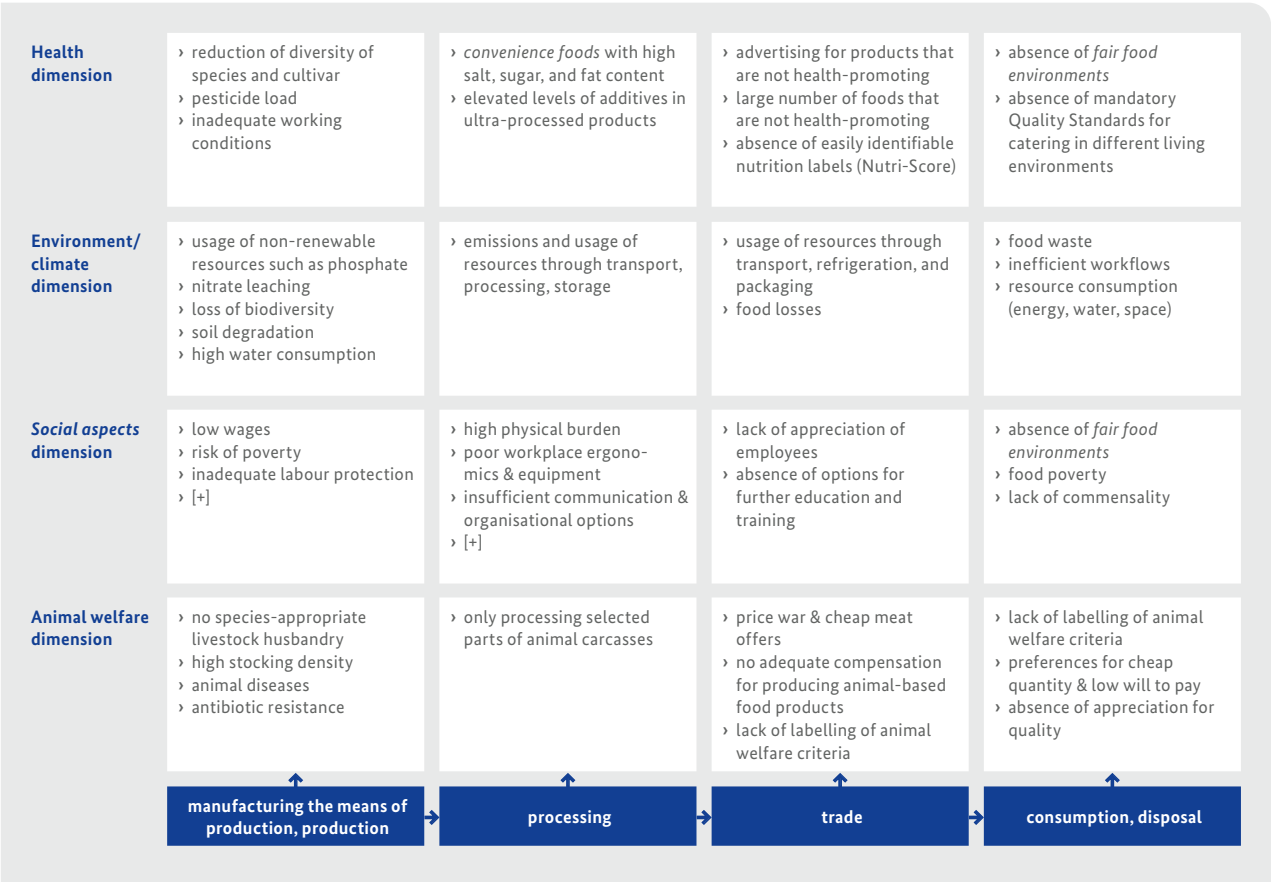


Figure 4: Examples of potential problem areas across the 4 goal dimensions of more sustainable nutrition and the value chain, modified according to [24]

open system, affects soil, water, animals, and plants. For example, intensive tillage can increase the risk of *erosion*, lead to soil compactness and may cause the loss of soil fertility in the long term [28]. Intensive animal husbandry partly carries the risk of resistance due to the excessive use of antibiotics [29]. The application of fertilisers and pesticides significantly affects the biodiversity of plants and animals [30], and intensive nitrogen fertilisation is responsible for water contamination with nitrate [31].

Therefore, it is not sufficient to adjust nutrition and school catering to aspects of health promotion only. Rather, it is essential to design diets and catering options in a way that minimizes the impact on the climate and the environment and also consider the other goals of a more sustainable diet, such as animal welfare and *social aspects*.

According to calculations of the project "KEEKS – Klima- und EnergieEffiziente Küchen in Schulen", *greenhouse gas emission* savings of around 40 % are possible in school kitchens [32]. According to the data, about ¾ of the *greenhouse gas emissions* in school catering are caused by food selection. Around ¼ of the greenhouse gases are caused by kitchen technology, preparation and food waste.

The production of animal-based foods like meat, eggs, milk, and dairy products (especially those derived from ruminants like cattle, sheep, and goats) causes particularly high *greenhouse gas emissions*. In contrast, the share of vegetable food like grains, vegetables and fruits in *greenhouse gas emissions* is usually much lower. Generally, there are also differences within a food group. For example: Tomatoes from Germany grown in greenhouses heated with fossil fuels in winter cause 10 times higher *greenhouse gas emissions* than *seasonal*ly harvested German tomatoes from unheated greenhouses or open field [7, 25].

Overall, in many cases the choice between different food groups makes 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, 1 kg of beef causes on average about 14 kg of CO_2 *equivalents* – whereas the same amount of ready-to-eat lentils causes 1.7 kg of CO_2 *equivalents* [25].

Even the production of nutritionally significant foods like milk and dairy products, fish or nuts may have comparably negative impacts on the environment. Nevertheless, these foods should be integrated into the diet in accordance with their recommended frequency and quantity due to their health-promoting impact (see Tables 2 and 3).

Table 1 compares the estimated *greenhouse gas emissions* of selected food, expressed in kg of CO_2 equivalent. The data shown provide orientation and may vary if conditions change.

Table 1: Estimated *greenhouse gas emissions* of selected foods [25]

vegetable food		kg CO_2-*equivalent*
grains, grain products and potatoes	1 kg rice	3.1
	1 kg bulgur	0.6
	1 kg pasta	0.7
	1 kg potatoes, fresh	0.2
vegetables and *salad*	1 kg lentils, dry	1.2
	1 kg carrots	0.1
	1 kg lamb's lettuce	0.3
fruits	1 kg pineapple, fresh, average	0.9
	1 kg apples, average	0.3
	1 kg walnuts, with shell	0.9
oils and fats	1 kg margarine, whole fat	2.8
	1 kg rapeseed oil	3.3

animal-based food resp. alternative vegetabale products		kg CO_2-*equivalent*
meat, sausage, fish and egg and vegetable meat alternatives	1 kg beef, average	13.6
	1 kg chicken, average	5.5
	1 kg pork, average	4.6
	1 kg fish, aquaculture	5.1
	1 kg egg	3.0
	1 kg seitan	2.5
	1 kg tofu	1.0
milk and dairy products and vegetable milk alternatives	1 kg cheese, average	5.7
	1 kg yoghurt, plain	1.7
	1 kg whole milk, ESL	1.4
	1 kg milk alternative, oatmilk	0.3
	1 kg milk alternative, soymilk	0.4
oils and fats	1 kg butter	9.0

The data shown and the fact that approximately 600 million lunches are served at German schools every year [32], illustrate that school catering with predominantly vegetable food may make a major contribution to climate protection. Kitchen technology and food waste prevention also play a crucial role. Preparing, cooling and keeping ingredients and food hot may have a significant environmental impact. This is where infrastructure, production planning and staff behaviour are essential [32–35]. Once food is discarded, all invested resources and all steps from farm to fork – and thus the linked *greenhouse gas emissions* – were wasted. In addition, the disposal process itself produces small amounts of greenhouse gases.

The "DGE-Quality Standard for Meals in Schools" combines aspects of health promotion and sustainability. In chapter 4, this DGE-Quality Standard specifies minimum frequencies for foods and food groups that are particularly recommendable from a health promotion and sustainability perspective. These include vegetable products such as vegetables including *legumes* and *salad* as well as wholemeal products and fruits. Additionally, a maximum frequency is specified for foods and food groups like meat, as well as ultra-processed and deep-fried products. There is scientific evidence that limiting these products is beneficial in terms of nutritional physiology and sustainability [36]. Regarding food qualities, the DGE-Quality Standard refers, as an example, to fish from sustainable fisheries or aquaculture and to meat that complies with certain animal welfare criteria (see chapter 4.2).

Furthermore, chapter 4 describes criteria for the design of a health-promoting and sustainable diet along the process chain – from planning to disposal. In this context, the reduction of avoidable food waste plays an important role.

Further information:
www.schuleplusessen.de
Keyword: Nachhaltigkeit

3.2 Food groups – basis for optimal choice

The food-based dietary guidelines of the DGE for a wholesome diet – as presented in the "DGE Nutrition Circle", the "Three-Dimensional DGE Food Pyramid" and the "10 Guidelines of the DGE for a wholesome diet" – are based on the "*Reference values for nutrient intake*" and the DGE's evidence-based guidelines regarding fat and carbohydrate intake [15, 37-39]. Recommendations for children and adolescents are based on these as well, and also serve as basis for health-promoting and sustainable mass catering. The **food quality** – as **optimal choice** – from each of the 7 food groups of the DGE Nutrition Circle shown in Tables 2 and 3 combines the recommendations from the models mentioned above. Thus, there are foods that should be consumed in different quantities and frequencies due to their nutritional composition, e.g., their *energy* and *nutrient density*, dietary fibre content and fat quality. For each food group, additional background information and aspects of sustainability are listed below, along with practical advice for the use in school meals.

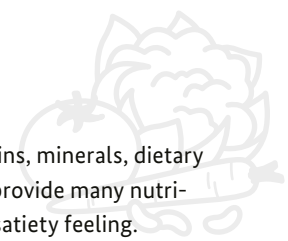
Food group grains, grain products and potatoes

Grains and **grain products** like bread, *muesli*, pasta or rice are important sources of energy, carbohydrates and dietary fibre. *Pseudocereals* or products made from them also belong to this group. Wholemeal varieties offer a higher *nutrient density* and are more filling than products made from refined flours or polished rice. *Parboiled* rice and other processed grains also provide a higher nutrient content than the polished variety.

Potatoes are among the possible sources of carbohydrates with high *nutrient density*.

Rice is a side dish containing starch with a comparatively large climate impact, as its cultivation releases larger quantities of climate-damaging greenhouse gases than potatoes or grains. Therefore, rice should only occasionally be integrated into the diet or replaced by local alternatives like spelt or green spelt.

Practical advice: Foods from this group should be offered in different ways, for example as mashed potatoes or pasta with tomato sauce. Ideally, grains and grain products are offered as wholemeal products. A slowly transition to the wholemeal alternative promotes acceptance among the current pupils. For example, it is recommended to mix a portion of wheat pasta with wholemeal pasta at the beginning and to gradually increase the amount of wholemeal pasta.



Food group vegetables and *salad*

Vegetables and ***salad*** are rich in vitamins, minerals, dietary fibre and phytochemicals. Thus, they provide many nutrients, little energy and contribute to a satiety feeling.

Vegetables and *salad* usually cause comparatively low *greenhouse gas emissions*. In particular, *seasonal* and *regionally* produced vegetables and *salad* grown open-field or in unheated greenhouses are especially climate-friendly and can be positive for social sustainability. Furthermore, local production strengthens the local economy.

Legumes like beans, lentils and peas also belong to this food group. They are an important protein source in a *plant-based* diet [20]. In addition, they contain a lot of dietary fibre and provide other nutrients such as vitamins B_1, B_6, folate and the minerals iron, magnesium and zinc, as well as phytochemicals. Combining foods from this group with cereals, cereal products, potatoes or animal-based products, increases the meal's *protein quality*. Examples include bean stew with potatoes, pasta salad with kidney beans, lentil bolognese with wholemeal pasta and (wholegrain) bread with hummus.

Moreover, *legumes* excel in terms of sustainability; during growth, the crops fix the required nitrogen from the air, which is why less fertilizer is needed [40]. At the same time, they ensure more biodiversity in agriculture. Dishes with *legumes* should therefore be a regular part of the diet. The "Protein Crop Strategy" of the Federal Ministry of Food and Agriculture aims, among other things, to increase domestic production [41, 42].

Practical advice: The possibilities for preparing vegetables and *salads* are as great as their variety. Whether as *raw vegetable* sticks with dip, classic side dish, stew, *salad* dish, vegetable casserole or patty – there are no limits for creative preparation. Fresh or frozen vegetables are the optimal choice.

Practical advice: *Legumes* are more digestible if the dry goods are soaked overnight, and the soaking water is then discarded. Adding herbs such as savoury, marjoram, rosemary or caraway and pureeing cooked *legumes* may also improve digestibility. Some varieties, such as red or yellow lentils, are already peeled and thus often easier to digest.

Further information:
www.schuleplusessen.de
Keyword: Gemüse und Obst

Food group fruits

Fruits are rich in vitamins, minerals, dietary fibre and phytochemicals and therefore have a high *nutrient density*.

From a botanical point of view, **nuts** also belong to fruits. Being important sources of nutrients, they are part of a health-promoting diet.

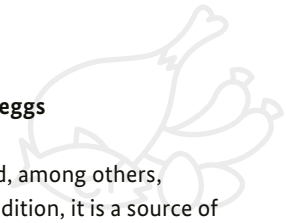
Practical advice: Fruits should be available fresh or as a frozen product, without added sugar and other *sweetening ingredients*, offered in a variety of ways on the menu or in the school kiosk. Examples are fresh fruits for breakfast or snack, briefly steamed for a sweet entrée, as fruit puree in yoghurt or cut into small pieces in *muesli*. In terms of taste formation, children should have the opportunity to get to know fruits in the "natural" form. Therefore, fruits should be offered as often as possible as *whole fruit*.

Further information:
www.schuleplusessen.de
Keyword: EU-Schulprogramm

Food group milk and dairy products

Milk and **dairy products** are "the primary calcium source". Along with vitamin D, this is especially important for growing children – for bone formation as well as for healthy teeth. Cheese in particular contains a lot of calcium but compared to other dairy products often has a high fat content. Cheese should be offered regularly, and varieties with an *absolute fat content* of maximum 30 % should be preferred. Milk and dairy products also provide high-quality protein, iodine and vitamins A, B_2 and B_{12}, among others.

Practical advice: The range of breakfast and snack options may be expanded to include for example porridge, overnight oats, *muesli* with milk or fresh fruits with yoghurt.



Food group meat, sausage, fish and eggs

Meat is a good source for protein and, among others, Vitamin B_{12}, selenium and zinc. In addition, it is a source of well available iron and has a high *protein quality*. However, meat, especially in processed form like **sausage** also contains unfavourable ingredients. For example, it has a high proportion of saturated fatty acids which can have a negative effect on the concentration of certain blood lipids. This is why lean meat is preferable. Sausage also contains a lot of salt. However, as part of a health-promoting and sustainable catering, a small amount of meat can complement the choice of vegetable food, making it easier to obtain essential nutrients.

Due to their ingredients as well as the high *greenhouse gas emissions* of animal-based foods – especially products derived from ruminants like cattle, sheep and goats – they should be moderately included in the diet.

Practical advice: The meat component in dishes may be reduced in favour of the vegetable and/or grain component. A more sustainable diet also includes the aspect of animal welfare. Organic farms and, for example, the Neuland Association advocate for meat from species-appropriate animal husbandry.

Further information:
www.schuleplusessen.de
Keyword: Tierwohl/Fleisch

Fish is a good source of protein as well. Fatty fish species, which include both freshwater and saltwater fish (see box), are additionally rich in valuable long-chain omega-3 fatty acids. Sea fish is also a good source of iodine.

Good sources for Omega-3 fatty acids:
trout, herring, salmon, mackerel

Examples for iodine-rich fish:
cod, haddock, pollock

Practical advice: Many children know and like fish, especially breaded. It may complement the menu. If children refuse to eat fish, imagination, creativity and some patience are needed. In this case, fish, like other foods with low acceptance, should be offered repeatedly. It usually takes a while before unfamiliar foods are accepted. One possibility is to combine fish with something familiar that children and adolescents like, for example fish filet with tomato sauce and pasta, fish patty in a burger or even using it in sauce or lasagna.

Today, many fish species are overfished. When buying fish, it is therefore important to look for fish from sustainable fisheries or aquacultures. The labels of the Marine Stewardship Council (MSC) and the Aquaculture Stewardship Council (ASC), for example, offer orientation.

