




Consumer support of policy measures to increase sustainability in food consumption

Jeanine Ammann^{a,1,*} , Andreia Arbenz^{a,b,1} , Gabriele Mack^a, Michael Siegrist^b

^a Agroscope, Research Group Economic Modelling and Policy Analysis, Ettenhausen, Switzerland

^b ETH Zurich, Department Health Science and Technology (D-HEST), Consumer Behaviour, Switzerland

ARTICLE INFO

Keywords:

Food policy
Consumer acceptance
Sustainable diet
Consumer behaviour
Climate change mitigation

ABSTRACT

The modern global food system is an important driver of climate change. Policy measures are one potential lever for shifting consumption towards more sustainability. Public acceptance can be a major barrier for the implementation of such measures. Thus, a profound understanding of consumers is needed to facilitate policy support. In the present study, we therefore invited 453 participants from German-speaking parts of Switzerland to participate in an online survey in which we tested 15 policy measures for their consumer acceptance. Furthermore, we explored individual predictors that contribute to policy support. Our results show that there is a difference in the support of policy measures depending on the level of intrusiveness, making less intrusive measures more accepted than more intrusive measures. Support also varied depending on the targeted product category. Measures targeting dairy and meat products tended to be less accepted than measures targeting vegetables. Using a regression analysis, we identified behaviour (i.e. meat and dairy consumption) and food sustainability knowledge as an important predictor of policy support. The findings have important implications for policy-makers, as they illustrate that personal involvement is a crucial factor in policy support. Taken together, our findings can help inform future food policies to increase consumer support and thereby facilitate sustainable behaviour change.

1. Introduction

What we eat impacts both ourselves and our environment. In 2019, our agri-food system accounted for around 30 % of global anthropogenic emissions (Tubiello et al., 2022). Current levels of livestock production (i.e. meat and dairy) significantly contribute to the emission of greenhouse gases and biodiversity losses (Mondière et al., 2024; Scarborough et al., 2023). Thus, our dietary patterns are a critical driver for climate change, and a transformation towards more sustainable diets is needed. Notably, besides the environmental dimension, food sustainability also includes social and economic dimensions (Jackson & Holm, 2024). Within the scope of this paper, however, we focus on the environmental dimension of sustainability, herein referred to as sustainability.

1.1. Drivers of policy support

Changing consumer behaviour towards more sustainability is difficult. One way of facilitating this change is through government

interventions. When governments decide on whether they implement certain measures, three aspects are important: effectiveness, cost and public acceptance of the measure (Diepeveen et al., 2013). In the context of this work, we focus on the latter. Not only does the degree to which a population accepts a policy affect its chances of success (Sharp et al., 2020), but scholars have even concluded that the implementation of policy instruments, especially in democratic countries, can only succeed if their legitimacy, which is itself influenced by consumer acceptance, is high (Anderson et al., 2017; Aschemann-Witzel et al., 2016). Therefore, public attitudes towards consumer-targeted policies and the extent to which such measures are accepted must be considered by governments when choosing their courses of action.

One important predictor of policy support is the intrusiveness of the policy measure (Ammann, Arbenz, et al., 2023). In an example of health nudges, acceptance was found to be inversely related to the perceived effectiveness of the nudge, posing difficulty in policy communication (Cadario & Chandon, 2019). Similarly, a Swiss study on the acceptance of consumer-targeted policy instruments to reduce sugar consumption

* Corresponding author at: Agroscope, Tänikon 1, CH-8356 Ettenhausen, Switzerland.

E-mail address: jeanine.ammann@agroscope.admin.ch (J. Ammann).

¹ The first two authors, Jeanine Ammann and Andreia Arbenz, equally contributed to this work.

for health reasons (Hagmann et al., 2018) found that less intrusive measures (e.g. labels) were better accepted than more intrusive measures (e.g. taxes). In line with this, a German study investigated the acceptance of food-related policy measures to improve sustainability and observed that the least intrusive instruments were also the most accepted (Lemken et al., 2018).

Another aspect driving support of policy measures is the socio-demographic background of an individual. Specifically, females and older individuals seem to express stronger support for policy interventions than males and younger individuals (Diepeveen et al., 2013). Another aspect that can play a role in policy support is political orientation. It seems more left-leaning individuals tend to prefer more governmental interventions than right-leaning individuals (Lusk, 2012).

