

Article

Dietary Behavior as a Target of Environmental Policy: Which Policy Instruments Are Adequate to Incentivize Plant-Based Diets?

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Abstract: Meat consumption causes major damage to the environment, such as the pollution of air, water, and soil, and contributes significantly to biodiversity loss and climate change. To reach environmental and climate targets, agricultural production methods need to be addressed politically. However, dietary behavior also needs to change. This is especially the case in Western countries with unsustainably high meat consumption, such as Germany. Based on a systematic analysis of the literature of different disciplines, the article examines the following: (a) Factors influencing food behavior; (b) Policy instruments effectively contributing to behavior change; (c) Potential problems with regard to their political feasibility. Using Germany as an example, the analysis shows that only a combination of measures is promising to achieve a reduction in meat consumption—both in terms of effectiveness as well as political feasibility. Instruments need to change contextual conditions in a way that makes sustainable nutritional choices the easier ones. In the longer term, education programs and campaigns can help to change basic influencing factors such as norms or values. And, in the short term, these factors can be activated and become relevant for action in the respective decision-making situations.



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1. Introduction

The production, processing, transport, and preparation of food contribute to exceeding the planetary boundaries, for example, accelerating climate change and biodiversity loss. They pollute the soil, water, and air with harmful substances and have a high land footprint [1,2]. However, the environmental impacts vary greatly between different food items. Therefore, what people eat has a significant influence on whether environmental and climate goals are achieved.

Every day, we make a multitude of often unconscious, routinized decisions about what we eat [3] (p. 37). Among other factors, dietary behavior is influenced by early childhood socialization, cultural influences, and the social environment but also one's own values, knowledge, available time, and financial resources. However, nutrition is also an area that is strongly influenced by what is being offered, structures, and social norms that surround us. Currently, these contextual conditions often make environmentally friendly and healthy diets more difficult [4] (pp. 108ff).

There is widespread consensus in the literature that agricultural production methods need to be addressed by public policies, but changes on the production side alone are by no means sufficient [1,3,5–11]. In addition, the dietary behavior of many people in industrialized countries must change, but adopting public policies to pursue this is perceived as being politically risky since nutrition is often regarded as a private issue [4].

This article draws on the report by the German Advisory Council on the Environment [4]. It is devoted to the topic of nutrition in the context of environmental policy and, in this case, to meat consumption as a case in point. It looks at factors influencing dietary behavior and analyzes which political measures could influence dietary behavior toward environmentally friendly nutrition. When trying to adopt such measures, which institutional barriers as well as social and political resistances are to be expected? Possible measures and political obstacles are illustrated by drawing on Germany as an example. Germany exemplifies an industrialized country in which most current dietary styles cannot be viewed positively from an environmental or health perspective [2,12] (p. 183).

The article, thus, fills a gap in the existing research landscape: there are already various articles from the fields of agricultural science, biology, geography, and environmental science on the environmental impact of food production (e.g., [1,2,5,7,13]) and a broad consensus that nutrition is a major lever for achieving environmental and climate goals. There are also scientific findings from psychological research and behavioral economics on factors influencing environmental and especially nutritional behavior (e.g., [14–21]). But, so far, these strands of research have hardly been linked. Also, there is not much research on what this means for the design of effective policy instruments addressing behavior. This article helps to close this gap by linking the research findings about environmental impacts of food production with those from psychology about environmental behavior and with the political science and behavioral economics literature on policy instruments. The article then goes even further and examines hurdles in the political decision-making process that make it difficult to introduce effective instruments. This article, thus, interweaves various disciplines and offers an interdisciplinary approach and view of political practice.

Thus, the next chapter describes the environmental effects of diet, particularly focusing on animal products. Afterwards, the article's methodological approach is introduced, followed by the main part of the article: At first, the current meat consumption of the population in Germany is presented based on the results of recent studies. Then, possible instruments that address dietary behavior are analyzed regarding their effectiveness and political feasibility. Lastly, the results are discussed and summarized.

2. Environmental Effects of Diet

To start with, this chapter summarizes data on the environmental effect of nutrition in general and especially of animal-based products in Germany. A total of 18% of the GHG emissions of German households result from food consumption [22] (p. 584). On average, food consumption in Germany caused 2 tons of GHG emissions per capita per year from 2015 to 2017 and required 2022 m² of agricultural land [23].

The environmental effects differ greatly depending on the type of food. For example, according to a study by Eberle and Fels [13] (p. 769), the production of animal-based foods requires up to eight times more agricultural land per kilogram of product than the production of plant-based foods directly produced for human consumption. With its immense land footprint, agriculture (in particular, feed production) is a major driver of biodiversity loss worldwide [5]. Due to the high share of imported feed, livestock farming in Germany also contributes to land-use change and biodiversity loss in other countries [2,9]. The climate impact of animal products per kilogram of product consumed is four times higher than the impact of plant-based products [13] (p. 769). Beef causes the largest GHG emissions per 100 g of contained protein [5]. Methane plays a major role in this, as it is produced during the digestion of ruminants and has 27 times the climate impact of CO₂ [24] (p. 756). Thus, animal products are responsible for a large share of agricultural GHG emissions globally (72–78% [1] or 56–58% [5]), despite providing only 37% of protein intake and 18% of calories [5] (p. 4). Moreover, in Germany, 62% of the nitrogen pollution from agriculture is due to cattle farming and 24% is due to pig farming [9] (p. 181).