Further information:
www.schuleplusessen.de
Keyword: Fisch

Eggs are a good source of high-quality protein and fat-soluble vitamins. At the same time, the yolk is high in fat and cholesterol. Based on current studies, no upper limit for egg consumption can be derived. In the context of a *plant-based* diet, however, an unlimited amount is not recommended (see Tables 2 and 3).

Food group oils and fats

Since fat provides twice as much energy as carbohydrates and protein, so **oils** and **fats** should be used consciously. In addition to the quantity of fat, the quality of the fat, e.g., the fatty acid composition, is of special importance for health. Oils and fats contain saturated, monounsaturated as well as polyunsaturated fatty acids and vitamin E.

Consuming less saturated fatty acids, which are mainly found in animal-based foods, has a positive effect. Instead, more foods with unsaturated fatty acids should be used. Good sources are, e.g. vegetable oils, margarine, nuts or fatty fish.

The preferred oil is rapeseed oil, a perfect all-rounder. It contains the lowest proportion of saturated fatty acids and at the same time a high content of monounsaturated and polyunsaturated fatty acids as well as vitamin E. The positive ratio of omega-3 to omega-6 fatty acids should also be highlighted.

Other recommendable oils with a notable content of omega-3 fatty acids are linseed, walnut and soybean oil. Olive oil with its high content of monounsaturated fatty acids is also a good choice. Margarine made from the above-mentioned oils has a higher content of unsaturated fatty acids compared to butter and thus a better fatty acid composition. Additionally, margarine has a significantly lower impact on the environment [43, 44]. In contrast, coconut oil, palm (kernel) oil and palm (kernel) fat, as well as animal lard, contain large amounts of saturated fatty acids, which have a particularly unfavourable effect on blood lipids.

The cultivation of plants yielding coconut oil, palm oil and palm fat is primarily conducted in *monocultures* causing substantial impacts on biodiversity and must hence be accessed as negative from an ecological perspective [45–47].

Further information:
www.schuleplusessen.de
Keyword: Palmöl

Practical advice: Rapeseed oil is multifunctional for cooking. It can be heated, offers neutral taste and is available everywhere. To promote flavour diversity, linseed, walnut, soy or olive oil can be used for typical dishes or even *salads*.

Food group beverages

Fluids are important. The task of **beverages** is to supply the body with water. Water as well as unsweetened herbal and fruit teas contain no calories and are therefore highly recommended.

The *guiding value* for the drinking amount is 1 L per day for primary school children and up to 1.5 L per day for secondary school children. In some situations, the body needs more fluid, for example in very hot or extremely cold weather or during physical activity like sports – then an additional 0.5 to 1 L of water per hour may be necessary.

Avoiding bottled water contributes to climate protection. Tap water offers a climate-friendly and at the same time cost-saving alternative, as packaging materials and transport routes are no longer required.

Caffeinated beverages like unsweetened black or green tea and coffee are calorie-free beverages that add to the fluid balance. However, due to their caffeine content, they are not an optimal choice.

Purchasing products with the Fairtrade label, such as coffee and tea, helps to improve the living and working conditions of small farming families and plantation workers in countries of the Global South.

Lemonades, cola and fruit juice drinks, fizzy beverages, nectars, fruit juices, iced teas, energy drinks and milkshakes are not suitable thirst quenchers. They contain a lot of sugar and thus provide many calories. So-called "flavoured water" may also be sweetened with sugar.

Light drinks and syrups that turn water into a tasty beverage or iced tea are also unsuitable. Despite being low or calorie-free, they often contain food additives like sweetener, colourings, and flavours, contributing to the development of a preference for sweet tastes.

Practical advice: During the school day, even in class, drinking water is available to the pupils, preferably free of charge, e.g. through drinking water dispensers, water fountains or a special corner in the classroom. At every meal it should be a regular part of the menu.

Further information:
www.schuleplusessen.de
Keyword: Getränke

3.3 Deriving criteria for a health-promoting and sustainable catering

The way recommendations for a wholesome diet translate into criteria for mass catering on a scientific basis is described below. Figure 5 illustrates this path in 4 steps, which are explained in more detail in the following text.

From the background...
Basis for the derivation of criteria for health-promoting and sustainable catering, especially the food qualities and frequencies in chapter 4.1, are the scientifically based *"Reference values for nutrient intake"* [39] and the evidence-based guidelines regarding fat and carbohydrate intake [37, 38]. The former specifies amounts for the daily intake of energy and nutrients, including water and dietary fibre. These amounts are formulated for a total of 12 different age groups, each separately for both sexes. In addition, the food-related recommendations of the DGE form a basis, like the "DGE Nutrition Circle", the "Three-Dimensional DGE Food Pyramid" and the "10 guidelines of the DGE for a wholesome diet".

... to theoretical derivation ...
Because of organisational and economic reasons, in mass catering it is not possible to provide meals whose energy and nutrient contents correspond to the respective age- and genderspecific reference values of the guests. Therefore, summarised values for the different living environments of mass catering were derived from the detailed *"Reference values for nutrient intake"*.

For school catering, the "*Reference values for nutrient intake*" were used for the age groups 7 to under 10 years (primary level) and 10 to under 19 years (secondary level). The *Physical Activity Level* (*PAL*) of 1.4 was used to derive the *guiding values* for energy intake in the age groups mentioned. Within these age groups, the *guiding values* of girls and boys were combined, and the average value (arithmetic mean) was determined. A different approach was used for the derivation of the reference values for vitamin and

mineral intake: If the values for boys and girls differed, the higher reference value was used in order to ensure a minimum intake for all.

... and calculation...
Based on these principles, nutrient-optimised menus for both a mixed diet and *ovo-lacto-vegetarian* diet including breakfast, snacks, lunch and dinner were composed. They are exemplary for 4 weekly menus respectively 20 catering days and considering the usual eating habits in Germany. The following aspects were taken into account:

- reaching the derived Reference values for mass catering for groups of people aged 6 to under 10 years (primary level) and 10 to under 19 years (secondary level),
- *physical activity level* (*PAL*) 1.4,
- energy is distributed to the individual meals according to the so-called "quarter approach": 25 % each to breakfast, lunch and dinner and 12.5 % of the *guiding value* for energy intake to each of the 2 snacks,
- corresponding food qualities (see chapter 3.2),
- "5 a day" campaign (at least 3 portions of vegetables and 2 portions of fruit),
- with 90 % of the total energy, 100 % of the recommended reference values of nutrients (vitamins and minerals) are met, so that 10 % of the total energy may be allocated to foods with low nutrient and high *energy density*, like chocolate, jam or potato chips.

... to food-related criteria for health-promoting and sustainable catering
Based on the nutrient-optimised menus for 20 catering days, corresponding quantities per day or per week were determined for each food group. These orientation values for food quantities create the basis for the derivation of corresponding food frequencies. Once these food quantities and frequencies are implemented in practice, and the defined food qualities are considered (see chapter 3.2), it can be expected that most likely all nutrients will cover the reference values.

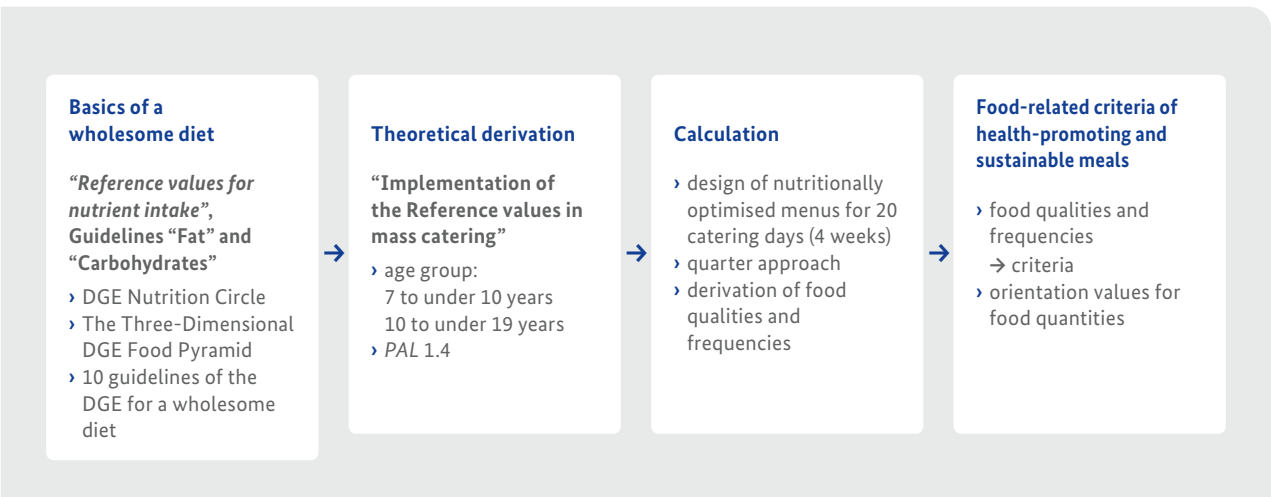


Figure 5: Path from the basics of a wholesome diet to food-related criteria for health-promoting and sustainable catering

4

Designing health-promoting and sustainable meals

This chapter provides assistance in the design and implementation of health-promoting and sustainable food and beverages in schools. The process chain is used to illustrate a catering offer for breakfast, snacks and lunch that is tailored to the needs and requirements of primary and secondary school pupils. Optimally composed, this offers pupils the opportunity to make a healthy and sustainable choice for every meal.

4.1 Planning

Planning | Purchase | Preparation | Service | Disposal and cleaning

Anyone who wants to provide a catering service must know upfront which or how many meals the school will offer (see also chapter 2.1). If, for example, only lunch is delivered by a *meal provider*, the planning will differ from the planning for breakfast, snack and lunch.

Creating health-promoting and more sustainable meals begins with planning. In this process step, among other things, the range of food and beverages is compiled, new recipes are developed, or existing ones are adapted, and the length of the *menu cycle* is determined. Proper planning not only affects the nutritional quality of the meals but may also contribute to reducing food waste and therefore to sustainability and economic efficiency.

The analysis of waste measurements in mass catering and explicitly in school catering shows that an increased amount of food waste is caused by overproduction, lack of order system and food returns.

Adequate planning becomes challenging without a well-functioning order system or close coordination with the school. It is essential to be promptly informed about the absence or non-participation of individuals or groups, to facilitate accurate production planning. Communication channels for registration and cancelling must be set up on a permanent basis. The ordering system should be designed in a way that pupils or their parents can cancel the meal independently and without specifying reasons within a given period.

When planning the production quantities, the pupils' wishes and preferences regarding dishes and portion sizes should be taken into account and ladle plans for the service adapted accordingly. This requires regular monitoring of the calculated portion sizes and the actual quantities served.

Another way to reduce food returns is to flexibly adjust portion and plate sizes at the table and proactively offer the pupils the option of "second helpings". In the case of exclusively self-service, such as free-flow serving systems or joint tables, leftovers can be reduced by using smaller containers and successively filling the buffet or catering stations. At the beginning of the lunch break, large or deep containers may be used for the first major rush and these can be replaced by smaller or flat containers towards the end of the break [13, 32, 48].

By the way: The "Competence Center for Out-of-Home Catering" (KAHV) informs and advises companies on the implementation of measures to reduce food waste. Measuring food waste is the first step towards better use of resources, lower waste costs and an improved carbon footprint.

Further information:
www.schuleplusessen.de
Keyword: Lebensmittelabfälle vermeiden

Furthermore, through a targeted choice of food, menu planning influences the sustainability of the meals offered. The *greenhouse gas emissions* of food production may vary greatly. Meals with a high proportion of vegetable components (e.g. vegetables, grains) generally generate fewer greenhouse gases than those with a high proportion of animal-based products (e.g. meat, cheese) [25].

Further information:
www.schuleplusessen.de
Keyword: Nachhaltigkeit in der Gemeinschaftsverpflegung

At the same time, enjoyment also plays an important role, because health-promoting and sustainable food should taste good and be enjoyable. Children and adolescents in particular need a range of foods that offers variety in taste as well as in smell, texture and appearance experiences in order to shape their senses. Olfactory and taste experiences shape the sensory memory.

By the way:
Getting used to a standardised taste, e.g. through flavour enhancers, may result in a lost taste for the variety of natural foods. In principle, products without flavour enhancers and other *sweetening ingredients* are to be preferred. For reasons of taste formation and shaping, not natural and processed meat products like formed meat should not be used. Food that contains alcohol or alcohol flavours as an ingredient should generally be avoided in school meals.

4.1.1 Food qualities and frequencies as well as other aspects of menu planning

Table 2 supports the planning of breakfast and snacks, Table 3 the planning of lunch. In this context, both a health-promoting and sustainable meal offer for the mixed diet and for an *ovo-lacto-vegetarian* diet are presented over 5 catering days. This way, it becomes immediately clear, which offer is favourable for the individual meals.

Based on the 7 food groups (see chapter 3.2), the Tables initially show the **food qualities – the optimal food choice**. Included are foods that are highly recommended because of their nutritional composition.

By the way:
Although animal-based foods have a high *protein quality,* the recommended *protein intake* should mainly be covered by vegetable food. In order to increase the *protein quality* of the catering offer, combining protein sources from different food groups (animal-based and vegetable or vegetable and vegetable) makes sense. This should be taken into account during menu planning, particularly in the case of *plant-based* catering (for further information see chapter 3.2.).

Additionally, the tables show criteria on **how often** certain foods or food groups must be used in a period of 5 catering days. For the food groups that should be offered several times a day, like vegetables or grain products, the daily frequency is also shown in brackets.

Moreover, **minimum and maximum requirements** are formulated to show particularly recommendable or less recommendable foods from a nutritional and sustainable perspective. The criteria on the foods' qualities and frequencies allow a balanced and varied menu. If the criteria are consistently observed in menu planning, all nutrients are assumed to likely meet the recommended values in the sense of the implementation of the *Reference values* in mass catering.

By the way:
Foods not listed in the tables, like jam, honey or butter, are not included as optimal choices because of their composition. Nevertheless, it is possible to use them.

One important parameter in the context of menu planning, purchasing and serving is the **portion sizes** of individual components. They provide orientation on how much of the food should be offered from a nutritional point of view. In both tables, **orientation values for food quantities** are shown as planning orientation. The quantities are already intake quantities, e.g., peeling and cooking losses are factored in. They provide orientation but are not a fixed parameter and must be calculated individually by each *meal provider*. The actual quantity should be based on experience of the kitchen staff. The pupils' wishes in particular should be reflected. Ultimately, a needs-based calculation is the precondition for responsible economic and ecological action.

The 4th column of both tables shows the criteria for the ***ovo-lacto-vegetarian*** diet. In addition, the following aspects should be considered if neither meat nor fish are offered.

Iron is a potentially critical nutrient in the *ovo-lacto-vegetarian* diet, as the human body tends to absorb this mineral more efficiently from animal-based sources than from vegetable ones. Enhancing iron absorption can be achieved by combining iron-rich plant foods such as *legumes*, millet, or oatmeal with foods high in vitamin C, citric acid (found in vegetables and fruits), or lactic acid (found in sauerkraut). Examples of such dishes include falafel sandwiches with coleslaw, lentil-stuffed peppers, millet casserole with fruit, and rye rolls, or sourdough bread served with soups or salads. These options should be incorporated into the *ovo-lacto-vegetarian* menu.

Fatty fish serves as the main source of **long-chain omega-3 fatty acids** and is, therefore a crucial component of a mixed diet. If no fish is consumed, for example because of an *ovo-lacto-vegetarian* diet, it is advisable to incorporate foods rich in alpha-linolenic acid, such as rapeseed oil, linseed oil, walnut oil, nuts, or oilseeds. While the human body can convert alpha-linolenic acid into long-chain omega-3 fatty acids, this process has limitations, and the complete substitution of fatty fish with other foods is not entirely feasible [50, 51]. Nevertheless, due to increasing demand, criteria for the *ovo-lacto-vegetarian* diet were included to ensure optimal nutritional provision.

Breakfast and snacks

Both breakfast and snacks contribute significantly to the daily nutrient intake. Breakfast, whether eaten at home or at school, and the mid-morning and mid-afternoon snacks should be coordinated to a large extent. Partly these meals are organised by the school, partly delivered by the *meal provider*. Alternatively, meals can be selected from a school kiosk or taken from home in a "lunch box". Regardless of the way breakfast and snacks are organised, the goal is to ensure an optimal offer for these meals too. To guarantee maximum flexibility due to the heterogeneous (meal) structures of different schools, these 3 meals (breakfast, 1st and 2nd snack) were combined in Table 2. Consequently, the orientation values for the weekly food quantities may be divided among all 3 meals. The weekly food frequencies are presented as a total for the 3 meals. To improve orientation and practicability, the daily frequencies are listed accordingly. If, for example, 10 × fruits is recommended on 5 days, it should be offered 2 × per day and be flexibly shared among breakfast and/or snacks.