Support of policy measures is also dependent on psychological predictors. For instance, healthy eating patterns were identified as a predictor of climate policy acceptance (Lemken et al., 2018), indicating that there are trade-offs and synergies between healthy and sustainable diets (Kopainsky et al., 2020). Similarly, it was found that a majority of meat reducers does so for health reasons rather than for environmental reasons (Apostolidis & McLeay, 2019).

Another important driver of policy support is policy design. Studies in Sweden (Bendz et al., 2023), Germany, and the United States (Fesenfeld et al., 2020) found that consumers do not unilaterally support or oppose policies for more sustainable food consumption. However, policy support can be critically improved through policy design (Bendz et al., 2023). Furthermore, the framing of a policy measure can help improve acceptance. For instance, it has been shown that framing a meat tax as being used to increase animal welfare is more accepted than framing it in terms of climate change mitigation (Perino & Schwickert, 2023).

1.2. Policy measures to drive change in consumer behaviour

Given that policy support depends on the policy measure, a closer look on the measures available is needed. Recent studies (Ammann, Arbenz, et al., 2023; Reisch et al., 2017) described four categories of policy measures: (1) information-based, (2) nudges and behavioural, (3) market-based, and (4) regulatory measures. These measures differ in their levels of intrusiveness (Ammann, Arbenz, et al., 2023). In essence, we define intrusiveness according to the 'Nuffield intervention ladder', where intrusiveness is considered relative to individual freedom and responsibility (Nuffield Council on Bioethics, 2007). For instance, information (information-based measures) can be willingly used or ignored by consumers, which makes them barely intrusive. A ban (regulatory measure), however, inevitably removes some consumption choices for all consumers and is therefore very intrusive. This categorisation is important, as there is a tendency for more intrusive measures to be more effective (Diepeveen et al., 2013).

Information-based measures can be labels, education, campaigns, or similar tools. They can inform consumers or raise awareness rather than change immediate behaviour. A prominent example is sustainability labels, which have received a lot of attention in the scientific literature (e.g. Apostolidis & McLeay, 2019; Grunert et al., 2014; Van Loo et al., 2014). A recent review suggests that sustainability labels have a positive effect on both psychological and behavioural outcome variables (Majer et al., 2022). For instance, a traffic light carbon label was found to be successful in promoting lower-emission meat products among consumers (Edenbrandt & Lagerkvist, 2021).

Nudges are instruments that shift consumers' behaviour towards desired behaviours or choices without limiting their freedom of choice (Thaler & Sunstein, 2008). They follow the idea of libertarian paternalism, which means that they follow the goal of influencing individuals (paternalistic), but at the same time allow individuals to opt out (libertarian) (Thaler & Sunstein, 2003). Possible nudging strategies include priming (Wilson et al., 2016), defaults (Zhang et al., 2024) or social norms (Salmivaara & Lankoski, 2019). Using these strategies, nudges

unconsciously influence consumers and are therefore slightly more intrusive than information-based measures. Using randomised controlled trials, a recent study found that changing the default meal option from meat to plant-based was effective in promoting the choice of the plant-based meal among consumers (Zhang et al., 2024). In terms of acceptance, another study tested three nudges aiming to increase the choice of a plant-based meal in a restaurant and found that all three nudges did not impact participants' intention to return to restaurants using these nudges (Weijers et al., 2024).

Market-based instruments impact prices through taxes or subsidies for specific products. Their purpose is to financially dissuade or encourage consumers to buy certain products. Thus, market-based instruments are more intrusive than nudges, as these price incentives affect all consumers who aim to buy a certain product. Previous studies have found that carbon taxes reduce the carbon footprint of the basket (Panzone et al., 2021) and that consumption taxes are a low-cost means of promoting sustainable consumption (Edjabou & Smed, 2013).

Finally, regulatory instruments can be bans or limits placed on certain products. They are the most intrusive because they define the product offer available to consumers (Spiller et al., 2017). They also tend to be the least accepted because they restrict personal and economic freedom. Panzone et al. (2011) found that bans and removals have been driving over 60 % of product changes.