According to calculations by Springmann et al. [1], globally, a shift in diet towards a mainly plant-based, whole-food, and healthy diet could reduce negative environmental impacts by up to 56% by 2050 (see also [7] (p. 1262)). Production-side measures, such as

improved fertilizer management, recycling of phosphorus, or more efficient and economical irrigation, as well as a reduction of food waste from the production and consumption phases, also contribute to reducing environmental effects [1]. However, in terms of GHG emissions, diet offers, by far, the largest leverage. Globally, Ivanova et al. [25] estimate that switching to a vegan diet would save 0.4 to 2.1 t CO_{2eq} per capita annually and to a vegetarian diet 0.01 to 1.5 t CO_{2eq}. If all people in Germany were to switch to a largely plant-based diet, GHG emissions from agriculture in Germany could be reduced by approximately 65% overall through the decreased production of animal-based foods and the associated rewetting of previously agriculturally used peatlands [26]. Calculations specifically for Germany show that a shift to a largely or even entirely plant-based diet would also drastically reduce the land footprint (around 25 and 18% less land, respectively [23,26]). As a benchmark for plant-based diets, these studies [23,26] each use the planetary health diet. This was developed by the EAT-Lancet Commission with the aim of providing recommendations for a healthy and environmentally sound diet for the entire world population [12].

3. Research Approach and Methods

This article pursues an interdisciplinary approach and connects the natural science literature on the environmental impact of food production with the literature from two relevant fields: psychological research on the influencing factors of environmental and especially food behavior as well as the political science literature on the challenges of designing and adopting public policies.

The article examines which factors are particularly relevant in influencing dietary choices. Furthermore, it explores which approaches are especially promising in changing dietary decisions and analyzes how the chances for political realization can be increased. It gives an answer to two research questions: Which instruments can effectively contribute to behavior change, i.e., reduce meat consumption? And, what are the potential problems with regard to their political feasibility? An interdisciplinary literature analysis is carried out, guided by these research questions. It synthesizes different strands of the literature and relates them to the case of meat consumption as one example of environmentally relevant behavior.

Our starting point is the natural science analyses presented above, indicating the role of behavioral changes for reducing the environmental impact of nutrition. In a second step we turn to psychological and behavioral economics research findings on factors influencing behavior and on approaches to promote environmentally friendly behavior. These results are then combined with results from public policy and economics research on the types of available policy instruments. In this article we particularly focus on advantages and disadvantages when addressing individuals directly. In addition to this, but beyond the scope of this article, food behavior can also be influenced indirectly by instruments addressing the production side. In order to effectively reduce the environmental effects of agriculture, food policy and land-use governance need to address both the demand and supply side simultaneously. Perfectly designed policy instruments are useless if—as happens regularly—they cannot be adopted due to political resistance. This is why we turn to the political science literature discussing the challenges of political feasibility, namely the role of acceptance, partisan, and interest politics as well as the role of institutional factors.

Germany is used as an example since a high meat consumption is still very common, but there are initial changes in attitudes and behavior among some population groups. Policy instruments to influence meat consumption have not been used yet and possible measures are controversially discussed. Even though the results of our analysis might not be directly transferable to other countries, food behavior and nutrition policies are similar in many respects to other high-income countries. Thus, with some adaptations made, the results may also be helpful for other, especially European, contexts.

4. Results and Discussion

4.1. Current Meat Consumption in Germany

In order to investigate the effectiveness and feasibility of food policy measures in Germany, it is first necessary to look at the current meat consumption and relevant nutrition trends. Meat consumption in Germany is in the mid-range compared to other EU countries [27]. While people in Germany were consuming around 64 kg of meat per capita per year in 1991, the amount has declined over the decades to 57 kg in 2020 and 52 kg in 2022 [28,29].

According to a regularly conducted survey by the German Federal Ministry of Food and Agriculture (BMEL), in 2015, 34% of respondents stated that they eat meat or meat products on a daily basis. In 2023, the percentage fell to 20%. Among the men surveyed, 28% said they ate meat or meat products daily, compared to 11% of women [30]. In 2023, 8% of respondents identified as vegetarian, i.e., did not eat meat (2015: 3%). A total of 2% of respondents identified as vegan, i.e., did not eat any animal-based foods (not included in results for 2015). The percentage of those eating vegan or vegetarian meat alternatives on a daily basis rose from 5 to 10% from 2015 to 2023. Meat consumption differs greatly between age groups. Among 14- to 29-year-olds, 21% identified as vegetarian or vegan, while among people of other age groups (30–44, 45–59, and 60 and older), it was only between 6 and 8% [30].

Changes in dietary behavior are already spreading in some population groups, with people reducing or even stopping their consumption of meat. Civil society initiatives are also increasingly drawing attention to the issue. Nevertheless, meat consumption is still very common, and many traditions and routines are still geared toward meat consumption [2,7,31]. In a study conducted in Germany, the majority of participants continued to name meat-based dishes when asked about their favorite dishes [32] (p. 184).

4.2. Factors Influencing Dietary Behavior

This chapter synthesizes research results on the influencing factors of food behavior and especially meat consumption. Like other environmentally relevant behaviors, dietary behavior is influenced by a variety of factors [3,4,33,34]: Values, environmental awareness, or awareness of the consequences of one's own behavior have an influence on the underlying willingness to engage in environmentally friendly behavior [4,14–16]. Other factors, such as specific knowledge [17,18], emotions [15,19], or social norms [4,20], affect behavior in concrete decision-making situations. Furthermore, contextual conditions, such as infrastructures and prices, have an influence [4]. Existing routines [4,21] and personal factors such as age or income [4] impact environmentally relevant behavior as well. The following analysis is structured along these three clusters of influencing factors: routines and contextual conditions, basic influencing factors, and characteristics of the decision-making situation.