Lunch

While breakfast and snacks are offered additionally at school, lunch is obligatory in the context of all-day school. It contributes also significantly to the daily nutrient intake. For a balanced school meal, the food qualities and frequencies listed in Table 3 apply.

The selection of foods and their frequency of use listed in Tables 2 and 3 provides a framework based on scientific principles. Within this framework, it is possible to design the catering offer in a varied and creative way or to optimise popular dishes. The use of wholemeal products, *legumes* or the offer of a popular vegetarian dish like (wholemeal) spaghetti with tomato sauce instead of a meat dish catering.

Optimising means:
Changing a dish by substituting foods in such way that the original character still persists while the *nutrient density* increases. Optimisation can also be achieved by supplementing individual components (e.g. *salad*).

Food qualities and frequencies on
4 catering days per week as well as 20 days:
www.schuleplusessen.de
category Essensanbietende, under Planung

Breakfast and snacks

Table 2: Food qualities and frequencies for health-promoting and sustainable breakfast and snacks on 5 catering days

food group	food qualities – optimal choice
grain, grain products, and potatoes 	› wholemeal products › *pseudocereals* › *muesli* without added sugar and other *sweetening ingredients*
vegetables and *salad* 	› vegetables, fresh or frozen › *legumes* › *salad*
fruits 	› fruits, fresh or frozen › nuts and oilseeds, unsalted → each without added sugar and other *sweetening ingredients*
milk and dairy products 	› milk, plain yoghurt, buttermilk, sour milk, kefir: max. *absolute fat content* 3,8 % › quark: max. *absolute fat content* 5 % → each without added sugar and other *sweetening ingredients* › cheese: max. *absolute fat content* 30 %
meat, sausage, fish[2] and eggs[3] 	› meat and cold cuts: max. 20 % fat
oils and fats 	› rapeseed oil › linseed, walnut, soybean, olive oil › margarine made from the oils mentioned
beverages 	› water › fruit and herbal tea → each without added sugar and other *sweetening ingredients*

1 The orientation values given for food quantities are consumption quantities, i.e. peeling and cooking losses are already factored in. The actual quantities should be based on experience (see also chapters 3.3 and 4.1.1).

2 Given the eating habits of German children and adolescents, fish was not included in the nutrient-optimised breakfast and snack menus.

	food frequencies on 5 catering days orientation values for food quantities[1] for 5 catering days, per pupil, **p**rimary school level and **s**econdary school level	
	mixed diet	***ovo-lacto-vegetarian* diet**
	min. 10 × (min. 2 × daily) p: ca. 450 g, s: ca. 500 – 700 g › thereof: min. half of the daily offer from wholemeal products	**min. 10 × (min. 2 × daily)** p: ca. 450 g, s: ca. 500 – 700 g › thereof: min. half of the daily offer from wholemeal products
	min. 5 × (min. 1 × daily) p: ca. 500 g, s: ca. 550 – 750 g › thereof: min. 3 × as *raw vegetables*	**min. 5 × (min. 1 × daily)** p: ca. 500 g, s: ca. 550 – 750 g › thereof: min. 3 × as *raw vegetables*
	10 × (2 × daily) p: ca. 900 g, s: ca. 1000 – 1200 g › thereof: min. 2 × as nuts or oilseeds p: ca. 25 g, s: ca. 50 – 60 g	**10 × (2 × daily)** p: ca. 900 g, s: ca. 1000 – 1200 g › thereof: min. 2 × as nuts or oilseeds p: ca. 25 g, s: ca. 50 – 60 g
	min. 10 × (min. 2 × daily) p: ca. 1200 g, s: ca. 1400 – 1600 g	**min. 10 × (min. 2 × daily)** p: ca. 1200 g, s: ca. 1500 – 1700 g
	max. 2 × meat/cold cuts offered p: ca. 20 g, s: ca. 40 – 50 g	**omitted in an *ovo-lacto-vegetarian* diet**[3]
	rapeseed oil is standard fat p: ca. 30 g, s: ca. 30 – 50 g	**rapeseed oil is standard fat** p: ca. 30 g, s: ca. 30 – 50 g
	beverages are available anytime	**beverages are available anytime**

3 There is no recommendation on the number of eggs to be consumed. In the nutrient-optimised meal plans, approx. 20 to 30 g (mixed diet) or 30 to 40 g (*ovo-lacto-vegetarian* diet) of eggs per week were calculated for breakfast and snacks.

Lunch

Table 3: Food qualities and frequencies for a health-promoting and sustainable lunch on 5 catering days

food group	food qualities – optimal choice
grain, grain products, and potatoes 	› wholemeal products › *pseudocereals* › potatoes, raw or precooked › *parboiled* rice or brown rice
vegetables and *salad* 	› vegetables, fresh or frozen › *legumes* › *salad*
fruits 	› fruits, fresh or frozen › nuts and oilseeds, unsalted → each without added sugar and other *sweetening ingredients*
milk and dairy products 	› milk, plain yoghurt, buttermilk, sour milk, kefir: max. *absolute fat content* 3,8 % › quark: max. *absolute fat content* 5 % → each without added sugar and other *sweetening ingredients* › cheese: max. *absolute fat content* 30 %
meat, sausage, fish and eggs[5] 	› lean muscle meat
oils and fats 	› rapeseed oil › linseed, walnut, soybean, olive oil › margarine made from the oils mentioned
beverages 	› water › fruit and herbal tea → each without added sugar and other *sweetening ingredients*

4 The orientation values given for food quantities are consumption quantities, i.e. peeling and cooking losses are already factored in. The actual quantities should be based on experience (see also chapters 3.3 and 4.1.1).

food frequencies on 5 catering days

orientation values for food quantities[4] for 5 catering days, per pupil, **p**rimary school level and **s**econdary school level

mixed diet	***ovo-lacto-vegetarian* diet**
5 × (1 × daily) p: ca. 600 g, s: ca. 650 – 800 g › thereof: min. 1 × wholemeal products max. 1 × *potato products*	**5 × (1 × daily)** p: ca. 600 g, s: 650 – 800 g › thereof: min. 1 × wholemeal products max. 1 × *potato products*
5 × (1 × daily) p: ca. 800 g, s: ca. 900 – 1200 g › thereof: min. 2 × as *raw vegetables* min. 1 × *legumes* p: ca. 80 g, s: ca. 100 – 120 g	**5 × (1 × daily)** p: ca. 900 g, s: ca. 1000 – 1400 g › thereof: min. 2 × as *raw vegetables* min. 1 × *legumes* p: ca. 140 g, s: ca. 150 – 200 g
min. 2 × p: ca. 150 g, s: ca. 150 – 200 g › thereof: min. 1 × al *whole fruit*	**min. 2 ×** p: ca. 150 g, s: ca. 150 – 200 g › thereof: min. 1 × as *whole fruit* min. 1 × as nuts or oilseeds p: ca. 25 g, s: ca. 25 – 30 g
min. 2 × p: ca. 200 g, s: ca. 200 – 300 g	**min. 2 ×** p: ca. 200 g, s: ca. 200 – 300 g
max. 1 × meat/sausage p: ca. 60 g, s: ca. 70 – 90 g › thereof: min. 2 × lean muscle meat within 20 catering days **1 × fish** p: ca. 45 g, s: ca. 50 – 70 g › thereof: min. 2 × fatty fish within 20 catering days	**omitted in an *ovo-lacto-vegetarian* diet**[5]
rapeseed oil is standard fat p: ca. 30 g, s: ca. 30 – 40 g	**rapeseed oil is standard fat** p: ca. 30 g, s: ca. 30 – 40 g
beverages are available anytime	**beverages are available anytime**

5 There is no recommendation on the number of eggs to be consumed. In the nutrient-optimised meal plans, approx. 20–30 g (mixed diet) or 40–50 g (*ovo-lacto-vegetarian* diet) of eggs per week were calculated for lunch.

In addition to the criteria for using food qualities and frequencies in Tables 2 and 3, the following additional criteria should be considered when planning a varied, health-promoting and sustainable meal offer:

☐ ***Ovo-lacto-vegetarian* options are available every day for every meal.**

Regardless of whether some of the pupils follow an *ovo-lacto-vegetarian* diet, popular dishes without meat and fish are always enriching the menu. In case of a *ovo-lacto-vegetarian* diet, it must be ensured that the same variety of choices is available at all meals as with the mixed diet. Simply reducing the meat or fish components of the latter is not sufficient enough for a health-promoting and sustainable offer. Main components on the plate should be vegetables, *salad* and/or *legumes*.

By the way:
Mixed and *ovo-lacto-vegetarian* menus may include vegan lunches for up to 3 days, all while adhering to the criteria for food quality and frequency.

☐ ***Seasonal* and *regional* vegetables and fruits are included.**

Apart from having a positive effect on the environment, this also avoids or shortens storage times and longer transport distances. Local *seasonal* products also give pupils a feeling of *seasonal* orientation. Out-of-season products are transported long distances to Germany and/or produced in heated greenhouses. This costs energy and releases greenhouse gases.

Further information:
www.schuleplusessen.de
Keywords: Saisonale Lebensmittel and Regionale Lebensmittel

☐ **Local foods are preferred in the menu.**

Vegetables and fruits from Germany and other EU countries generally have fewer pesticide residues than products from non-EU countries [52]. By using local *seasonal* food, long transport routes might be avoided, energy consumption and costs reduced, and at the same time the local economy may be supported.

☐ **Grains, grain products and potatoes are offered in varied ways.**

When planning the menu, this food group allows for variety. In addition to potatoes, pasta and rice, spelt, green spelt, bulgur and millet may also be prepared in different ways.

☐ **Deep-fried and/or breaded products are used at most 4 times in 20 catering days.**

Deep-fried and/or breaded components like croquettes, battered vegetables, breaded schnitzels, chicken nuggets or fish fingers absorb larger amounts of fat during preparation. This category also includes dishes that are fried while floating in fat, like potato waffles or pancakes.

... furthermore:

- [ ] **Meat and fish alternatives are offered for lunch no more than 4 times in 20 catering days.**
  This includes ultra-processed, ready-to-cook foods like “sausages”, “schnitzel” or fried patties e.g., based on soy, tofu, lupine, mushrooms or milk as well as seitan. Tofu, seitan and tempeh (whether nature or pickled) that undergo no further processing are not considered in this context.

- [ ] **Beverages are available anytime.**
  Water should be placed in prominent locations in the school and canteen, if possible free of charge. An energy-free beverage of at least 0.2 L is served with lunch. The beverage costs are included in the menu price. Tap water is an economic and ecological alternative.

- [ ] **The lunch *menu cycle* is repeated after 4 weeks at the earliest.**
  The *menu cycle* should be as long as possible to ensure variety in the menu. Within a week, the same components, like potatoes or carrots, are possible, but should be prepared differently and combined with other components in a varied way.

- [ ] **The dishes are colourful and the composition varies.**
  As early as the planning stage, a colourful composition of the dishes or components should be kept in min.

- [ ] **Participation in meals is possible in case of food intolerances like allergies.**
  For this purpose a special meal offer, a selection of individual components or (if otherwise not possible) a meal brought from home would work. Further information can be found in chapter 4.6 and 6.3.

- [ ] **The pupils’ wishes and suggestions are considered in the menu planning as far as possible.**
  Pupils should be given the opportunity to express their wishes and criticism about the meals. This can take place in personal conversations, via questionnaires or the *catering committee*. If wishes and suggestions may not be realised, giving an explanation is recommended (see chapter 2.4).

- [ ] **Culture-specific, regional and religious eating habits are taken into account in the planning.**
  If these aspects are respected, the pupils may identify themselves to a certain extent through the food. Themed weeks addressing traditional food from different countries or regions, major events (European and World Championships, cultural events) or school project weeks on specific topics (grains, milk, herbs, sustainability) are particularly suitable for this purpose.

4.1.2 The use of *processed food* *(convenience food)* in mass catering

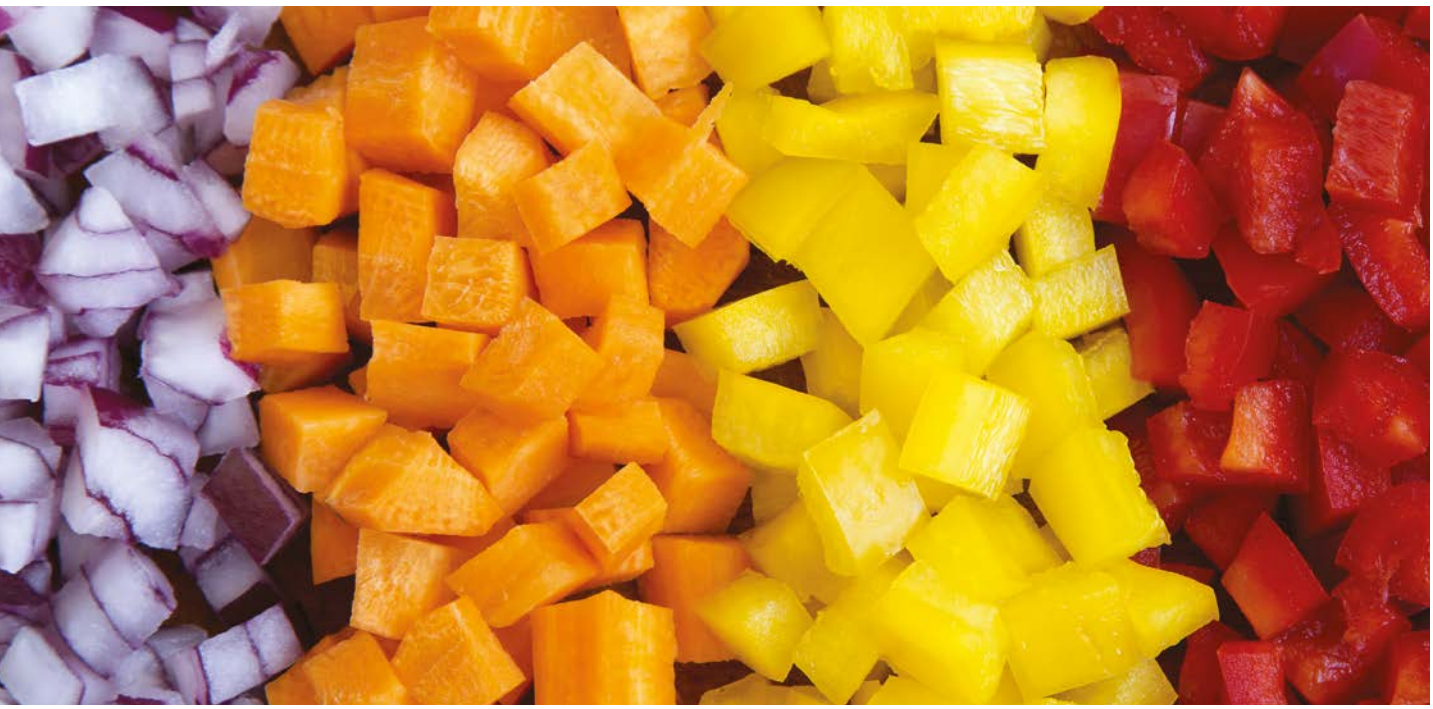
The use of *processed food* is a common practice in mass catering. This food is classified according to the degree of processing. The product range extends from low to ultra-processed:

Low-*processed food* is, e.g., pasta as dry products or pre-cut *salad*s, frozen vegetables, and fruits, as well as dried fruits.

The food that has undergone several processing steps are referred to as ultra-*processed food*. They include ready-made menu components like breaded schnitzels, spring rolls, meat substitutes, classic sauces and dressings (dry or wet products) or ready-made entrées like frozen lasagna or pizzas as well as ready-made soups. Depending on the product group, they may have a high content of sugar, fat, especially unfavourable saturated fatty acids, and salt.

By the way:
The German Federal Ministry of Food and Agriculture (BMEL) initiated the "The National Reduction and Innovation Strategy: Less sugar, fats and salt in *processed foods* " in 2018 with the goal of reducing the content of sugar, unfavourable fats and salt as well as the energy content in *processed food*. As part of the strategy, the food industry committed to reduce the sugar, fat, salt and/or energy content in their products by 2025 with the help of concrete targets [53].

Further information:
www.schuleplusessen.de
Keyword: Verarbeitete Lebensmittel



When using *processed food (convenience food)*, the following criteria apply:

☐ **Products without palm (kernel) fat, palm (kernel) oil or coconut fat are preferred.**
The mentioned fats contain large amounts of unfavourable fatty acids and are therefore not recommended from a nutritional perspective. If products with palm oil are used, be sure to use only those made from sustainably certified palm oil. Products with rapeseed, linseed, walnut, soybean or olive oil should be preferred.