1.3. Aims of the present study

Building on the existing literature, the present study adds two important contributions. First, previous research reviewed four types of consumer-targeted policy instruments and their potential to improve the sustainability of food systems (Ammann, Arbenz, et al., 2023). The current study complements these results by investigating consumer support of these policy instruments, as this is an important facilitator of policy implementation. Specifically, a first aim was to examine consumer support of different policy measures, covering different instrument types and three product categories (meat, dairy and vegetables). We hypothesised that consumers express higher support for less intrusive policies and that support depends on the product category, with meat-targeting policies receiving lower support. Similar studies have been conducted on health-related measures or specific sustainability categories (Hagmann et al., 2018; Richter et al., 2023). Our study, however, investigated a broader range of measures and food categories.

Second, we investigated potential drivers that influence consumer support for policy interventions for sustainable food choices, complementing previous studies that looked into health-related policy interventions (Hagmann et al., 2018). These drivers included participants' sociodemographic variables (e.g. age, sex), behaviour (e.g. meat and dairy consumption), knowledge (i.e. regarding sustainable food consumption), health consciousness and environmental awareness. With that, our study aimed to provide further insights into how policy measures can be designed or framed to increase their potential in terms of policy support.

2. Methods

2.1. Participants

We collected data in February 2023 using an online questionnaire built using the online platform Unipark (Management Questback GmbH, Germany). Using a professional panel provider (LINK, Switzerland), we recruited 514 participants in German-speaking parts of Switzerland. Quotas were used for sex (50 % male and 50 % female) and age (18–35, 36–54, and 55–74 years). All participants with an incomplete questionnaire or whose response time was below half of the median response time of the sample (i.e. 328 s) were excluded from the analysis due to data quality concerns. The final sample consisted of 453 responses. The mean age was 48 years (standard deviation (SD) = 16), and 46.8 % of

the participants were men (see Table 1). Before starting the survey, the participants gave their written informed consent. The study was approved by the Ethics Committee of ETH Zurich (approval number: EK 2023-N-04).

2.2. Policy measures for sustainable food consumption

We investigated participants' support for 19 policy measures (Fig. 1). The measures were selected to cover a broad range of policy and product categories. For the policy categories, we used five types as described in more detail in the introduction. The measures were chosen to cover the five categories, however, there are certain overlaps as in some cases, provision of information could also be understood as a nudge. In terms of product categories, we chose meat and dairy as resource-intensive categories and vegetables to add a plant-based category. To test product-specific effects, we added a control category, in which the product was not specified (see Fig. 1).

In total, we developed 19 policy measures in accordance with previous studies (Hagmann et al., 2018; Lemken et al., 2018). We did not include a measure for the regulation and unspecific product combination, as we were unable to identify a realistically implementable example of this combination. The complete list of measures in German and their English translations can be found in the Appendix A.

2.3. Questionnaire

The survey consisted of seven parts (see Fig. 2). In the first part, the participants provided written informed consent. In the second part of the survey, we collected personal information, including age, sex and education. Further, we asked participants to place themselves on the political spectrum using an interactive slider scale from 0 (very left) to 100 (very right), as has been done in previous studies (Ammann, Mack, et al., 2023; Saleh et al., 2024). The participants made use of the entire range of the response scale ($M = 49.8$, $SD = 20.2$, range 0–100).

Next, the participants indicated how often they consumed meat and dairy products on a scale from 1 (never) to 6 (multiple times per day). On average, the participants reported higher consumption frequencies for dairy products than for meat (see Table 2).

In the third part of the survey, we measured the participants' knowledge regarding various aspects of sustainable food consumption based on the food sustainability knowledge questionnaire (FSKQ) developed and validated by Hartmann et al. (2021). The participants answered 16 questions and received one point for each question they correctly answered ($M = 8.6$, $SD = 3.7$). The questions dealt with various topics, such as sustainable production methods, environmental impact of different foods, or seasonality. Sample questions were "Which of the following foods is associated with the lowest climate impact (per 100 g of food)?" with the response options potato chips, bread roll, and salami stick and "Which beverage is more environmentally friendly?"

Table 1
Sample description (N = 453).