4.2.1. Routines and Contextual Conditions

Dietary decisions are made several times a day and, therefore, are not consciously reflected upon each time but are ingrained in routines. Hence, unconscious dietary decisions play a key role [33–35]. These regular, solidified dietary habits are difficult to change [7] (p. 1268).

In addition to routines, the food environment, i.e., the contextual conditions, also plays an important role. This includes, for example, access to certain offerings, such as whether vegetarian meals are easily accessible or how they are presented in the supermarket [33]. In 2022, half of the respondents of a survey rated simple and quick preparation of meals as very important or important [36]. So far, the consumption of vegetarian alternatives is still perceived as less easy or convenient [37]. For changing dietary habits, gastronomic offers also play an important role [38] (p. 411). This is especially the case as more and more meals are being eaten out (at least once a week in a restaurant by 15% and in a canteen by 15%) or ordered from delivery services (at least once a week by 8%) [30]. Eberle and

Fels [13] (p. 768) estimate that out-of-home consumption is responsible for 6 to 19% of the environmental damage of total food consumption in Germany.

Another relevant contextual condition of nutrition is price. As for many other products, meat prices do not adequately reflect the negative environmental effects that arise during production. Meat is disproportionately cheap [2,3,7,32]. The current value-added tax (VAT) system in Germany does not motivate environmentally friendly diets due to a reduced VAT rate on meat and many meat products [39] (pp. 44ff). Although, on a general note, people only slightly adjust their diets to price changes, they do react relatively more strongly to price increases for meat, beverages, and out-of-home meals (with regard to meat [40] (p. 53); in general [41] (pp. 218–219)).

In households, those who are primarily responsible for preparing meals also influence the diets of other household members [42] (p. 34). Conversely, a switch to a plant-based diet desired by some household members may be more difficult if it is not supported or at least tolerated by everyone in the household [33].

4.2.2. Basic Influencing Factors

In addition to contextual conditions, basic influencing factors such as values, norms, identities, and environmental awareness shape dietary behavior. As these are developed already in very early childhood, experiences through food offerings in the family as well as in daycare and school have a major influence on the development of eating habits [42] (p. 33), [2] (p. 195).

4.2.3. Decision-Making Situation

The extent to which basic influencing factors lead to environmentally friendly behavior depends on the respective situation and the behavior-related influencing factors. The social situation in which a meal is eaten is, therefore, also relevant for dietary decisions. Different social motives play a role in the choice of food, depending on the context, whether as a daily shared meal in the family, on festive occasions, or among colleagues [2] (pp. 195–196). In addition to social norms, specific knowledge about the environmental effects of meat consumption can also have an influence. Results of the BMEL survey from Germany indicate that many people are not aware of the environmental potential of a low-meat diet [36,43].

4.3. Policy Instruments to Reduce Meat Consumption

As shown above, dietary behavior is influenced by a variety of factors, so it seems sensible to use public policies addressing pertinent behavior at different points. In its report, the German Advisory Council on the Environment (SRU) [4] identified three approaches that may be suitable to modify environmentally relevant behavior, depending on where the particularly important influencing factors and barriers lie for a particular behavior [4] (pp. 50ff) (see Figure 1).

The first—and most relevant—approach is to change contextual conditions in order to facilitate environmentally friendly behavior. A second approach addresses the basic influencing factors and, for example, attempts to change values and create environmental awareness. A third approach focuses on the moment of decision-making and aims to activate the basic influencing factors and support environmentally friendly behavior, for example, by pointing out social norms. In the following, promising policy instruments directly addressing the consumer are discussed and assigned to these three approaches (see also Table 1).

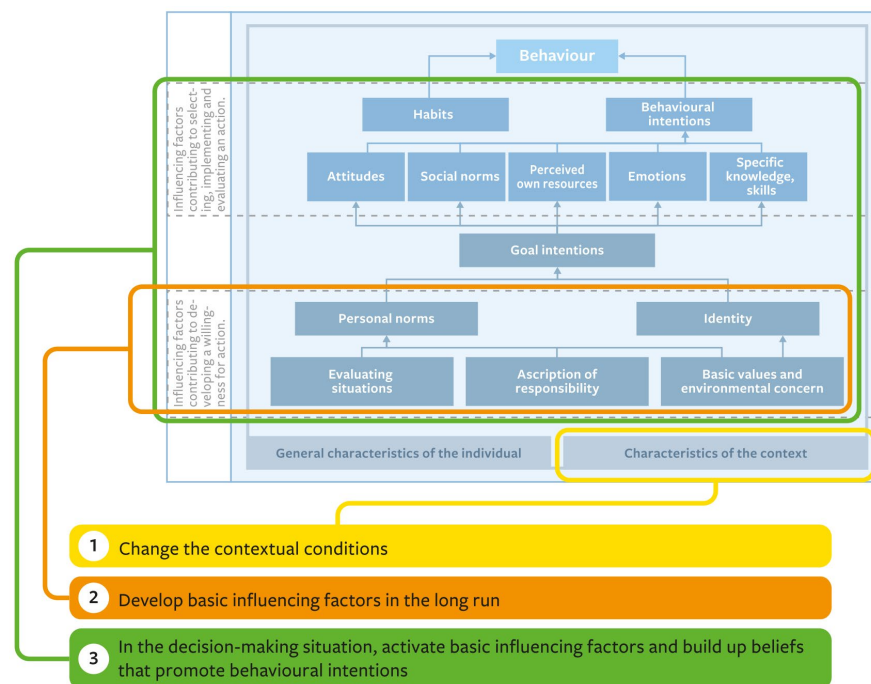


Figure 1. Approaches to promote environmentally friendly behavior. Source: [44] (p. 8).