Further information:
www.schuleplusessen.de
Keyword: Palmöl

☐ **Unprocessed or low-*processed food* like fresh or frozen vegetables and fruits, meat or fish, are preferred to be processed further on site.**
Due to the higher nutrient content, vegetables and fruits, fresh or frozen, are preferred to canned products. From an environmental perspective, unprocessed or low-*processed food* are also favourable, as the level of resource utilization tends to increase with food processing.

☐ **Ultra-*processed food* is always combined or supplemented with low *processed food* or components.**
Ready-to-cook vegetable patties for example may be combined with boiled potatoes and *salad* made from *raw vegetables* with home-made dressing.

☐ **Food with a low content of sugar, fat, saturated fatty acids and/or salt and a low *energy density* are selected.**
There are significant differences in the sugar, fat, saturated fatty acid, salt and energy content of *processed food* within the product groups. Therefore, food should be carefully chosen and those of them that are considered to be more favourable from a nutritional perspective should be preferred. The document "Evaluation of selected *convenience foods* in mass catering and recommendations for optimisation" provides assistance for evaluation of selected *processed food* [54] as well as the results of the "Start Low" project further information. Data from this project is available for estimating the sugar, salt and saturated fat content (see further information).

Further information:
www.schuleplusessen.de
Keyword: Zucker, Fett, Salz

4.1.3 Menu

Similar to the way a business card contains all important information about a person, the menu should do the same: It is source of information for pupils, parents and teachers and represents the kitchen's flagship. Legal aspects must be considered when designing the menu. Chapter 6 provides background information.

When designing and providing the menu, the following criteria apply:

- ☐ **The current menu is in advance accessible on a regular and barrier-free basis.**
  The menu is available in advance (e.g., on display or online) so that pupils and parents are regularly informed about the meals and can compare them with their meals at home.

- ☐ **Information is provided on allergens and food additives requiring labelling.**
  For further information see chapter 6.3.

Further information:
www.schuleplusessen.de
Keyword: Kennzeichnung

- ☐ **Food is named clearly.**
  When using non-standard or ambiguous names, e.g., fantasy names like "Viking pan", non-German language indications like " Ratatouille" as well as general names like "vegetable stew", pupils can only assume which dishes or components are meant. Therefore, it is important that the main ingredients of the dish are indicated on the menu. This also applies to classic garnishes like "Gardener's style" or "Hunter's style".

- ☐ **For meat, sausages and fish, the animal species is named.**
  It is easier to choose when the animal species is known. This may also be important for religious reasons.

- ☐ **The basis of alternatives to meat, fish, egg, milk and dairy products is clearly defined.**
  The alternatives to meat, fish, egg, milk and dairy products have grown considerably in recent years, offering a diverse range. Soybean, pea, lupin or wheat protein, as well as beans, sunflower seeds, milk, eggs and jackfruit, for example, serve as the basis for meat and fish substitutes. *Plant-based* beverages made from soy, oats, rice or almonds are available as milk alternatives. To enable pupils to choose consciously, the menu should indicate the source of the alternatives, for example by stating "with pea protein" or "soy-based". Descriptions like "*plant-based* yogurt alternative" or "vegan schnitzel" are in-sufficient.

- ☐ **If nutritional values are declared, the legal requirements are observed.**
  For further information see chapter 6.

- ☐ **If prices are mentioned, they are displayed clearly and transparently.**
  Prices on the menu are generally voluntary. If prices are mentioned, they should be clearly linked to the dishes or components. It should be instantly obvious whether the price refers to a portion or 100 g.

... furthermore:

- ☐ **The menu is tailored to the particular target group.**
  When designing the menu, ensure that the font is large enough. A complementary display of pictures may help primary school pupils to make their choice.

- ☐ **Several menu lines are clearly presented, and the health-promoting and sustainable meal is particularly highlighted.**
  It is easier to choose if the health-promoting and sustainable meal is at the top of the menu and highlighted in colour or with a symbol. In this context the use of nudging techniques may be considered (see chapter 5.3).

4.2 Purchase

Planning | **Purchase** | Preparation | Service | Disposal and cleaning

In addition to the planning of food and beverages, purchasing also has a significant influence on the quality of the offer, especially on sustainable aspects.

For purchases the following criteria apply:

- ☐ **Organic food is used.**
  Organic food contains minimal pollutants and residues. In addition, organic farming makes significant contributions to environmental, climate, water, soil, and resource protection. E.g., soil and water conservation by avoiding the use of synthetic chemical pesticides and mineral fertilizers, by using antibiotics in animal husbandry only in emergencies and by reducing environmental pollution with pesticides. These examples have a positive effect on biodiversity [52, 55].The full potential of organically produced food is realized when sourced locally and *seasonally* [56].

  Incorporating a high proportion of organic food in mass catering serves as a crucial tool in fostering an increased demand for seasonal organic produce from the respective region. The new Organic Out-of-Home Catering Ordinance (Bio-AHVV) simplifies organic certification for professional catering facilities. Among other things, this regulation allows gastronomic facilities to showcase the organic share of 20 % or more of the total food input's monetary value with a 3-stage logo after obtaining appropriate certification [57].

→

... furthermore:

The guideline "Auf dem Weg zu mehr Nachhaltigkeit in der Betriebsverpflegung", a publication of the project "NACHHALTIG BUND GESUND", shows ways to increase the organic share in mass catering even with a fixed and limited budget [58].

Further information:
www.schuleplusessen.de
Keyword: Ökologisch erzeugte Lebensmittel

☐ **Fair trade products are used.**
Purchasing fair trade food like nuts, coffee, tea or bananas contributes to securing a fair income for people in producing countries as well as providing better working and living conditions. This applies as well to direct purchasing agreements with producers.

Further information:
www.schuleplusessen.de
Keyword: Fair gehandelte Lebensmittel

☐ **Fish is purchased from sustainable fisheries.**
The Marine Stewardship Council (MSC) and Aquaculture Stewardship Council (ASC) labels, as well as the EU-label for organic produced fish and organic labels like Bioland or Naturland, provide orientation when purchasing fish.

Further information:
www.schuleplusessen.de
Keyword: Fisch

☐ **Meat from species-appropriate animal husbandry is preferred.**
Species-appropriate animal husbandry is promoted, for example, by organic farms or the Neuland-Verein as well as the animal welfare initiative "Eine Frage der Haltung" of the German Federal Ministry of Food and Agriculture (BMEL). If it is not possible to purchase only meat from species-appropriate animal husbandry for economic reasons, e.g. the offer may be limited to individual dishes.

Further information:
www.schuleplusessen.de
Keyword: Tierwohl/Fleisch

☐ **Environmentally friendly packaging is preferred for all food.**
In order to contribute to the reduction of packaging waste, food in disposable packaging should be avoided and instead reusable packaging in bulk containers preferred. When purchasing it is recommended to look for recyclable, mono-material packaging.

☐ **The first-in-/first-out-principle is applied.**
Food that has a shorter shelf life or was stored first should be consumed first. This helps to use food before it spoils and contributes to wasting less food and saving costs.

4.3 Preparation

Planning | Purchase | **Preparation** | Service | Disposal and cleaning

Apart from the food choice, the way meals are prepared and the time they are kept hot have an impact on the nutritional and sensory quality. Selecting and using kitchen equipment in a thoughtful way might also contribute to a higher level of sustainability.

The following criteria to the preparation of food apply:

☐ **Recipes, if required with preparation instructions, are used.**

With recipes, consistent food quality is ensured, even with staff turnover. They simplify the preparation process and provide a reliable basis for calculating products as well as for a functioning allergen management. Proven and optimised recipes additionally help avoiding food waste.

Recipes and menus are available at:
www.schuleplusessen.de, category Service

☐ **Fat is used consciously.**

Due to its high energy content and differences in composition, fat and high-fat food should be used consciously, e.g., in moderate amounts and preferably in the form of high-quality vegetable oils. Dairy products with a high fat content, like high-fat cheeses, crème fraiche, sour cream or sweet cream, should only be used in low quantities when preparing dishes like casseroles, dressings, sauces or desserts.

☐ **Sugar is used sparingly.**

Sugar-sweetened food and beverages increase the risk of caries, overweight and *obesity* as well as secondary diseases like type 2 diabetes. The addition of sugar and other *sweetening ingredients* should therefore be kept to a minimum. To get pupils used to a less sweet taste, a gradual reduction in recipes is recommended. Instead of sugar and other *sweetening ingredients*, the sweetness from fresh or frozen fruits is often sufficient enough.

Further information:
www.schuleplusessen.de
Keyword: Zucker, Fett, Salz

☐ **Iodised salt is used, it is salted sparingly.**

Too much salt in food increases the risk of high blood pressure and thus cardiovascular diseases. The guidance level for table salt intake for children is 3 to 6 g per day, depending on age [59]. Food like bread, sausage and cheese already contain larger amounts of salt, so there is only a small amount left to add. When using salt, choose iodized salt, which is an important source of iodine alongside sea fish, milk and dairy products. In order to promote the acceptance of low salt food, the addition of salt may be reduced slowly and gradually, and more herbs and spices may be used instead.

... furthermore:

☐ **Herbs (fresh, frozen, dried) and spices are used in a variety of ways.**
Herbs and spices don't simply help to save salt, they may also create a greater variety of flavours.

☐ **Nutrient-preserving and low-fat cooking methods are used.**
In addition to appearance, taste and consistency, the cooking method also influences the nutritional quality of the food. To keep losses of vitamins and minerals to a minimum, vegetables and potatoes should be cooked without or with little fat and water by sautéing, steaming, or grilling. When preparing meat, sautéing, roasting, stewing, grilling and low-temperature cooking in little fat are recommended as low-fat cooking methods. For fish, these are steaming, sautéing, grilling and short frying in low fat.

☐ **Cooking periods are kept as long as necessary and as short as possible.**
Extended cooking results in unnecessary vitamin losses and additional energy consumption, while appearance, taste and texture of the food also suffer. If vegetables and fruits are pureed afterwards, a short cooking period is also sufficient.

☐ **Maximum holding time for cooked food is 3 hours.**
The longer the food is kept hot, the more heat-sensitive vitamins are lost, and the food appearance, taste and consistency suffer. Keeping food hot for a longer period of time also consumes additional energy. According to DIN 10508:2022-03 [60] and the "Hygiene rules in the catering sector" of the Federal Centre for Nutrition and the Federal Institute for Risk Assessment [61] the hot-keeping period, thus the time between the end of the cooking process and serving of the meal to the last guest, should be maximum 3 hours long. If a 3 hour hot-keeping period is not feasible, the food must be cooled down immediately after preparation and regenerated in batches before serving, according to DIN 10536:2023-03 [62].

☐ **The holding temperature of cooked food is at least 60 °C throughout the food.**
To protect food from spoiling and minimise the risk of foodborne infection or poisoning, the minimum temperature for keeping food hot is 60 °C according to DIN 10508:2022-03. For safety reasons in practice, the mentioned norm recommends a temperature of 65 °C throughout the food. This applies to storage as well as transportation and serving [60].

Further information:
www.schuleplusessen.de
Keyword: Heißhalten und Regenerieren

☐ **Chilled food is stored at a maximum of 7 °C.**
Chilled food like *salads* or desserts can also spoil easily. According to DIN 10508:2022-03 [60], a storage, transport and dispensing temperature of 7 °C should not be exceeded as a precaution. Until serving, chilled food should be cooled accordingly and consumed immediately after serving.

... furthermore:

- **Use resource-efficient kitchen appliances.**
  Kitchen appliances differ widely in their energy and water consumption. Gas and induction appliances are usually very efficient. The size of the appliances should be chosen according to the amount of food to be prepared. Too large appliances consume unnecessary energy and water. In addition, for energy-intensive processes like freezing, cooling or dishwashing, the use of energy-efficient appliances is advisable. Replacing old models with new ones can amortise in a relatively short time [32].

- **Appliances are only turned on during operating times.**
  Appliances should not be operated longer than necessary in order to save energy. For this purpose, the power-on times of all kitchen appliances can be compared with the actual needed times of use and adjusted accordingly [63]. In addition, in energy-intensive processes like freezing, cooling or dishwashing, it is important to ensure efficient utilisation of the appliances. Switching off (deep) freezing units during school break or the efficient loading of dishwashers are some ways to save energy [32].

4.4 Service

Catering does not end at the kitchen door – only when it is handed over to the pupils, it reaches the guests. Thereby, the presentation of the food components, no matter whether it takes place in the kitchen or later by the serving staff, as well as the sensory quality of the meal are of great importance for the meal to be accepted. The service at the food counter is an important interface between kitchen and pupils. Here they receive their food, have the opportunity to give feedback and express wishes about what is being offered or portion sizes. In turn, this is helpful and important information for the kitchen.

This chapter provides criteria about how to design the serving situation, e.g. by presenting the food in an appealing way on the plate or at the buffet. The mentioned hot-keeping temperatures and periods as well as cold storage temperatures also play an important role. In addition, communication with the pupils in the sense of health-promoting and more sustainable catering may contribute significantly to an appropriate choice.

The following criteria are to be considered for service at the food counter:

- ☐ **Proper timing between kitchen and serving is realised.**
  Good organisation or regeneration of food in batches, for example, allow for short hot-keeping periods. Towards the end of the serving time, smaller or flat containers should be used for refilling [64]. This helps to avoid or minimize food waste.

- ☐ **Serving staff is informed in detail about the current menu.**
  This includes information about the meal components, portion size or number of pieces and which components may be exchanged. Practically a short consultation between kitchen and serving staff is beneficial. This way, the serving staff keeps track, respond to the pupils' wishes and order additional components if necessary. Ladle plans and portioning aids support with calculated quantities.

- ☐ **Pupils are given opportunities to influence portion sizes.**
  Enabling pupils to express their wishes about portion sizes or independent portioning has a positive effect on food returns. Regularly comparing the served with the calculated quantities helps to plan them accurately.

- ☐ **Pupils are given friendly advice when ordering and choosing food. The principle of *nudging* is considered.**
  Health-promoting and more sustainable food options are communicated positively at the time of serving. Pupils receive assistance and the opportunity to give feedback and are informed about the offer on request. An attractive presentation of all food, where cleanliness and quick refills of food and beverages are standard, is crucial. Further *nudging* aspects are explained in chapter 5.3.

... furthermore:

- ☐ **Questions about a wholesome diet and food intolerances are answered.**
  At least one responsible person is appointed for answering to detailed questions about the dishes. Basically, the offer of health-promoting and sustainable meals should be known and supported throughout the team.

  This implies a positive attitude of the staff towards the food served to the pupils. All serving staff should be trained and able to provide information. Further aspects on this topic are explained in chapter 4.6.1 and chapter 6.3.

4.5 Disposal and cleaning

Planning › Purchase › Preparation › Service › **Disposal and cleaning**

After serving food and beverages, it is beneficial to access the overproduction, the food returns from the food counter and tables and the food waste generated in the dishwashing room. As far as possible, the food returns per component should be measured over a period of time. The results help to reconsider and, if necessary, adjust the menu planning, the procedure and organisation of ordering, purchasing, production, *nudging* techniques, the presentation of the meals as well as their calculated quantities. All these are starting points to avoid overproduction and food returns. While non-regenerated components can be re-integrated into the menu the following day as long as maintaining the cold chain, food returns have to be discarded. The resource-saving handling of food and the avoidance of food waste is an important aspect of calculation, menu planning and final disposal and should also be included in the *catering concept*. Reducing food waste is an ongoing process that must be constantly reviewed and, if necessary, adjusted [13].

Measuring food waste is a simple method to identify potential savings. It is worth making the (alleged) effort, as measuring offers the possibility of saving costs for purchase, disposal and unnecessary labour! Further suggestions are available through the "Competence Center for Out-of-Home Catering" (Kompetenzstelle Außer-Haus-Verpflegung, KAHV).

In order to raise pupils' awareness on this topic, waste prevention strategies are important. This may result in activities like the introduction of a waste barometer or a pupil survey on portion sizes. In addition, for interpreting the food returns, good communication between service and pupils or kitchen is of great importance. In the kitchen, there is often a lack of information about the causes of food returns. Was the portion size not appropriate? Did individual components not taste good? Was the mealtime too short? By systematically collecting this information and passing it on to the kitchen or the caterer, they are able to react accordingly to the food returns.

Further information:
www.schuleplusessen.de
Keyword: Lebensmittelabfälle vermeiden

The following criteria apply to the disposal of waste:

- ☐ **Food returns are recorded separately by meal and component and the outcomes are used for future menu planning.**
  Are the portion sizes resp. serving quantities calculated correctly? Which dishes or components are less popular and cause larger quantities of returns? Controlling the food returns provides a basis for optimising menu planning, preparation and presentation.

- ☐ **Unavoidable waste is made available for energy utilization.**
  Organic waste and food returns may be used to produce heat and electricity in biogas facilities, and used fat to produce biodiesel. Today, a number of companies have specialised in the collection and sustainable utilisation of such residues.

When cleaning the food counter and kitchen area as well as the storage rooms, there must be a defined cleaning plan and, if applicable, a corresponding disinfection plan. The plans contain information on the cleaning agents and disinfectants to be used, as well as their usage and dosage.

The following criteria for cleaning and disinfection apply:

☐ **Attention is paid to the use of environmentally friendly cleaning agents.**
Large quantities of cleaning agents are used in kitchens every day to clean surfaces, dishes and laundry. After use, they are discarded as wastewater. Depending on the ingredients, they can be hazardous to the environment and health. Therefore, environmentally compatible cleaning agents are preferable, for example those labelled with the EU Ecolabel and/or ecolabel "Blauer Engel" (Blue Angel). If the cleaning agents contain palm (kernel) oil-based tensides, sustainably certified palm oil should be used.

☐ **Dosage aids are used.**
Besides the cleaning agents' ingredients, it is also important to know how much detergent to use. Dosing aids help to ensure that not more cleaning agent than necessary is used. This protects the environment and reduces costs at the same time.

☐ **Hygiene requirements are observed.**
The principles of good hygiene practice and the "*Hazard Analysis and Critical Control Points*" concept (*HACCP* concept) must be strictly observed. Excellent hygiene practices and compliance with relevant laws and standards ensure the health of staff and guests (see chapter 6).

Further information:
www.schuleplusessen.de
Keyword: Hygiene

4.6 Together and yet individual

The question that often arises in everyday contact with pupils is how much individuality might be allowed in mass catering. The pupils body is very heterogeneous and it is not possible to accommodate all needs and wishes. Special diets or food intolerances, including allergies, require a detailed look at individual needs. Schools and also *meal providers* are often faced with the challenge of how to deal with this aspect in their daily routine. First of all, clearly defined rules regarding meals for individual requirements that are transparent and accessible to all needs to be in place. How these rules are formulated depends on local circumstances and structures. The school can incorporate these procedures in the *catering concept*.

4.6.1 Food intolerances like allergies

Often pupils with very different food intolerances like allergies attend school. Nut allergies, coeliac disease, lactose intolerance – there is a wide range. So how do schools and *meal providers* deal with this? The primary goal should be that affected pupils are able to participate at mealtime without restriction as far as possible. This might be achieved by:

- a special dish, for example a low-allergen basic dish that can be easily adapted,
- a choice of individual components,
- or (if no other option is possible) a meal brought from home.

To plan appropriate measures, a medical certificate or an allergy passport is recommended. Only if the school and the *meal provider* know whether there is an intolerance or not, both sides can act accordingly.

By the way:
Allergen labelling has been mandatory for unpackaged food since the end of 2014 [65]. Chapter 6.3 explains how this labelling needs to be carried out. This labelling creates transparency and assurance for those affected.

Further information:
www.schuleplusessen.de
Keywords: Kennzeichnung and Lebensmittelunverträglichkeiten

4.6.2 School kiosk, *cafeteria*

In many schools, breakfast and/or snacks are offered in bistros, school kiosks, *cafeterias* or vending machines. The offer of sweet or salty snacks, chocolate bars and sugary soft drinks is often discussed controversially. Similar to lunch, breakfast and snacks should be defined with targets and strategies in the *catering concept*. A discussion with all stakeholders of the *food or catering committee* is recommended. If transition to a health-promoting and sustainable offer without sweets cannot be implemented immediately, the assortment may be gradually changed: This involves slowly cutting down on undesirable products and food and replacing them with alternatives like unsalted nuts, trail mix, yoghurt with fruits, sugar-free *muesli* or *raw vegetables*. A list of criteria is available in chapter 4.1.1., Table 2. In principle, a snack may consist of cold and hot meals as well as beverages. “Food to go” or “hand-held food” are very popular among young people and may also be offered in a health-promoting way through a selective food choice. However, an increased amount of packaging needs to be considered with this form of serving. European and national regulations have been adopted to reduce the amount of waste and the discharge of single-use plastic products into the environment (see chapter 6).

In order to minimise the use of limited resources and the amount of waste produced in the form of packaging and leftovers, the following principle applies:

avoid → reduce → recycle

Further information:
www.schuleplusessen.de
Keyword: Verpackungen

4.6.3 Snacks

The desire for separation and more freedom increases during puberty. Adolescents develop their personality and shape their own lifestyle, which also includes their eating style. For the most part, it is extremely important for adolescents to be where their friends are. The peer group has a huge influence on the decision where to eat lunch. Experiencing things together is the main focus. Adolescents prefer fast and uncomplicated food, which at the same time allows further activities and enables a self-determined choice [66–69].

Primarily, snacks are intended for pupils who either eat their main meal together with their families in the evening and therefore only a small snack at lunchtime, but also for pupils who prefer to eat a casual snack with friends to meet their preferences for a quick, uncomplicated meal. In addition to the classic lunch plate, snacks can be included in the portfolio. Snacks should also be available for consumption on site.

The sale of unpackaged food and meals is recommended, as well as the transition from disposable to reusable packaging. This helps to reduce packaging waste and is part of a sustainable diet. Legal requirements are described in chapter 6.

The IN-FORM project **Schule + Essen = Note 1** developed cold and warm snack recipes for implementation in practice. In addition to the nutritional aspects, the needs of the target group were also addressed to ensure a wide acceptance of the snacks offered.

Further information:
www.schuleplusessen.de
Keyword: Snacks

5 Beyond the plate

Providing a health-promoting and sustainable catering is an important first step. However, the acceptance of the offered food depends not only on what is presented, but also on how and where it is presented and how the information on the food offer is communicated. The collaboration of diverse stakeholders is essential in crafting a wholesome and sustainable food offering, fostering a healthy and sustainable food offer, a conducive eating atmosphere for all pupils and an interlinked educational offer around the plate. Following, the stakeholders are presented with their tasks and influence possibilities. This is followed by looking at some general aspects that stakeholders may influence. This chapter intends to raise awareness for the various topics and provide suggestions for transferring them into practice. This way, it is possible to create a *fair food environment* in schools together.

5.1 Stakeholders in school catering

Figure 6 shows selected stakeholders involved in school catering. According to their respective fields, they are divided into 3 groups: ***meal providers*** who plan, produce and/or offer meals in or for schools (green), all stakeholders involved in the **school environment** (blue) as well as **parents and pupils** (yellow), who should be considered as guests or relatives. The large number of stakeholders shown as examples illustrates the various responsibilities that need to be coordinated so that catering on and around the plate can be optimized.

In this context, establishing a *catering committee* including the mentioned stakeholders (see chapter 2.1) makes sense.

School authority, sponsor

The school authority or sponsor is responsible for the external school affairs, e.g. maintenance and provision of school equipment. In addition, it is responsible for the provision of lunch. However, in some school laws of the federal states, there are no or only vague regulations on lunch arrangements. Often, a *meal provider* or caterer is assigned with the organisation of school meals [70].

The school authority may influence the design of school catering and the *catering concept*, ideally together with the school or the school principal in a joint process, by controlling the tender and award procedure. The school authority may make a fundamental contribution to the acceptance of school meals by supporting the material and

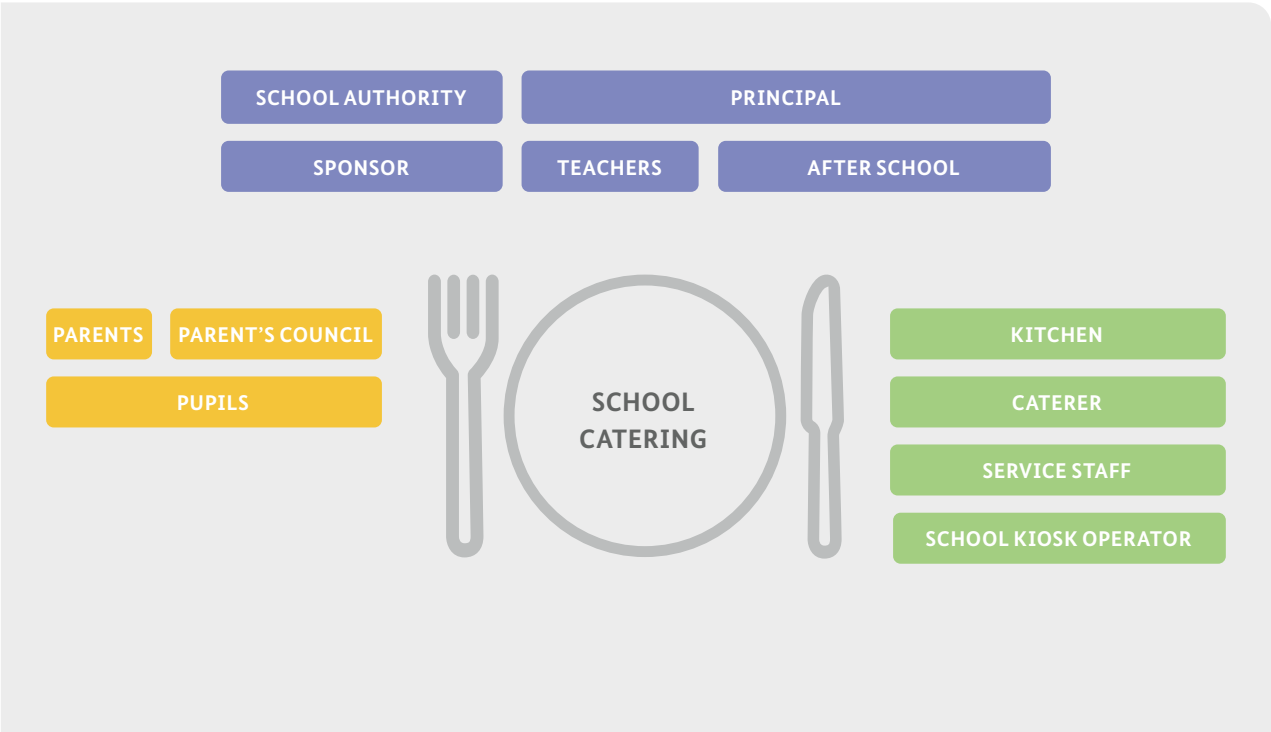


Figure 6: Selected stakeholders involved in school catering

personnel framework ensuring the practical implementation of the "DGE-Quality Standard for Meals in Schools". This includes, e.g., providing bright, appealing rooms or the employment of qualified staff.

Principal

The design of school catering is not only the responsibility of the federal states, but also the responsibility of the individual schools [62]. This allows schools a huge amount of creative freedom and at the same time also means responsibility. The principal may support this in different ways: through suitable general conditions and processes and also by incorporating catering into the educational concept. In addition, the principal has a particular function as a role model for teachers, pupils and parents.

By the way:
A healthy diet must also be made possible for pupils from low-income families. Various education and participation benefits are available from the education and participation package for eligible families, including the reimbursement of expenses for school lunches. School lunches are guaranteed for pupils without additional costs for eligible parents. This also applies to a shared lunch at after-school care if there is close cooperation between the school and the childcare facility. Participation for affected pupils could be significantly increased through targeted information from the school authorities, school management, teachers and educational staff. Further information and an overview of contact points can be found at the Federal Ministry of Labour and Social Affairs (Bundesministerium für Arbeit und Soziales [BMAS]).

Teachers, educational staff

Teachers or educational staff often join and supervise pupils at lunch. Shared meals in a pleasant atmosphere provide opportunities for communication, learning and interaction. Teachers and educational staff are important role models for pupils. By observing their teachers, pupils learn behaviour and communication rules and "experience" their attitude and appreciation towards food. Shared meals provide opportunities for both teachers and pupils to address current issues and thus establish a trusting relationship. Accompanying food and nutrition education within the classroom or outside (e.g. through projects or study groups) promote the acceptance and appreciation of lunch.

Further information:
www.schuleplusessen.de
Keyword: Akzeptanz

Kitchen, caterer, service staff

Meals are provided by the kitchen or the external caterer. They are responsible for the specific composition and implementation of the dishes. This is often done without personal contact with the pupils. The serving staff, on the other hand, is directly in contact with them. They help to portion the meals and serve them or fill the bowls resp. the buffet. As contact persons at the food counter, they may support pupils in their food choice. In order to accept a health-promoting and sustainable diet, not only the offer – how it tastes, smells and looks – but also the communication between serving staff and pupils is crucial. Friendly and competent communication improves the atmosphere at mealtimes and promotes acceptance and appreciation of the food offered.

School kiosk operator

In some schools, a snack or partly also breakfast is offered. These meals are often organised by the janitor or an external school kiosk operator. Thus, these stakeholders have a considerable influence on the design of breakfast and snacks. In order to realise a health-promoting and sustainable diet for the pupils, it is very desirable to coordinate the offer with the *catering concept* of the school.

Parents, parent's council

For schools, parents are the most important educational partners. Children gain their first eating experiences in their family. Parents are role models and shape children's attitudes and eating habits. A good relationship with parents is therefore crucial for how well school meals are accepted. Therefore, information about the meals should be provided regularly e.g. at parents' evenings and the importance of regular participation of children and adolescents in school meals should be made clear. Additionally, parents should be given the opportunity to give feedback on the dishes.

Pupils, pupil council

Pupils should be offered food that is appetising and tasty. In addition, a health-promoting and sustainable diet ensures an optimal intake of nutrients for the pupils and thus promote their physical and mental development. Eating together brings pupils from all parts of our society together, creates space for conversations and thus promotes social interaction as well as emotional and social development. For this to succeed, all pupils must have the opportunity to participate in lunch, regardless of their financial, cultural and religious background. As children grow older, they become more able and willing to take responsibility for their own eating decisions. Therefore, pupils or the corresponding pupil council should be involved in the design of school meals, for example as part of the *catering committee*. Regular surveys provide information about the pupils' satisfaction with the menu and generate ideas for improvement strategies (see also chapter 2.4). In addition, this promotes the acceptance and appreciation of school meals.

5.2 Design of *dining environment* and atmosphere

The design of the gastronomic facilities, especially the dining rooms, has an influence on whether the pupils accept and use the catering services. The gastronomic facilities, such as the *cafeteria*, should serve as central, daily meeting and communication hubs for students, teachers, and educational staff. Shared dining opportunities act as essential "slow-downs" and "pacemakers" during the school day. In addition to offering a healthy and sustainable selection of food and beverages, the dining atmosphere stands out as one of the most influential factors in shaping nutritional behaviour. Thus, to create a positive and conducive dining atmosphere, the design of recess periods and the dining rooms is crucial.

An appropriate planned recess period offers pupils enough time to enjoy their food and creates space for joint conversations. This strengthens social connections and promotes social learning. For example, skills like listening, showing consideration and helping each other may be learned. In contrast, recess periods that are too short and hectic cause pupils to miss out on the meals or they perceive it as a burden. Halls that are noisy, cramped and have an unappealing ambience (e.g. light, temperature, smell) are also a source of stress rather than a place that offers enjoyment and recreation.

By the way:
If recess periods are too short, lunch may not be taken in the first place [1, 86]. It may also lead to unwanted food returns and, therefore avoidable food waste.

The following criteria apply:

- **Recess periods that are sufficient and, if necessary, staggered and specific to each grade are planned.**
  Pupils should have a sufficient break period. About 60 minutes are recommended so that there is enough time for walking to the canteen or the dining hall, queuing at the food counter, finding a free seat, eating lunch, socialising and cleaning up. If there is not enough space for all pupils in the canteen, staggered, level-specific break periods should be planned. This needs to be considered when designing the school's timetable.

- **Enable eating and drinking in an age-appropriate and appealing ambience.**
  A separate room should be available as food counter and for eating. A bright, friendly and cosy dining hall that offers sufficient space, as well as a well-planned food counter that ensures short waiting times, contribute to well-being and promote the joy of eating. To keep the noise level as low as possible, appropriate sound proofing is recommended. If possible, there should be a separate room or area for high school grades. When building or renovating the school canteen, an expert advisor and the pupils as well should be involved in the planning. In this way, the canteen can become not only a dining hall but also an "experience place" for them.

5.3 *Nudging*

Eating habits are not only the result of conscious and reflected decisions but often also a consequence of existing offers, habits and other influences that the guests are unaware of at the moment of deciding to eat [7, 71, 72]. Therefore, what, how much and how pupils eat something also depends on the very specific design of the *dining environment*. Changes of the *dining environment* that make healthy and balanced choices 'easier' are often referred to as '***nudging***'. In this context it is important that there is still a choice, but the health-promoting and balanced choice is made more accessible and attractive through, e.g., placement, options, descriptions and presentation. Banning or reducing prices is therefore not a nudge. Several *nudging* techniques have proven to be effective and often do not require much effort or cost. To achieve wider acceptance, all stakeholders should support the measures. The appropriate and feasible approach on site depends on the general conditions of the respective school.