Table 1. Approaches to address behavior and possible policy instruments to reduce meat consumption.

Approach	Instrument Type	Instrument
Change in contextual conditions	Price-based instruments	Increased VAT on meat products, introduce additional taxes or levies
Develop basic influencing factors over the longer term	State infrastructures and offers	Improved vegetarian offerings in canteens and gastronomy
	Educational instruments	- Nutritional education to strengthen knowledge about the environmental effects of nutrition and environmental awareness - Suggestions for vegetarian meals and cooking courses
	Persuasive instruments	Campaigns for plant-based diet with the help of role models
Activate basic influencing factors in the decision-making situation and build up behavior-promoting beliefs	Nudging	- Signs reminding people of social norms - Changes in defaults at events, e.g., to make vegetarian food the first choice
	Informational instruments	Labels informing about environmental effects of food
	Regulatory instruments	Limits of advertising for meat

4.3.1. Change Contextual Conditions

One way to address the contextual conditions of meat consumption is to introduce price-based instruments, for which different proposals are discussed (e.g., [3,39,45–49]). Various authors suggest charging the full VAT rate of 19% on meat products or even on meat and dairy products instead of the reduced 7% [3,9,39,40,45,48–52]. However, this means that all meat prices would increase in equal proportions by 11.2%. More expensive

meat from better forms of husbandry would become even more expensive and many customers would possibly resort to cheaper meat from poorer husbandry conditions to maintain the amount of meat consumed [52,53]. To compensate for the price difference between organic and conventional products, exemptions from tax increases [39] (pp. 51ff) or higher subsidies [50] for organic products are, therefore, suggested.

Alternatively, or complementarily, additional taxes or special levies on meat are discussed, which could differ in their amount according to different types of meat (among others [47,54,55]). In addition, a climate tax, or a broader sustainability tax on food in general is also proposed, which internalizes various negative environmental or even social externalities [3] (pp. 571–580). In contrast to modified VAT rates, however, the introduction of additional economic instruments requires a relatively large effort, and the calculations are sometimes complex [48] (p. 23), [52] (p. 31). Unlike a tax, a special levy would add a fixed amount to the price of products, for example, 40 ct/kg of meat (e.g., [54]). However, according to GAWEL [53] (p. 54), this should be regularly adjusted to price developments. If taxes or levies on meat are too small, it could happen that prices in the retail trade would not increase at all but that the price increase would be passed on to other products by the retailers or that producers would be pushed even harder to lower prices [53] (pp. 34–35).

Instead of directly addressing consumers with price increases on the demand side, price-based instruments could also indirectly affect consumers when addressing the supply side. Although not the focus of this article, the inclusion of emissions from livestock farming in the EU emissions trading scheme is particularly promising in indirectly influencing food behavior [56,57]. The advantage of a demand-side pricing instrument is that if in one country the demand for meat is reduced by national public policies this applies to domestic as well as imported meat products. Supply-side measures, on the contrary, require border adjustment mechanisms as complementary tools [56].

It is empirically still unclear at what price increase meat consumption would actually decrease. More empirical studies are required to allow for making clearer assumptions here. However, calculating with tax rates of 15% and 30% [58] or between 3% and 13% depending on the type of meat [59], studies suggest that price increases could have an effect on dietary behavior. Banse and Sturm [48] (pp. 29ff) conclude in their analysis that abolishing the VAT concession in Germany for animal products could reduce their consumption by 6% overall, which, in turn, would reduce GHG emissions by 5.4 million t CO_{2eq} annually. Förster et al. [52] (p.16) assumed a decrease in the consumption of meat and meat products excluding out-of-home consumption of 11% to 12%.

Price-based instruments have a particularly strong effect on those population groups that consume a lot of meat and, at the same time, are primarily price-oriented in their purchasing decisions [60]. Thus, these instruments are likely to have less of an effect on the consumption of high-income households—they have a regressive effect, i.e., they burden low-income households more than high-income households [3] (p. 461). Therefore, it is often suggested that a higher tax rate on meat should be accompanied by compensatory measures that relieve low-income households [52,53,61,62].

One option is to completely abolish VAT on fruits, vegetables, and legumes and, if necessary, other plant-based foods [50,52,55]. This would make plant-based products and meat substitutes more attractive in terms of prices, as they are currently relatively expensive. Studies show that a combination of taxes on some products and subsidies on others is also more effective [61]. However, it is questionable whether a reduction in VAT on certain products would actually be passed on in full to customers by retailers or partially offset by higher net prices [46] (p. 164). Another variant is to compensate low-income households for the additional costs through transfer payments. For example, the German Environment Agency proposes, among other things, an increase in the standard rates for food in government transfer payments and free meals in nurseries and schools [39,49].

In the discussion of price-based approaches, reference is also made to possible substitution effects, i.e., to which foods consumers switch [3,58,63]. Moreover, an increase in the price of meat in Germany could lead to an increased export of meat products instead of

a reduction in its production in Germany [6,53]. Therefore, it is suggested that measures that target the price for consumers should always be accompanied by measures that target changes on the production side [39,47].