Basically, different types of nudges with proven effectiveness through scientific studies can be distinguished [65–70]:

› **Cognitive nudges: attention and thinking**
These draw pupils' attention to the more balanced option and reduce the exposure of the less balanced option.

One of these are guiding labels. Such labelling provides information on classification and evaluation, for example through symbols or colour coding. However, improving visibility also falls into this category. The health-promoting and more sustainable option is positioned in a way that is more visible, e.g. by presenting it directly at eye-level, putting it in the middle of the shelf or on top of the menu.

› **Emotional nudges: wishes and preferences**
These make the more balanced option more attractive and interesting.

Through direct interaction or signs, pupils are prompted and encouraged to make a balanced choice. A short and friendly reminder right before the choice or purchase might influence the decision positively. To do this, the serving staff might ask specific questions, like: "Would you like some fruits with your dessert?" Descriptions, pictures or the form of presentation highlight the positive taste experience of the more balanced option and emphasise how it feels to eat it. Special lighting and arrangement may also make the meals more attractive. Sample pictures or plates might illustrate the offer.

COGNITIVE NUDGES
attention and thinking

- signs, flags, stickers
- traffic lights
- coloured tableware
- placed on top of the menu
- eye-level of the pupils
- multiple placement
- extra distributing area

EMOTIONAL NUDGES
wishes and preferences

- verbal request: Would you like more vegetables?
- attractive pictures in serving area and break room
- appealing arrangement
- illumination or lighting
- sample plate
- attractive combination
- attractive name for the dish
- attractive, age-appropriate tableware
- appealing decoration
- subconscious recommendations (e.g. funny slogans)

BEHAVIOURAL NUDGES
enabling behaviour

- wholesome components as "standard"
- variety of options and servings (e.g. different *whole fruits*, pre-cut and/or ready-to-eat)
- to-go-option
- samples
- dishes in different shapes and sizes
- different portion sizes
- salad bar easily accessible in entrance hall of the food counter
- use of counters with the highest sales figures
- use of waiting areas (e.g. checkout, in front of counter)
- use the entrance area
- reach hight of pupils
- free choice of components

Figure 7: Different types of nudges with examples

› **Behavioural nudges: enabling habits**
These simplify the more balanced choice and habits.

The more balanced option is more easily accessible and conveniently placed or it becomes the "standard" by offering it first. For example, health-promoting sides may be the dishes' 'standard', fruits are offered pre-cut and ready-to-eat for easier handling, or the salad bar in the entrance hall of the food counter makes the choice more convenient. Shape and size of tableware and cutlery as well as serving and portion sizes set the "standard" for the "regular" amount of food to be eaten. The larger it is by default, the larger the amount of food consumption or food returns. For example, portions on smaller plates are perceived as larger. The choice for more balanced options increases when vegetables and fruits are offered in different options and forms of presentation or as a to-go option at the checkout. Additional "samples" may reduce the inhibition threshold towards new options.

Goals of *nudging* measures in school catering might be:

- improve pupils' water intake,
- reduce consumption of sugar sweetened beverages,
- increase consumption of health-promoting and sustainable food like vegetables, *salad*, *legumes*, wholemeal products and/or fruits,
- reduce intake of certain food like meat and meat products or sugary and fatty dishes.

Nudging measures promote desirable habits and make them easy. At the same time, nudging leads to a reduction in factors that make a healthy and sustainable diet more difficult. *Nudging* thus makes an important contribution to the design of *fair food environments*.

Further information:
www.schuleplusessen.de
Keyword: Nudging

5.4 Food and nutrition education

School is a place of teaching, learning and living for pupils from different backgrounds, personal, family and cultural experiences and influences. Schools offer great potential for actively shaping a health-promoting and sustainable diet as well as food and nutrition literacy for all.

School and eating in community enables direct experiences, shared taste experiences and conversations, and this way children and adolescents might learn from each other together. In the long term, this shapes eating habits and the appreciation that food should receive [7]. Learning through one's own experiences can be decisively strengthened by food and nutrition education activities at school. By closely linking food and nutrition education with a health-promoting and sustainable diet, children and adolescents on their way to becoming young adults may learn how to deal responsibly with their health and the resources of this earth in the long term. Thus, nutrition at school contributes to health and consumer education as well as to education of values. Schools might manage this educational and health policy task with appropriate offers [79–83].

Understanding education and catering as a unit
Children and adolescents learn, live and experience the world in and outside of the classroom. Outside the classroom, this tends to be unstructured, unconscious and without a specific learning intention, e.g. by observing others or the environment. This implicit skill acquisition is therefore often overlooked as learning. However, this kind of "implicit learning" offers numerous starting points for food and nutrition education, e.g. through the eating habits of teachers and educational staff, the design of the menu in the canteen, the school kiosk, the food vending machines, or through school events.

Health-promoting and sustainable meals create additional experiences for pupils through joy of eating and tasty experiences and are important for the development of future eating habits in the short and long term. Adapted teaching content creates the conditions for ensuring "*food literacy*" for all pupils, the ability to shape their everyday eating habits in a self-determined, responsible and enjoyable way [84]. School meals support the transfer in everyday life and may encourage the development of health-promoting and sustainable habits as well as help to shape the school culture in the discussion with the social environment. In this way, "health" and "sustainability" go together and children and adolescents are able to experience this directly every day and learn in the long term.

As part of the curriculum, the *catering concept* can offer many links between food and classroom. It should be part of the school's development and involve the principal, teachers, parents and pupils as well as *meal providers*. It is easier to succeed if all stakeholders are involved. The combination of an environmentally and socially compliant menu with matching curriculum ensures a permanent pupils' awareness and promotes the competence to make a profound decision about the own food choice, even in the future in an extracurricular context.

A health-promoting and sustainable school menu enables pupils to:

- experience learned skills directly in everyday school life,
- taste a variety of food and discover new ones, combine the familiar with the unfamiliar and to expand the sense of taste,
- build on the experiences of other pupils when eating together in the canteen, and
- shape the school culture together with others and become role models themselves.

Practical advice: The set-up of specialised rooms (teaching kitchens, taste laboratories) for nutritional education enables pupils to gain experience in the preparation of food and beverages. Project weeks about environment and climate-friendly nutrition, the set-up of a school garden, a visit to a nearby farm or a food processing company allow the pupils to experience food and nutrition education in a practical way.

Further information:
www.schuleplusessen.de
Keyword: Ernährungsbildung

By the way:
Anyone who intends to cook together with pupils at school does not need a fully equipped kitchen. Small cooking activities and simple food preparation may also take place in the class room. Important: Take care of hygiene! The leaflet “Good hygiene practice when cooking with children” explains the best way to achieve this in practice. It was approved by all federal states in accordance with the national protocol for reviewing guidelines for good practice, as outlined in Article 8 of Regulation (EC) No. 852/2004.

Further information:
www.schuleplusessen.de
Keyword: Hygiene

6

Legal requirements for school meals

Mass catering in schools centres must observe a wide range of legal requirements. Food and hygiene law is of central significance, with the primary goals of food safety, protection against misleading and fraud, as well as the provision of information to consumers and guests. More than 200 European and national legal norms regulate how these goals are to be achieved. Not all of them need to be known by those responsible for mass catering in detail. However, in terms of the duty of care under food law, they must know and comply with all responsibilities relevant to their food business activity. They are also obliged to keep up to date with any changes in the law.

6.1 Food law key regulations

Key regulation of the food law is the Regulation (EC) No 178/2002 laying down the general principles and requirements of food law (Lebensmittel-Basisverordnung, [LM-BasisVO]). Like all EU regulations, it applies directly in all EU member states and fundamentally regulates how the protection of health and the prevention of fraudulent or deceptive practices is to be guaranteed at all stages of the process ("from farm to fork"). In particular, it stipulates that only safe food may be distributed and prohibits practices of fraud and deception. It also regulates the companies' obligations in crisis situations, such as public notification or removal of unsafe food from the market. The principle of staged responsibility applies to the adherence to food law regulations: Each food business operator is responsible for what happens in his/her own, controllable field. His/her primary responsibility ends when other business operators influence the food, e.g., at the beginning of the next value chain level. If, for example, frozen vegetables are delivered to a mass catering facility for further processing, the kitchen management can generally assume that the goods are safe. However, they must always fulfil their own duties of care under food law by, for example, checking the temperature and packaging when receiving the goods, complying with the temperature specifications during storage and further processing, and defining and implementing criteria for selecting suppliers.

The German Food and Feed Code (Lebensmittel- und Futtermittelgesetzbuch, [LFBG]) is also important for food companies in Germany. It complements the European Regulation (European LM-BasisVO) by incorporating national provisions related to aspects such as the structure of official food monitoring, penalties, and fines, as well as, regulations for public information.

The basis for food information and labelling is the European Food Information Regulation (FIR) (EU) No 1169/2011, which regulates general labelling and further information for pre-packaged food in an EU-wide standardized way. It also outlines essential requirements for mass catering, including allergen declaration, which is also required for unpackaged food (loose goods). In Germany, the national Food Information Implementation Regulation (Lebensmittelinformations-Durchführungsverordnung, [LMIDV]) supplementing the LMIV, is also required. The LMIDV stipulates, for example, that food marketed in Germany must always be labelled in German or the allergen declaration on non-prepackaged food. Table 4 provides an overview of selected food law regulations and interpretation aids for mass catering.

Table 4: Selected legal regulations and interpretation aids for mass catering

topic	law and regulations	
	EU-level	**national level**
basic regulations	› Regulation (EC) No 178/2002 laying down the general principles and requirements of food law	› German Food and Feed Code (Lebensmittel- und Futtermittelgesetzbuch [LFGB])
hygiene and infection control	› Regulation (EC) No 852/2004 on the hygiene of foodstuffs › Regulation (EC) No 853/2004 laying down specific hygiene rules for food of animal origin › Regulation (EC) No 2073/2005 on microbiological criteria for foodstuffs	› Food Hygiene Ordinance (Lebensmittelhygiene-Verordnung [LMHV]) › Animal Food Hygiene Ordinance (Tierische Lebensmittelhygiene-Verordnung [Tier-LMHV]) › Ordinance on foodstuff provisions to control zoonoses and zoonotic agents (Zoonose-Verordnung [ZoonoseV])
		› Infection Protection Act (Infektionsschutzgesetz [IfSG])
official monitoring	› Regulation (EU) No 2017/625 on official controls and other official activities	› Food Law Penalty and Fine Ordinance (Lebensmittelrechtliche Straf- und Bußgeldverordnung)
labelling and consumer information	› Regulation (EU) No 1169/2011 on the provision of food information to consumers (FIR) › Regulation (EC) No 1333/2008 on food additives › In the case of nutrient and health-related claims: Regulation (EU) No 1924/2006 on nutrition and health claims made on foods › In case of organic claims: Regulation (EU) 2018/848 on organic production and labelling of organic products	› Food Information Implementation Ordinance (Lebensmittelinformations-Durchführungsverordnung [LMIDV]) › Food-additive Implementing Regulation (Lebensmittelzusatzstoff-Durchführungs-verordnung [LMZDV]) › In the case of organic claims: e.g. Ecological Production Act (Ökolandbaugesetz [ÖLG]), Organic Labeling Act (Öko-Kennzeichengesetz [ÖkoKennzG])), Organic Out-of-home Catering Ordinance (Bio-Außer-Haus-Verpflegung-Verordnung [Bio-AHVV])

	legally non-binding aids for practical implementation
	› Guidance on the Implementation of Articles 11, 12, 14, 17, 18, 19 and 20 of Regulation (EC) No 178/2002 on General Food Law (Dec. 2004)
	› "Guidelines of Good Hygiene Practice" » Guideline for good food hygiene practice in social facilities, (working version, 2022) » Guideline for good food hygiene practice in daycare facilities, (2nd edition, 2020) » Guideline for the gastronomy sector (3rd edition, 2022) › Selected DIN-Standards on Food Hygiene: » 10506: Food hygiene – Mass catering » 10508: Food hygiene – Temperature requirements for foodstuffs » 10514: Food hygiene – Hygiene training » 10516: Food hygiene – Cleaning and disinfection » 10524: Food hygiene – Work wear in food business » 10526: Food hygiene – Retained samples in mass catering » 10536: Food hygiene – Cook & Chill method – Hygiene requirements › Publications of the German Federal Institute for Risk Assessment » Safe food: Especially vulnerable groups in communal facilities, 2021 › Publication of the Federal Institute for Risk Assessment in cooperation with the Federal Centre for Nutrition » Hygiene rules in the catering sector, 2020 › European Commission Notice regarding » *HACCP* (Commission Notice 2022/C 355/01) » EU guidelines on food donation (Commission Notice. 2017 C 361/1)
	› Commission Notice on questions and answers on the application of the FIR (Commission Notice 2018/C 196/1) › Identifying the public perception: Designations of the German Food Code (Leitsätze des Deutschen Lebensmittelbuchs)

From legal obligation to practical implementation

Laws and regulations regulate a large number of legally binding matters for an undefined group of people. For example, food law applies to all food business operators – regardless their size or whether they only offer sandwiches or a comprehensive hot lunch. Therefore, it is sometimes difficult for food business operators to know how to implement the generally applicable legal obligations in relation to their individual field. Guidance is provided by various legally non-binding publications, like the technical standards of the German Institute for Standardisation (Deutsches Institut für Normung e. V., [DIN]), statements and recommendations by authorities like the Federal Institute for Risk Assessment (BfR) or the sector-specific "Guidelines of Good Hygiene Practice". In addition, the EU Commission sometimes publishes legally non-binding guidelines to contribute to the EU-wide harmonised application of EU law.

6.2 Hygiene and infection control

A comprehensive hygiene management is obligatory in every food business. The requirements that persons responsible for food law must fulfil are essentially determined from 2 European regulations:

- **Regulation (EC) No 852/2004 on the hygiene on foodstuffs:**
  As required by law, the hygiene in food businesses must meet a high standard in order to fulfil the principle of ensuring optimal product safety. It is therefore required, that the business hygiene management must put a so-called basic hygiene concept in place, which is supplemented by a mandatory "*Hazard Analysis and Critical Control Points*" concept (*HACCP* concept). Annex II of the regulation outlines fundamental requirements for operating facilities where food is handled. These must generally be clean, constantly maintained, and easy to clean. Various other specifications, such as lighting and ventilation, floor conditions, the number of washbasins, are also stipulated. The implementation of legally mandated hygiene measures in specific cases depends on the unique circumstances at each location. Interpretation aids for the practical implementation of Annex II are provided by sector-specific "Guides for good hygiene practice" and the relevant DIN standards, like DIN 10506:2018-07: Food hygiene – Mass catering as well as DIN 10508:2022-03: Food hygiene – Temperature requirements for foodstuffs.

- **Regulation (EC) No. 853/2004 laying down specific hygiene rules for food of animal origin:**
  The regulation complements Regulation (EC) No 852/2004 if a company processes food of animal origin. Excluded from its scope is food that contains both ingredients of plant origin and processed products of animal origin, for example salami pizza or breaded schnitzel. Of practical importance for mass catering establishments are the storage temperatures for certain food regulated in the annexes to Regulation (EC) No 853/2004 (see DIN 10508:2022-03). It is also regulated whether a mass catering business requires approval in accordance with Article 4(2)(d) of Regulation (EC) No 853/2004 or is only subject to registration.

In addition to these 2 key regulations, there are other European and national hygiene regulations that contain obligations for food business operators (see Table 5). For example, § 20a of the national Animal Food Hygiene Ordinance (Tier-LMHV) defines specific requirements for the distribution of raw egg products in mass catering.

Good hygiene practice

According to EU law, food business operators must establish their hygiene management with regard to the basic principles of good hygiene practice. Compliance with these principles ensures basic hygiene in the company. Elements of good hygiene practice are in particular

- guarantee of adequate constructional facilities,
- equipment and transport hygiene,
- hygienic handling of foodstuffs,
- personal hygiene,
- cleaning and disinfection,
- storage and pest management, and
- waste management.

Guidance on how these aspects should be implemented into practice is provided in particular by the sector-specific "Guidelines for good hygiene practice", e.g., in gastronomy or in kitchens of social facilities (see Table 4).

Obligatory self-monitoring according to "*Hazard Analysis and Critical Control Points*" principles

In addition to good hygiene practice, food business operators must introduce, apply and maintain a documented self-checking system in their business in accordance with the "*Hazard Analysis and Critical Control Points*" principles (see Regulation (EC) No 852/2004). This is based on the general hygiene policy of the business. The aim of such a self-checking system is to identify and evaluate possible health hazards already during food production and to minimise or eliminate them by taking appropriate precautions. If, for example, cooling temperatures are set for certain foods and checked as scheduled, health risks can already be prevented when deviations occur during the production process, thereby increasing the safety of the end product. The official food control checks the "*Hazard Analysis and Critical Control Points*" system, including associated documentation, as part of their control activities [85].

Further information:
www.schuleplusessen.de
Keyword: Hygiene

Hygiene training obligation

Anyone who produces, handles or distributes food or dishes to guests must be regularly trained in food hygiene matters (see Regulation (EC) No 852/2004, annex II, chapter XII in combination with the Food Hygiene Ordinance (LMHV) § 4). This regulation also applies to persons who, regularly transport or serve food, regardless if this are parents or a person who is member of the school. Annex 1 of the Food Hygiene Ordinance (LMHV) and DIN 10514:2009-05: Food hygiene – Hygiene training provides good orientation on essential requirements for this training. DIN 10514 also describes the training content for persons who are responsible for developing and applying the "*Hazard Analysis and Critical Control Points*" concept within the company. In terms of good hygiene practice, employees should be trained at least once a year. The standard also recommends a success assessment and documentation.

Instruction obligation for infection protection

According to § 43 of the Infection Protection Act (IfSG), there is also an obligation to instruct all persons who produce, handle or place food on the market or hand it out to guests. The purpose of the training is to educate employees about specific rights and responsibilities related to infection protection thereby reinforcing their individual accountability. The focus is on prohibitions on activities and employment in the event of certain illnesses or symptoms of illness, such as vomiting and diarrhoea as outlined in § 42 of the IfSG. The local health authority is usually responsible for the initial instruction. It issues a corresponding certificate, which must be presented to the company. It must not be older than 3 months when the employee starts work. Subsequent training is required at this juncture and every 2 years thereafter. It can be conducted by the employer or an authorized person.

6.3 Labelling and public information

In mass catering, most meals are offered unpackaged. Certain information obligations also apply to them, but these are implemented somewhat differently than for packaged food, which are offered in supermarkets, for example.

However, a central principle of labelling law also extends to the menu: All information must be accurate and must not mislead guests. This means that names on the menu must be chosen carefully, ensuring they do not create false expectations in the target group and facilitate conscious consumer decisions. In the case of meat products, for example, specifying the animal species from which the meat originates is advisable. There are legally binding designations for some ingredients or dishes, such as “cheese”. This term is protected by law and is reserved for products made from milk. The description “gratinated with cheese” may only be used if it contains cheese. For instance, a “pudding” is typically prepared with milk. If a comparable vegan dessert is offered based on rice drink, this should be indicated.

Assistance in selecting suitable names for dishes: The guidelines of the “German Food Code” describe, as a kind of anticipated expert opinion, what is generally expected of a “cordon bleu”, a “rye bread” or a “milk ice cream”, for example.

Special information requirements on allergens and food additives

Some people have an allergic reaction or suffer from intolerances when they eat certain food. Others are sceptical about the use of additives and want to avoid them. For this reason, special information obligations apply to certain allergens and substances that trigger intolerances as well as additives. This enables everyone to make a conscious consumption decision, not only for packaged goods, but also for unpackaged food. These obligations apply wherever food is typically offered unpackaged – in bakeries, restaurants, ice cream parlours and also in mass catering. The information requirements are based on EU law. Details on implementation are regulated by 2 national regulations:

- the Food Information Implementation Ordinance (LMIDV) regarding allergens (see § 4(2) LMIDV in conjunction with Article 9(1)(c) FIR in conjunction with Annex II FIR) and
- the Food-additive Implementing Regulation (see § 5 LMZDV).

The information obligation under Annex II of the FIR covers 14 food or food groups that most frequently trigger allergies or intolerances in Europe – in common parlance, they are referred to as the “14 major allergens” (see box, p. 80). The obligation to provide information on additives does not apply to individual additives, but to certain groups of additives, including preservatives, sweetener and colorants. Information must always be provided on additives of certain classes if they are included in the food on offer. Detailed requirements are set out in § 5 (1) and (2) LMZDV (see Table 5).

Table 5: Overview of food additives subject to mandatory labelling

Class name or food additive	Labelling	Practical examples
colorants	› "with colorant"	› desserts, coatings
preservatives	› "with preservative" or "preserved"	› deli *salads*, mayonnaises
	› if only the food additives E 249 to E 252 are used: for food with curing salt "with curing salt", for food with sodium or potassium nitrate "with nitrate" and for food with curing salt and sodium or potassium nitrate "with curing salt and nitrate"	› meat products
antioxidants	› "with antioxidant"	› seasonings, instant soups, broths
flavour enhancers	› "with flavour enhancer"	› seasoning mixes, instant soups, sauces, flavoured products
iron salts E 579 or E 585 (no class name)	› "blackened"	› black olives
sweetener	› "with sweetener"*	› mustard, deli *salads*, sauces
	› for food with aspartame (E 951) or aspartame-acesulfame salt (E 962): "contains a source of phenylalanine"	› food with reduced energy value
	› for food with more than 10 % added polyhydric alcohols with the numbers E 420, E 421, E 953 and E 965 to E 968: "may have a laxative effect if consumed excessively"	
food additives with the numbers E 338 to E 341, E 343 and E 450 to E 452	› "with phosphate" only applies to meat products	› boiled sausages, cooked ham
food additives with the numbers E 445, E 471, E 473, E 474, E 901 to E 905 and E 914, which are used for surface treatment	› "waxed" only applies to fresh fruit and vegetables	› apples and pears, fresh citrus fruits, melons

* with the exception of tabletop sweetener: for these, the indication "based on …", supplemented by the name of the sweetener used, is mandatory.

While the obligation to provide information on allergens and additives is governed by different regulations, it is implemented according to a single principle: in both cases, written information must be available in German before making a purchase. There are various ways to do this:

- on menus, beverage menus or in the price list, e.g. by stating “Wiener Schnitzel, contains egg and gluten” or “Bratwurst, with curing salt” (footnotes, symbols or abbreviations are possible if these are listed in close proximity and clearly itemized),
- on a sign on or near the food,
- in other directly and easily accessible written or electronic information (e.g. folder, leaflet, electronically on a terminal, etc.).

Verbal information is also possible, but only by an adequately informed person (about the relevant ingredients and processing additives) under the following conditions (see § 4 (4) LMIDV):

- There must be an additional written documentation on the allergenic ingredients and food additives used in the production of the specific food (as mentioned above).
- There must be a clear reference to this information option, e.g. a sign in the sales area or a note on the menu.
- This written documentation is easily accessible to the authorities and guests upon request.
- The required information must be promptly provided upon request before the purchase is made and before the food is handed over.

In the context of school catering, providing only verbal information about allergens and food additives seams impractical, given that a substantial number of pupils typically need to be served in a limited time frame.

The 14 food or food groups (main allergens) are:

- **cereals containing gluten**
- **crustaceans**
- **eggs**
- **fish**
- **peanuts**
- **soy**
- **milk**
- **nuts**
- **celery**
- **mustard**
- **sesame seeds**
- **sulphur dioxide and sulphites**
- **lupin**
- **molluscs**

Organic claims on the menu

The term “organic” (in German “öko” or “bio”) is protected by law. The Organic Out-of-home Catering Ordinance (Bio-AHVV) specifies 2 options for organic food labelling for catering companies. Firstly, the labelling of exclusively organic ingredients used in the kitchen is permitted. Additionally, the AHV label can convey the monetary percentage of organic content in 3 categories (bronze: 20–49 %, silver: 50–89%, gold: 90–100%). Both the labelling of organic ingredients and the indication of organic content require a valid organic certificate, granted after a successful inspection by a state-recognized inspection body [57].

Nutrition declaration

Nutrition declaration is not obligatory for loose goods – in contrast to pre-packaged goods. However, anyone who voluntarily wish to provide information on nutritional values, must comply with the requirements of Article 30 (5) of FIR in conjunction with Article 32 in conjunction with Annex XV FIR. According to this, either

- only the energy value (in kcal and kJ) or
- the energy value and the amounts of fat, saturated fatty acids, sugar and salt,

each per 100 g or 100 mL are listed. It is also permitted to refer the information to a portion, as long as it is clearly quantified.

Nutrition claims like "low-fat" or "rich in Vitamin C" are only permitted if the requirements of Regulation (EC) No 1924/2006 on nutrition and health claims made on foods (HCVO) are met. For example, a food product advertised as "low-fat" in form of a dessert with a solid texture may contain a maximum of 3 g of fat per 100 g. Advertising the Vitamin C content is only permitted above a certain minimum content.

Further information:
www.schuleplusessen.de
Keyword: Kennzeichnung

6.4 Product liability and retained samples

Anyone who manufactures food is liable under the German Act on Liability for Defective Products (ProdHaftG) for damage to property and health resulting from defective products. This applies, for example, if a guest or pupil complains of stomach pains caused by eating a microbially contaminated dessert. In such cases, producers must prove that the dessert they produced was free of any defects when it was served. Otherwise, they are liable for any damage found. Liability exists regardless of fault.

In practice, **retained samples** can be used to prove that a company has adequately fulfilled its own duty of care under food law or to prove that the cause of the damage is to be found elsewhere. A retained sample is a representative product sample that is taken and stored under defined conditions. Guidance on this is provided by DIN 10526 "Food hygiene – retained samples in mass catering". The person responsible in the company usually decides whether retained samples are taken. There is no general legal obligation to do so. However, this can be useful for perishable food containing poultry, eggs, or fish.

6.5 Waste management and the obligation to offer reusable (food) packaging

Waste naturally occurs in mass catering, which cannot be completely avoided even with good resource management. Several regulations apply in this context, and those responsible for operations must be familiar with them. This includes the Animal by-products-Elimination Act (TierNebG) regarding the disposal of kitchen and food waste. EU hygiene legislation also outlines specific requirements for waste management. DIN 10506: Food hygiene in mass catering, for example, describes how these can be implemented in practice.

Efforts to minimize waste in mass catering are crucial, encompassing measures to reduce food waste. This may involve voluntarily redistributing surplus, still-edible food to interested third parties on-site.

Since January 2023, mass catering companies have been mandated to offer reusable packaging when offering food or beverages intended for immediate consumption takeaway: §§ 33 and 34 of the German Packaging Act (VerPackG) stipulate that, in addition to disposable plastic food packaging and disposable drinks cups, reusable alternatives must be offered, and customers must be informed of this choice. An exemption to this obligation is granted to companies with a sales area of up to 80 m^2 and a maximum of 5 employees.

Further information:
www.schuleplusessen.de
Keyword: Verpackungen

Checklist

The following checklist provides an overview of all criteria of this DGE-Quality Standard. It enables *meal providers* and schools to independently review their current catering situation and, if necessary, identify potential for improvement. Thus, it might be the starting point for planning appropriate steps and supporting them on the way to more catering quality (see chapter 2). The criteria are listed along the individual chapters of the DGE-Quality Standard. For explanations of the criteria, see the respective chapter.

Development of quality school meals	**not fulfilled**	**partially fulfilled**	**fulfilled**
A *catering concept* is in place.			
All stakeholders are involved.			
A catering commissioner exists.			
Catering staff receive continuous training.			
Ergonomic workplaces and workflows are in place.			
Employees are valued.			
Feedback on the menu is regularly obtained, evaluated and measures are derived.			

Design of health-promoting and sustainable meals

	not fulfilled	partially fulfilled	fulfilled
Planning · Purchase · Preparation · Service · Disposal and cleaning			
Food qualities and frequencies for BREAKFAST and SNACKS, MIXED DIET, 5 catering days			
grain, grain products, potatoes **min. 10 × (min. 2 × daily)** wholemeal products, *pseudocereals*, *muesli* without added sugar and other *sweetening ingredients*	☐	☐	☐
thereof: min. half of the daily offer from wholemeal products	☐	☐	☐
vegetables and *salad* **min. 5 × (min. 1 × daily)** vegetables (fresh or frozen), *legumes*, *salad*	☐	☐	☐
thereof: min. 3 × as *raw vegetables*	☐	☐	☐
fruits **10 × (2 × daily)** fruits (fresh or frozen) nuts and oil seeds, unsalted → each without added sugar or other *sweetening ingredients*	☐	☐	☐
thereof: min. 2 × as nuts or oil seeds	☐	☐	☐
milk and dairy products **min. 10 × (min. 2 × daily), based on the following specifications** milk, plain yoghurt, buttermilk, sour milk, kefir: max. *absolute fat content* 3,8 % quark: max. *absolute fat content* 5 % → each without added sugar or other *sweetening ingredients* cheese: max. *absolute fat content* 30 %	☐	☐	☐
meat, sausage, fish and eggs **max. 2 × meat/cold cuts offered** meat and cold cuts as bread topping: max. fat content 20 %	☐	☐	☐
oils and fats **rapeseed oil is standard oil** rapeseed oil, linseed, walnut, , soybean, olive oil, margarine made from the oils mentioned	☐	☐	☐
beverages **available anytime** water, fruit and herbal tea → each without added sugar or other *sweetening ingredients*	☐	☐	☐

	not fulfilled	partially fulfilled	fulfilled
Food qualities and frequencies for BREAKFAST und SNACKS, *OVO-LACTO-VEGETARIAN* DIET, 5 catering days			
grain, grain products, potatoes **min. 10 × (min. 2 × daily)** wholemeal products, *pseudocereals*, *muesli* without added sugar and other *sweetening ingredients* thereof: min. half of the daily offer from wholemeal products	☐ ☐	☐ ☐	☐ ☐
vegetables and *salad* **min. 5 × (min. 1 × daily)** vegetables (fresh or frozen), *legumes*, *salad* thereof: min. 3 × as *raw vegetables*	☐ ☐	☐ ☐	☐ ☐
fruits **10 × (2 × daily)** fruits (fresh or frozen) nuts and oil seeds, unsalted → each without added sugar or other *sweetening ingredients* thereof: min. 2 × as nuts or oil seeds	☐ ☐	☐ ☐	☐ ☐
milk and dairy products **min. 10 × (min. 2 × daily), based on the following specifications:** milk, plain yoghurt, buttermilk, sour milk, kefir: max. *absolute fat content* 3,8 % quark: max. *absolute fat content* 5 % → each without added sugar or other *sweetening ingredients* cheese: max. *absolute fat content* 30 %	☐	☐	☐
oils and fats **rapeseed oil is standard oil** rapeseed oil, linseed, walnut, soybean, olive oil, margarine made from the oils mentioned	☐	☐	☐
beverages **available anytime** water, fruit and herbal tea → each without added sugar or other *sweetening ingredients*	☐	☐	☐

	not fulfilled	partially fulfilled	fulfilled
Food qualities and frequencies for LUNCH, MIXED DIET, 5 catering days			
grain, grain products, potatoes **5 × (1 × daily)** wholemeal products, *pseudocereals*, potatoes (raw or precooked) *parboiled* rice or brown rice	☐	☐	☐
thereof: min. 1 × wholemeal products	☐	☐	☐
max. 1 × *potato products*	☐	☐	☐
vegetables and *salad* **5 × (1 × daily)** vegetables (fresh or frozen), *legumes*, *salad*	☐	☐	☐
thereof: min. 2 × as *raw vegetables*	☐	☐	☐
min. 1 × *legumes*	☐	☐	☐
fruits **min. 2 ×** fruits (fresh or frozen) nuts and oil seeds, unsalted → each without added sugar or other *sweetening ingredients*	☐	☐	☐
thereof: min. 1 × als *whole fruit*	☐	☐	☐
milk and dairy products **min. 2 ×, based on the following specifications:** milk, plain yoghurt, buttermilk, sour milk, kefir: max. *absolute fat content* 3,8 % quark: max. *absolute fat content* 5 % → each without added sugar or other *sweetening ingredients* cheese: max. *absolute fat content* 30 %	☐	☐	☐
meat, sausage, fish and eggs **max. 1 × meat/sausage** lean muscle meat	☐	☐	☐
thereof: min. 2 × lean muscle meat within 20 catering days	☐	☐	☐
1 × fish	☐	☐	☐
thereof: min. 2 × fatty fish within 20 catering days	☐	☐	☐
oils and fats **rapeseed oil is standard oil** rapeseed oil, linseed, walnut, soybean, olive oil, margarine made from the oils mentioned	☐	☐	☐
beverages **available anytime** water, fruit and herbal tea → each without added sugar or other *sweetening ingredients*	☐	☐	☐