Based on the aforementioned studies on price-based instruments and research findings on factors influencing dietary behavior, it can be concluded that price increases on meat can be expected to have a relevant impact on meat consumption by changing the contextual conditions.

4.3.2. Developing Basic Influencing Factors

Another strategy is to change the basic factors influencing dietary behavior. One variant is educational programs that inform, e.g., about the environmental impacts of meat consumption. Studies show that those people who are already environmentally aware but lack the concrete knowledge relevant for action can be stimulated to change their consumption. Nutritional counseling, too, can have an effect on dietary behavior [64] (p. 4). Studies also show that cooking classes focused on vegetarian diets help people learn the skills necessary to change their dietary behavior and lead to a reduction in meat consumption in the longer term [65]. Although more empirical research is needed on this, studies, to date, suggest that educational interventions can be successful [65], but they need time to show effects.

Because dietary behavior is formed at an early age, nutritional education in school and daycare is discussed. Thus, the German Advisory Council for Consumer Affairs (SVRV) [32] (p. 208) suggests expanding nutritional education, to train teachers more for this purpose and to improve teaching materials. A combination of education and information with formulating one's own nutrition goals has also been shown to be effective in studies [65]. Campaigns and counseling can be more successful if they start at points in time when habits are disrupted anyway. This applies, for example, to the phase when young people move out of their parents' house and are responsible for their own food supply for the first time [34] (p. 57).

In addition to education and advice, persuasive instruments such as campaigns are also discussed, with which civil society organizations or governments draw attention to unhealthy or environmentally harmful products, directly or with the support of prominent personalities, and promote different consumption [4] (pp. 68ff) (e.g., Veganuary 2023). Here, social norms and identities help to increase the relevance of the information conveyed [4] (p. 68f). If dietary habits and norms change in social groups, this also facilitates and motivates people close to these groups to change their dietary habits [7] (p. 1273). Furthermore, campaigns can initiate debates and change norms in the longer term, which, in turn, can be the basis for further action [34] (p. 48). The Scientific Advisory Board for Agricultural Policy, Food and Consumer Health Protection (WBAE) in Germany recommends running campaigns over a longer period of time, with a wide reach and frequent repetitions [3] (p. 586).

However, campaigns, educational projects, and information can only have an impact if they are designed appropriately for the target group. Otherwise, they can even lead to defensive attitudes, which, under certain circumstances, can lead to even higher meat consumption [65] (p. 3). To reach people with less environmental awareness, it can be helpful to communicate the co-benefits of low meat consumption, such as for health [65,66] or animal welfare [65].

4.3.3. Support at the Moment of Decision and Activating Influencing Factors

In terms of the third approach mentioned above, people can be supported at the very moment of food selection so that environmentally friendly values and knowledge do result in behavioral change. In the situation of food shopping, product labels can help those who already have an interest in and a basic knowledge of environmentally friendly nutrition to make a purchasing decision. One possible instrument is a label that makes environmental externalities transparent, for example, by indicating the GHG emissions of a

product (e.g., [2,3]). Labels composed of different sustainability dimensions are also being discussed. However, these are much more difficult to implement as they require an even more comprehensive database and calculation method [3] (p. 661).

As initial meta-studies show, labels on food products could be quite effective, depending on their specific design [67]. If designed to be simple and clear, information on GHG emissions or certain other environmental issues had an impact on choices in experimental studies and reduced the consumption of environmentally harmful products [68,69]. A similar effect was shown on menus [70]. However, the indication of GHG emissions has a greater effect on consumers who are already environmentally conscious and who already consume comparatively little meat [71].

Other studies assume a rather low direct effect of information on purchasing behavior (e.g., [72]). In many cases, environmental labels are not properly understood [62] (pp. 65ff). According to a study by Meyerding et al. [73], the majority of consumers hardly understand the carbon footprint of a product if it is only given as a number. This label proved to be effective only for a small proportion of the study participants with greater environmental awareness and more pronounced knowledge of and trust in environmental labels ([73]; similarly, [74–76]). Therefore, a label that uses traffic light colors in addition to numerical information could be more useful for consumers [3,68,69,73,76]. This is especially the case if it is mandatory. In the future, it could be expanded to include other sustainability dimensions. For interested consumers, additional information via QR codes or apps is proposed (e.g., [2] (p. 205)).

As a further approach, guidelines are being discussed that provide recommendations for healthy and environmentally friendly nutrition and for corresponding offerings in canteens. Springmann et al. [1,77] see considerable potential for achieving ecological and also health objectives in the adaptation of national nutrition guidelines with regard to the reduced consumption of animal products (especially beef and dairy products).

However, if only the recommendations are adjusted, the effect is questionable. On average, the population in Germany strongly exceeds the current recommendations of the German Nutrition Society (DGE) [78] (pp. 63–64) and probably only a few people will change their consumption when the adjustment is limited to national recommendations. Therefore, various authors [3,32,49,55] recommend that the menus of public and private canteens, such as those of a broad range of educational institutions, hospitals, or youth hostels, be oriented toward guidelines for healthy and environmentally friendly nutrition and corresponding quality standards of the DGE [78]. This is also included in the nutrition strategy of the Federal Government of Germany from January 2024 [79] (p. 5).

The potential for changing habits and norms is particularly great in canteens where people eat regularly and together [2] (pp. 198–199). School canteens, in particular, can have a major impact on dietary behavior today and in the longer term, because children act as multipliers, carrying new ideas, values, and norms into families [62] (p. 83). They, therefore, also have an effect on the development of basic influencing factors (see above). Similarly, there is still great potential for change in hospitals and nursing homes, particularly because of the large number of meals consumed. If public canteens increase the proportion of vegetarian meals in their daily offerings, they also live up to the state's role model function [34,80]. In addition, appropriate pricing can make vegetarian options cheaper and, thus, more attractive compared to meat-based dishes, which, in turn, affects the contextual conditions.

Beyond food selection in canteens, studies have found other measures that change decision contexts to be helpful [81] (p. 5). These include, for example, changing the presentation of dishes in restaurants or canteens and the standard selection at events (see also [9] (pp. 383–384)). Studies in which meatless dishes are presented as standard options on the menu and meat dishes are offered on demand or on a separate menu suggest that this could lead to a reduction in meat consumption (e.g., [82–84]). Changes in the arrangement of food in buffets of hotels, youth hostels, and canteens have a similar aim (e.g., [45] (p. 120), [85] (pp. 79–80)). Here, meat dishes can be placed less visibly or conveniently to

reach than vegetarian dishes [86] (pp. 79–80). Another way of presenting food differently and, thus, influencing behavior is by visually dividing shopping carts into differently sized areas for fruit and vegetables and for meat and dairy products in order to show how large the share of certain product groups in the diet should be [85] (pp. 76–77).

These approaches take effect at the moment of decision and activate social norms and values but, at the same time, can also change behavioral beliefs, such as social norms, in the longer term. In the long term, plant-based diets could, thus, be perceived as common and desirable, while high meat consumption would be seen as out of the ordinary [86] (p. 5).

Advertising bans also have an impact at the moment of dietary decisions. Following regulations in the area of alcohol and tobacco, these have also been discussed in recent years for meat and other environmentally harmful foods [2] (p. 207), [3] (pp. 379ff). Assessments have investigated their feasibility and constitutionality [46,87]. The Dutch city of Haarlem was the first city in the world to decide to ban advertising of conventionally produced meat and other climate-damaging products in public spaces starting in 2024 [88]. As an alternative to advertising bans on meat, mandatory labeling with environmental or health information on advertising posters or in promotional videos is also being discussed [2,3].

In principle, studies on the effect of advertising restrictions in various areas show positive effects on children's nutrition. However, there have been only a few studies on the effect of advertising and advertising restrictions on adults [62]. A study by Dubois et al. [89] uses the example of an advertising ban on potato chips to show that it is certainly suitable to reduce demand. However, the effect is reduced if prices fall as a consequence of declining sales. Moreover, a ban on a product category must not be too narrowly defined because, otherwise, other similarly problematic products will be consumed instead [89] (pp. 424–426).

Instruments that take effect in the decision-making situation can, thus, certainly influence meat consumption. However, information such as labels, in particular, only work in conjunction with other instruments, for instance, because they are primarily noticed by those already interested in environmental issues.

4.4. Political Feasibility

If the political goal is to change environmentally relevant behavior, identifying effective approaches and instruments is not enough. These can only be adopted and implemented successfully if they are politically feasible. As a tendency, the more effective measures promise to be, the less feasible they are [90–92]. For the political feasibility of measures to reduce meat consumption, their social acceptance plays a crucial role. However, compatibility with partisan positions and the question of which interest groups are likely to react with resistance can also play a role in the feasibility of measures. In addition, federal and EU legal requirements must be taken into account when discussing the introduction of new levies or changes to tax rates.

4.4.1. Acceptance

Dietary behavior is of great importance for one's own identity and has a high social and symbolic value [32] (p. 166), [2] (pp. 200–201). Measures that address individual dietary behavior, therefore, potentially interfere strongly with everyday decisions and privacy. For this reason, they are often judged to be illegitimate and are politically difficult to adopt. Nevertheless, even now, dietary behavior does not take place in a space free of political influence [34] (p. 22).

Acceptance depends on the type of measure and how its introduction is justified but also differs between groups of people. Due to the great importance of health aspects, acceptance can be increased by communicating health co-benefits [34] (p. 26). A study on nutrition policy conducted in Germany, Denmark, France, Hungary, Italy, and the United Kingdom showed that women are significantly more positive about most measures than men (such as the arrangement of food in the supermarket and a meat-free day in canteens) [92] (p. 7). A study conducted only in Germany in 2020 showed similar results [93]

(p. 29). Overall, in this study, the majority of respondents rated information and advisory services designed to promote an environmentally friendly diet very positively (84% fully or rather agreed). Improving vegan and vegetarian options in canteens and restaurants was supported by 63% of respondents [94] (p. 71). In other studies, soft measures that make it easier to eat vegetarian meals are more likely to be accepted than hard measures that push for the meat-free alternative [34,92,95].

If people fear a restriction of freedom, this can, in some cases, generate reactance (cf. [96,97]) because they do not want to be told to give up meat. When, in 2013, the green party in Germany proposed to introduce a vegetarian day in canteens to reduce meat consumption (so-called Veggie Day), this led to a controversial debate and great outrage, especially in the tabloid press. Nevertheless, three surveys from 2013 show that a similar proportion of respondents supported Veggie Day as opposed it. Acceptance for the proposed measure was actually higher than the political controversy suggested and has certainly increased since then [2] (p. 201). Nevertheless, in Denmark in 2020, a plan to introduce vegetarian days in public canteens failed due to strong opposition against it [98]. Reactance to individual measures can ultimately also lead to resistance to the goal itself—in this case, environmental and climate protection.