	not fulfilled	partially fulfilled	fulfilled
Food qualities and frequencies for LUNCH, *OVO-LACTO-VEGETARIAN DIET*, 5 catering days			
grain, grain products, potatoes **5 × (1 × daily)** wholemeal products, *pseudocereals*, potatoes (raw or precooked) *parboiled* rice or brown rice	☐	☐	☐
thereof: min. 1 × wholemeal products	☐	☐	☐
max. 1 × *potato products*	☐	☐	☐
vegetables and *salad* **5 × (1 × daily)** vegetables (fresh or frozen), *legumes*, *salad*	☐	☐	☐
thereof: min. 2 × as *raw vegetables*	☐	☐	☐
min. 1 × *legumes*	☐	☐	☐
fruits **min. 2 ×** fruits (fresh or frozen) nuts and oil seeds, unsalted → each without added sugar or other *sweetening ingredients*	☐	☐	☐
thereof: min. 1 × als *whole fruit*	☐	☐	☐
min. 1 × as nuts or oil seeds	☐	☐	☐
milk and dairy products **min. 2 ×, based on the following specifications:** milk, plain yoghurt, buttermilk, sour milk, kefir: max. *absolute fat content* 3,8 % quark: max. *absolute fat content* 5 % → each without added sugar or other *sweetening ingredients* cheese: max. *absolute fat content* 30 %	☐	☐	☐
oils and fats **rapeseed oil is standard oil** rapeseed oil, linseed, walnut, soybean, olive oil, margarine made from the oils mentioned	☐	☐	☐
beverages **available anytime** water, fruit and herbal tea → each without added sugar or other *sweetening ingredients*	☐	☐	☐

	not fulfilled	partially fulfilled	fulfilled
Additional criteria for menu planning			
O*vo-lacto-vegetarian* options are available every day for every meal.			
S*easonal* and *regional* vegetables and fruits are included.			
Local food are preferred in the menu.			
Grains, grain products and potatoes are offered in varied ways.			
Deep-fried and/or breaded products are used at most 4 times in 20 catering days.			
Meat and fish alternatives are offered for lunch no more than 4 times in 20 catering days			
Beverages are available anytime.			
The lunch *menu cycle* is repeated after 4 weeks at the earliest.			
The dishes are colourful and the composition varies.			
Participation in meals is possible in case of food intolerances like allergies.			
The pupils' wishes and suggestions are considered in the menu planning as far as possible.			
Culture-specific, regional and religious eating habits are taken into account in planning.			
Criteria for the use of *processed food (convenience food)* in mass catering			
Products without palm (kernel) fat, palm (kernel) oil or coconut fat are preferred.			
Unprocessed or low *processed food*, like fresh or frozen vegetables and fruits, meat or fish, are preferred for further processing on site.			
Ultra-*processed food* is always combined or supplemented with low *processed food* or components.			
Food with a low content of sugar, fat, saturated fat and/or salt and a low *energy density* are selected.			

	not fulfilled	partially fulfilled	fulfilled
Menu criteria			
The current menu is in advance accessible on a regular and barrier-free basis.	☐	☐	☐
Information is provided on allergens and food additives requiring labelling.	☐	☐	☐
Food is named clearly.	☐	☐	☐
For meat, sausages and fish, the animal species is named.	☐	☐	☐
The basis of alternatives to meat, fish, eggs, milk and dairy products is clearly defined.	☐	☐	☐
If the nutritional values are declared, the legal requirements are observed.	☐	☐	☐
If prices are mentioned, they are displayed explicitly and transparently.	☐	☐	☐
The menu is tailored to the particular target group.	☐	☐	☐
Several menu lines are clearly presented, and the health-promoting and sustainable meal is particularly highlighted.	☐	☐	☐

Planning | **Purchase** | Preparation | Service | Disposal and cleaning

Organic food is used.	☐	☐	☐
Fair trade products are used.	☐	☐	☐
Fish is purchased from sustainable fisheries.	☐	☐	☐
Meat from species-appropriate animal husbandry is preferred.	☐	☐	☐
Environmentally friendly packaging is preferred for all food.	☐	☐	☐
The first-in-/first-out-principle is applied.	☐	☐	☐

	not fulfilled	partially fulfilled	fulfilled
Planning · Purchase · **Preparation** · Service · Disposal and cleaning			
Recipes, if required with preparation instructions, are used.	☐	☐	☐
Fat is used consciously.	☐	☐	☐
Sugar is used sparingly.	☐	☐	☐
Iodised salt is used, it is salted sparingly.	☐	☐	☐
Herbs (fresh, frozen, dried) and spices are used in a variety of ways.	☐	☐	☐
Nutrient-preserving and low-fat cooking methods are used.	☐	☐	☐
Cooking periods are kept as long as necessary and as short as possible.	☐	☐	☐
Maximum holding time for cooked food is 3 hours.	☐	☐	☐
The holding temperature of cooked food is at least 60 °C throughout the food.	☐	☐	☐
Chilled food is stored at a maximum of 7 °C.	☐	☐	☐
Use resource-efficient kitchen appliances.	☐	☐	☐
Appliances are only turned on during operating times.	☐	☐	☐
Planning · Purchase · Preparation · **Service** · Disposal and cleaning			
Proper timing between kitchen and serving is realised.	☐	☐	☐
Serving staff is informed in detail about the current menu.	☐	☐	☐
Pupils are given opportunities to influence portion sizes.	☐	☐	☐
Pupils are given friendly advice when ordering and choosing food. The principle of *nudging* is considered.	☐	☐	☐
Questions about a wholesome diet and food intolerances are answered.	☐	☐	☐

	not fulfilled	partially fulfilled	fulfilled
Planning · Purchase · Preparation · Service · **Disposal and cleaning**			
Food returns are recorded separately by meal and component and the outcomes are used for future menu planning.	☐	☐	☐
Unavoidable waste is made available for energy utilization.	☐	☐	☐
Attention is paid to the use of environmentally friendly cleaning agents.	☐	☐	☐
Dosing aids are used.	☐	☐	☐
Hygiene requirements are observed.	☐	☐	☐

Beyond the plate

Recess periods that are sufficient and, if necessary, staggered and specific to each grade are planned.	☐	☐	☐
Enable eating and drinking in an age-appropriate and appealing ambience.	☐	☐	☐

Please note:
Guidelines for DGE certification including DGE certification checklists are available for DGE certification. These documents explain the criteria examined during in the audit and provide guidance on verifying implementation.

Further information:
www.schuleplusessen.de
Keyword: Externe Qualitätsüberprüfung

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Glossary

Absolute fat content: see *fat content absolute (cheese)*

Body-Mass-Index (BMI): BMI (kg/m^2) is a parameter used to classify body weight into underweight, normal body weight and overweight. It is calculated by dividing the body weight [kg] by the squared body height [m^2] [87].

Cafeteria: A cafeteria is a self-service café or restaurant. Usually, small dishes and snacks that are also suitable for take-away, as well as beverages and pre-packaged goods are offered [88].

Catering Committee: This is a working group in which all stakeholders in school catering meet at regular intervals. These stakeholders include the school authority, sponsor, school principal, representatives of the pupils, parents and teachers as well as educational staff and *meal providers*. The term catering committee is used here as a synonym for "round table".

Catering Concept: A catering concept is a written document with criteria for school meals. It describes who, when, where, how and what meals must be provided. A catering concept is usually individually designed for the facility and describes its self-conception regarding eating and drinking.

Convenience food: see *Processed food*

CO_2 equivalents: In addition to CO_2 other greenhouse gases (e.g. methane or nitrous oxide) have an impact on global warming. Their climate impact can be converted into the equivalent amount of CO_2 and thus offers the advantage of a standardised indicator of *greenhouse gas emissions*.

Dining environment: The dining environment includes the menu and food offer (quality, quantity, choice), characteristics of the food and dishes (e.g. portion size), the design of the environment (e.g. noise, time, stress), the ambience (space, light, temperature, smell, music) and the social environment (e.g. community, type of social occasion). The dining environment, unlike the *food environment*, only affects the consumption phase of the behavioural process [7, 90].

Energy density: The energy density of food is defined as the amount of energy (in kcal or kJ) per unit mass (g or 100 g). The energy density is affected, among other things, by water and fat content (9 kcal/g), and to a lesser extent by the carbohydrate (4 kcal/g) or protein content (4 kcal/g). Thus, food with low energy density is often characterised by a high water and dietary fibre content compared to those with high energy density.

Erosion: The natural process whereby fertile soil on the earth's surface is eroded by wind and water. The process can also be triggered or intensified by agricultural use of soil [89].

Fair food environment: A food environment is described as fair when it is primarily aligend with human perception and decision-making capabilities and behaviours and, secondly, it is more health-promoting, socially, environmentally and animal welfare-friendly. Thus it contributes to sustaining the livelihoods of both current and future generations [7].

Fat content absolute (cheese): This declaration refers to the actual fat content of the ripened cheese, whereas the usual commercial information refers to the fat content in the dry matter. The absolute fat content is expressed in g/100 g of food. This information is part of the nutrition declaration.

Food environment: A food environment covers all environmental factors that influence nutrition behaviour throughout the entire behavioural process. Therefore, the influence of the food environment extends well beyond the actual decision at the moment of consumption and spans the entire behavioural process. This is divided into the 4 phases of exposition (perception, e.g. via advertising and social media), access (depending on price, availability of information, social food and behavioural norms), choice and consumption [7,11].

Food Literacy: "The ability to shape everyday nutrition in a self-determined, responsible and enjoyable way" [91].

Greenhouse gas emissions: The most relevant greenhouse gases are water vapour (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) und ozone (O_3). Greenhouse gas emissions are the emissions of these gases into the earth's atmosphere. Greenhouse gas emissions can be used, for example, as a measure of the climate impact of a product and are usually expressed in *CO_2 equivalents*.

Guiding values: Guiding values are stated in terms of aids for orientation and are given for nutrients that are not essential for the organism. In addition, guiding values are given if there is a need, but it varies widely depending on numerous influences (e.g. energy requirements depending on lifestyle, occupation, etc.). Preventive effects of these nutrients are factored in when deriving guiding values.

Hazard Analysis and Critical Control Points (HACCP): This concept aims to carry out a hazard analysis and control of critical control points in food handling.

Legumes: Legumes are plant seeds that grow in a pod. They are harvested when fully mature and subsequently dried. Among vegetable food, dried legumes offer the highest protein content. Examples include peas, beans, lentils, soybeans, chickpeas and lupins. In addition to dried legumes, fresh varieties such as green peas, sugar snap peas and string beans also belong to this botanical group. They are not as rich in protein, are harvested unripe and prepared like vegetables [92].

Meal provider: Meal provider is used as an generic term for all food service providers who offer food and/or beverage services in schools.

Menu Cycle: The menu cycle refers to the period of time after which the lunch meals sequence is repeated.

Monocultures: Monocultures are a form of agricultural land use where only one type of crop is grown on the same area for several years. In the long run, this can reduce the nutrient content of the soil and require the frequent use of pesticides or artificial fertilisers [94].

Muesli: Muesli consists of one or more cereals without added sugar and other *sweetening ingredients*. These cereals might be processed in different ways, like crushed, ground or extruded. Other ingredients may include milk, plain yoghurt, quark or their vegetable alternatives, fruits (fresh or frozen), nuts or oilseeds.

Nudging: Nudges are those environmental aspects that regularly and predictably influence decisions without prescribing or prohibiting certain courses of action through regulations and laws or through setting economic incentives that are relevant to decisions [95].

Nutrient density: Nutrient density describes the amount of a nutrient in a food per unit of energy (e.g. mg/kcal).

Obesity: Obesity refers to the accumulation of body fat that exceeds the normal level. It is diagnosed using the *body mass index (BMI)*. Since the body mass index depends on age and sex, in childhood *BMI* reference curves must be used. In children and adolescents, obesity is defined as a *BMI* above the *BMI* percentile of 97-99.5. Extreme obesity is classified as *BMI* above the 99.5 *BMI* percentile [87].

Ovo-lacto-vegetarian: The ovo-lacto-vegetarian diet combines plant food with only those products of animal origin that come from living animals, e.g. milk, eggs or honey. The vegetarian diet basically excludes food from slaughtered animals, e.g. meat and meat products, fish as well as slaughter fats.

Parboiled: Parboiling is a technical process for treatment of rice or other grains. During this process, vitamins and minerals are pressed out of the outer layers into the grain. Parboiled varieties are therefore nutritionally more valuable than polished varieties.

Physical Activity Level (PAL): The average daily energy need for the physical activity as a multiple of the basal metabolic rate. It is therefore a parameter that is included in the calculation of the guiding value for energy intake. PAL levels are derived for different occupational and leisure activities. Depending on the physical activity, the guiding value for energy intake can vary accordingly [35]. A PAL of 1.4, which corresponds to a low level of physical activity, was used as a basis for the design of the nutritionally optimised menu plan.

Plant-based: A plant-based diet according to the recommendations of the DGE consists predominantly of plant-based food such as vegetables and fruit, whole grains and *legumes* as well as nuts and vegetable oils. This selection is supplemented by a small amount of food of animal origin. The term flexitarian diet refers to this type of diet. Other plant-based diets include the Mediterranean and Nordic diets, the Planetary Health Diet and vegetarian and vegan diets [96].

Potato Products: These are processed products made from potatoes. Included are french fries, instant potato, mashed potato, potato dumpling, pre-shaped potato dough, fried potato and potato snack products [93].

Processed food: According to current legislation, processed food are all primary products that have been significantly altered, for example by "heating, smoking, curing, maturing, drying, marinating, extracting, extruding or a combination of these different processes" [102].

Protein quality: The protein quality or biological value captures how dietary protein can be incorporated into the proteins of the organism's body. The protein's amino acid pattern and its digestibility are crucial factors. The protein quality is often indicated relatively by comparison with a reference protein (egg's protein or cow's milk casein) [97].

Pseudocereals: These are grains that do not belong to the botanical group of sweet grasses like wheat and rye, but visually resemble them. They include quinoa, amaranth and buckwheat. Due to their nutrient composition, pseudocereals are good supplements to the food group grains and make an important contribution to the nutrient requirement.

Raw vegetables: Raw vegetables refer to raw, unheated vegetables or lettuce, with or without dressing.

Reference values for nutrient intake: The Reference values for nutrient intake specify quantities for the daily intake of energy and nutrients, including water and dietary fibre. They are published by the German Nutrition Society (DGE) together with the nutrition societies of Austria and Switzerland.

Regional: A region is an area that forms a geographical, political, economic and/or administrative unit. The food producer is free to choose the region's label, but it must be clearly comprehensible for consumers. This can be done by political-administrative borders (counties, administrative districts, federal states), by a kilometre radius around a place to be defined, by indicating metropolitan regions (e.g. southern Germany) or defined regions (e.g. Altes Land, Rhineland, Hessische Bergstraße) [98,99].

Resource protection: Natural resources, like soil, air or water, should be considered as components of nature. In this context, resource protection is the totality of all actions to preserve or restore natural resources [100].

Salad: Salad includes all leafy salads or preparations containing vegetables and/or lettuce as the main ingredient.

Seasonal: If open-field vegetables and fruits growing in classical agriculture are harvested and sold during the harvest period, e.g. the most profitable time, they are referred to as seasonal food.

Social aspects: Social aspects of a more sustainable diet relate on the one hand to the conditions under which food and meals are produced. These include, for example, appropriate wages, compliance with labour rights and training, as well as further education opportunities. On the other hand, they refer to the conditions under which food and meals are offered and consumed, e.g. the creation of *fair food environment*s that allow everyone access to a healthy and sustainable diet or eating and drinking in community (commensality) [101].

Sweetening ingredients: In this DGE-Quality Standard, sweetening ingredients are those ingredients that are used as an alternative to sugar to sweeten food. In addition to sweetener such as aspartame or sugar substitutes, these can also be honey or fruit syrups.

Whole fruit: Whole fruit is raw, unprocessed fruit, whole or cut into pieces ready for consumption, without the addition of other food.

Addresses for School Catering in Germany:

National Quality Centre for Nutrition in Daycare Centres and Schools (Nationales Qualitätszentrum für Ernährung in Kita und Schule [NQZ]):
https://nqz.de/

Networking Centres for School Catering (Vernetzungsstellen Schulverpflegung):
https://nqz.de/vernetzungsstellen/vernetzungsstellen-schulverpflegung/

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www.schuleplusessen.de
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- National Quality Centre for Nutrition in Daycare Centres and Schools (Nationales Qualitätszentrum für Ernährung in Kita und Schule [NQZ]),
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IN FORM is German's national initiative to promote healthy diets and physical activity. It was initiated 2008 by the Federal Ministry of Food and Agriculture (Bundesministerium für Ernährung und Landwirtschaft [BMEL]) and the Federal Ministry of Health (Bundesministerium für Gesundheit [BMG]) and has since been active nationwide with project partners in every living environment. Aim is to permanently improve people's dietary and exercise habits. Further information is available at **www.in-form.de**.