In this context, it is also discussed whether such measures can be framed differently when they are introduced so as not to be scandalized by the media. If it were only communicated that canteen menus must, in future, be based on DGE quality standards, but not that this also goes hand in hand with a lower quantity of meat on offer, they would possibly receive less media attention (discussed in [3] (p. 435)). However, it is worth discussing whether such a renunciation of transparency in favor of higher acceptance is legitimate.

With regard to price-based instruments, the acceptance of abolishing the VAT on fruits, vegetables, and legumes is certainly higher than that of increasing the VAT on meat and meat products. Higher taxes on meat products raise issues of social justice as they burden poorer households in particular, which have to spend a larger share of their income on food [62,99]. If the additional government revenue generated by higher taxes is used to ease the burden on low-income households, this may increase acceptance [90] (p. 178). In addition, the acceptance of higher taxes on meat could be increased if it is combined with other instruments, such as measures that address the production side, e.g., higher animal husbandry standards [1] (p. 179).

Another way to develop accepted nutritional policy instruments is to have citizens participate in discussions and decision-making, for example, in the form of citizens' councils [4,100]. In July 2023, the German Bundestag decided to set up a citizens' council on the topic of nutrition [101], which submitted a citizens' report to the Bundestag in January 2024 [102]. Its mandate was to discuss the role of government in influencing nutrition environments and give advice on appropriate federal policy instruments. Among other policy instruments, the citizens' council recommends to either introduce a special levy on meat or increase the VAT rate on meat from poorer farming conditions, combined with the abolishment of VAT on fruits, vegetables, and legumes [103]. It remains to be seen whether the fact that a citizens' council has recommended a stronger political interference in food behavior helps to select appropriate and accepted policy instruments.

4.4.2. Partisan Politics

In the parliamentary system of Germany, political parties play a major role not only in establishing the government but also in structuring public debates on public policies. An evaluation by the WBAE of the positions of the parties represented in the Bundestag on sustainable nutrition in their programs for the 2016 elections shows clear differences between the parties [3]: For the Christian Democratic CDU/CSU, nutrition is primarily linked to agribusiness and the food industry. The Social Democrats supported comprehensible labeling as well as financial support for school meals in their program [3] (p. 405). The election program of the green party contained further policies. Instead of again proposing a vegetarian day in canteens, they now demanded better vegetarian and vegan offerings

in nurseries as well as in canteens in schools and other institutions. The Left Party demanded affordable organic food in schools and nurseries. The Free Democratic Party (FDP) and Alternative for Germany (AfD) did not mention the issue of nutrition. The election programs for the Bundestag elections in September 2021 show a similar picture: Only the green party explicitly addresses the goal of reducing the consumption of meat and animal products. Among other things, they call for the further development and expansion of the nutrition label Nutri-Score and financial support for farmers for improvements in animal husbandry [104]. Although the Social Democrats state that agriculture must also contribute to climate protection, they do not explicitly address meat consumption [105] and neither does the CDU/CSU [106].

If the issue of reducing meat consumption in Germany has been addressed politically at all, it has so far been mainly through soft measures. The current coalition agreement between the Social Democrats, the green party, and the FDP [107] mostly mentions soft measures on the topic of nutrition. Among other things, it was agreed that plant-based alternatives to meat products should be strengthened. In addition, the DGE standards should be updated and given greater consideration in public canteens [107]. The white paper on the development of a nutrition strategy now tackles these issues [79] (p. 5). One of the goals included in the nutrition strategy is to help create food environments that support a more plant-based diet [79] (p. 7).

4.4.3. Interest Groups

Policy instruments that aim to reduce meat consumption predictably meet resistance from meat producers and distributors of meat products and their associations [40]. This is also evident in debates following the publication of a WBAE [3] report on its recommendations for policy interventions in the food system (e.g., [108–110]).

The food sector is characterized by enormous concentration and market power. The food industry as well as food traders pursue intensive interest politics to defend their stakes [2,3,7,110–112]. Stakeholders in the agricultural sector have traditionally had close relationships with decision-makers, for example, in the Federal Ministry of Food and Agriculture or in the Bundestag. Such patterns of influence are well documented, for example, in the case of the German Farmers' Association (Deutscher Bauernverband) [113]. In 2019, this association clearly spoke out against a meat tax [114]. In other countries, there is a wide range of cases in which the food industry has acted massively against political measures intended to restrict the consumption of its products (e.g., tax on sweetened beverages in the USA and fat tax in Denmark—see [6]).

At the same time, there are opposing trends; for example, some meat-processing companies themselves increasingly focus on meat substitutes [31,34] and are, therefore, not necessarily opposing policy instruments which aim to reduce meat consumption. Meat substitutes have evolved from marginal phenomena to relevant business segments within two decades. Both processing industry and retailers are profiting more and more from increasing consumption of these products [115,116]. The strong concentration of a few market players in food processing and distribution may reinforce the spread of meat substitutes as those companies do not rely on high meat consumption [115] (p. 234). Therefore, these market actors can be expected to offer no or relatively little resistance to policy proposals that aim to reduce meat consumption but encourage the purchase of meat substitutes [4].

Another relevant interest group in this context includes consumer organizations, which generally aim for freedom of choice for consumers and transparent product information and often criticize higher food prices [117]. Accordingly, the German federation of consumer organizations (vzbv) is calling for clear labels concerning animal welfare and the abolition of VAT on fruit, vegetables, and pulses, among other things. However, in times when the issue of climate and environmental protection is gaining importance among consumers, the association also takes a positive view of food policy with the aim of achieving a sustainable

food system. They support meat prices that reflect the true costs of production, if higher prices are accompanied by compensation for low-income households [118].

4.4.4. Legal and Institutional Framework Conditions

When designing policies for Germany, legal and institutional factors must be considered. In particular, a range of restrictions result from European and national constitutional law [4]. However, expert opinions conclude that special levies and taxes on meat would be possible under this legal framework [46]. Until recently, the abolition of VAT on fruit, vegetables, and legumes was not permissible under EU law. However, due to an amendment of the corresponding directive, this is possible since April 2022 (Art. 98, paragraph 2, Council Directive 2006/112/EC). Reports on a ban on advertising meat in general and cheap meat in particular also come to the conclusion that such measures would be compatible with constitutional and European law [46,87].

Measures in public canteens and at events of state actors can be directly decided by the state. Specifications could also be made for catering at publicly funded events [2] (p. 206). By contrast, changes in the private sector, for example, in the restaurant industry or in food retailing, can only be stimulated through voluntary agreements with industry associations or indirectly through a change in demand if social norms on eating meat change.

So far, an institutional obstacle to ambitious measures to reduce meat consumption in Germany has been that policy projects in this area have been the responsibility of the Ministry of Food and Agriculture, despite strong links to the expertise of the Federal Ministry of Environment, Nature Conservation, Nuclear Safety, and Consumer Protection. The former has traditionally been closely linked to agriculture and has not given high priority to environmental protection when it conflicts with agricultural interests [119,120]. Interministerial initiatives, in this case between these two ministries, as a mechanism to overcome such barriers, usually require increased effort. If the ministries involved are under the responsibility of the same political party, as is the case at the time of writing, this could facilitate coordination between the ministries and instruments to reduce meat consumption could be adopted more easily. In contrast, the authority to introduce price-based instruments, such as a change in VAT rates or the introduction of an additional tax on meat, lies with the Federal Ministry of Finance. This ministry, in turn, has the inherent task of ensuring a sound financial situation and is influenced by the programmatic of the respective responsible party. Therefore, additional negotiation processes between the ministries are necessary here.

In addition, the distribution of competencies in the multi-level system also poses challenges [3] (p. 496). For example, federal standards for canteens could be made more difficult by the fact that the facilities (educational institutions, hospitals, etc.) are mostly the responsibility of Länder or municipalities or are even privately run. Other measures, such as pricing instruments addressing the supply-side or a climate label would be more effective when introduced at the EU level.

5. Conclusions

Meat consumption causes major damage to the environment, such as the pollution of water and soil or climate change. The production of plant-based foods requires comparatively less agricultural land and causes fewer greenhouse gas emissions than the production of animal products. Therefore, decreasing the consumption of animal products is one of the biggest levers for reducing greenhouse gases from food production, in particular. Using the example of meat consumption in Germany, the article has shown that two things are important: First, it is important to understand the influencing factors of dietary behavior and possible approaches and instruments to address it. Second, it is important to have a strategy for adopting effective measures and bundles of measures politically.

Dietary behavior is influenced by a variety of factors. It is strongly socially and culturally shaped, and habits are difficult to change. So far, the political, economic, and social framework conditions tend to promote meat consumption. Yet, there is not one

single “silver bullet” that will solve all problems. Rather, only a combination of measures is promising to achieve a reduction in meat consumption in Germany. Contextual conditions, e.g., in supermarkets, public canteens, or restaurants, can be designed in a way which makes sustainable nutritional choices the easier ones. In the longer term, basic influencing factors such as norms, values, environmental awareness, and perceptions of the consequences of one’s own dietary behavior can change. And, ultimately, in the short term, these factors can be activated and become relevant for action in the respective decision-making situations.

Overall, it can be seen that price-based instruments influence dietary behavior but that tax rates or levies must be set high enough and increases must be combined with support for lower-income households. However, the empirical data do not clearly show whether the price increase induced by a change in the VAT rate is high enough to reduce meat consumption to a relevant extent when combined with other measures. Therefore, the effects of a change in the VAT rate should be evaluated a few years after its introduction and, if necessary, another price-based instrument should be introduced.

By changing the choice architectures in public canteens, many people and nutritional contexts can be reached, and the state also acts as a role model. This can be achieved by changing offerings and pricing in public canteens, schools, nurseries, and universities in a way that is in line with environmental goals and the planetary health diet. Although the state has no direct influence on private canteens and the catering industry, it could, within its scope of influence, also work towards corresponding offers.

Informational tools can also be effective, especially if positive health effects are highlighted and different target groups are addressed differently. Educational interventions have the potential to reduce existing knowledge gaps about the environmental effects of meat consumption and to offer advice for environmentally friendly food preparation. They are more likely to have a long-term impact by addressing dietary habits and environmental awareness as well as the social norm of eating meat. Concerning informational and educational instruments, more empirical research is needed in order to better understand when these instruments are particularly effective.

What resistance can be expected to the adoption of such policies that could complicate their political feasibility? The analysis has shown that there may be challenges due to both a lack of acceptance among the population and a lack of compatibility with partisan lines. Both challenges can be met by bundling measures. If both food production and consumption are addressed and pricing instruments are combined with support for lower-income households, this can increase acceptance. Studies also demonstrate the contribution of citizen participation to finding suitable and acceptable measures and succeeding in the shift to a more environmentally friendly food sector.

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