	Frequency	%
Sex		
Male	212	46.8
Female	241	53.2
Age	$M = 48$	$SD = 16$
Education		
No degree or in education	5	1.1
Compulsory school	18	4.0
Vocational apprenticeship/Vocational college/school high	200	44.2
Matura/vocational baccalaureate	48	10.6
Higher technical or vocational training	78	17.2
Technical school or college of education	43	9.5
University/ETH	61	13.5

with the response options coffee, black tea, or do not know. We placed these food-related sustainability knowledge questions at the beginning of the questionnaire, as the participants received information about the environmental impact of the consumption of certain products later on in the course of the questionnaire, which could potentially influence their knowledge of sustainable food consumption and lead to carryover effects.

In the fourth part of the survey, participants were informed that the food system accounts for a significant amount of greenhouse gas emissions and that different strategies exist to reduce diet-related greenhouse gas emissions. Next, they were asked to indicate for each of the policy measures for sustainable food consumption how much they would support them on a 7-point Likert scale ranging from 1 (I do not think it is good at all) to 7 (I think it is very good). The phrasing of the question was similar to previous research investigating government intervention for a healthier diet (Hagmann et al., 2018). The endpoints and the middle of the response scale were identified through verbal description. On average, participants were supportive on the 19 policy measures ($M = 4.1$, $SD = 1.2$).

Part five of the survey used the Health Consciousness Scale to measure participants' perceived importance of a healthy diet (Dohle et al., 2014). The scale contains four items, which are rated on a 7-point Likert scale ranging from 1 (do not agree at all) to 7 (totally agree). Sample items were "I think it is important to eat healthily" and "My health is dependent on how and what I eat." The scale's reliability was good (4 items, Cronbach's $\alpha = 0.75$, $M = 5.1$, $SD = 1.1$).

In part six of the survey, participants' environmental attitudes were assessed using the New Ecological Paradigm scale (NEP, Dunlap et al., 2000). The scale contains 15 items, which participants were asked to evaluate on a 5-point Likert scale ranging from 1 (do not agree at all) to 5 (totally agree). Sample items are: "Humans have the right to modify the natural environment to suit their needs" and "Human ingenuity will ensure that we do not make the Earth unliveable". The scale's reliability was good (15 items, Cronbach's $\alpha = 0.78$, $M = 3.6$, $SD = 0.5$).

Finally, in part seven of the survey, participants were given the opportunity to leave a comment if they wished to do so. After that, they were informed that they had reached the end of the study, thanked for their participation, and instructed to close the survey. Both the data obtained and the questionnaire used are openly available on Zenodo (Ammann, Arbenz, et al., 2024).

2.4. Statistical approach

For the environmental attitudes, all 15 items were summarised as an averaged value. A one-way analysis of variance (ANOVA) with repeated measures was used to investigate whether the policy instrument categories differed in the levels of public support. Next, we performed a PCA to identify the underlying components of the 19 policy support items. Factor analytical methods are routinely used in consumer studies (for instance Ammann et al., 2019; Pacheco et al., 2018) with the aim of reducing the number of variables into a smaller set of factors or components (i.e. explanatory constructs), which account for most of the variance in the original set (Field, 2009). The full results of the PCA can be found in the Appendix A. We found that the item with the lowest component loading was the only item addressing food waste as a sustainability challenge (item 8). As exclusion of this item would have led to an unbalanced design with only three measures in the not specified product category, we decided to exclude the whole category (items 4, 12 and 16) and focus here forth on the remaining 15 items in the meat, dairy and vegetable categories.

Pearson's correlation was used to investigate the relationships between the different variables. Finally, to estimate the effect of socio-demographic variables and psychological and consumption-related variables on individuals' policy support, we applied a linear regression model, which takes the following functional form:

Intrusiveness		Meat	Vegetables	Dairy	Not specified
	Information	Meat-free recipes at school	Label for supermarket vegetables	Information campaign	Information provision
	Nudge	First canteen menu is meat-free	Minimum of one seasonal menu at canteen	Clearly marked shelves for dairy alternatives	Smaller canteen portions, second helping possible
	Market (Subsidy)	Subsidy on meat alternatives	Subsidy on seasonal vegetables	Subsidy on dairy alternatives	Subsidy
	Market (Tax)	Meat tax	Tax on non-seasonal vegetables	Dairy tax	Tax
	Regulatory	2 meat-free days at canteens	No transport by plane	No advertising	-

Fig. 1. Overview of the 19 policy measures, their intrusiveness, and the policy and product categories used in the survey.

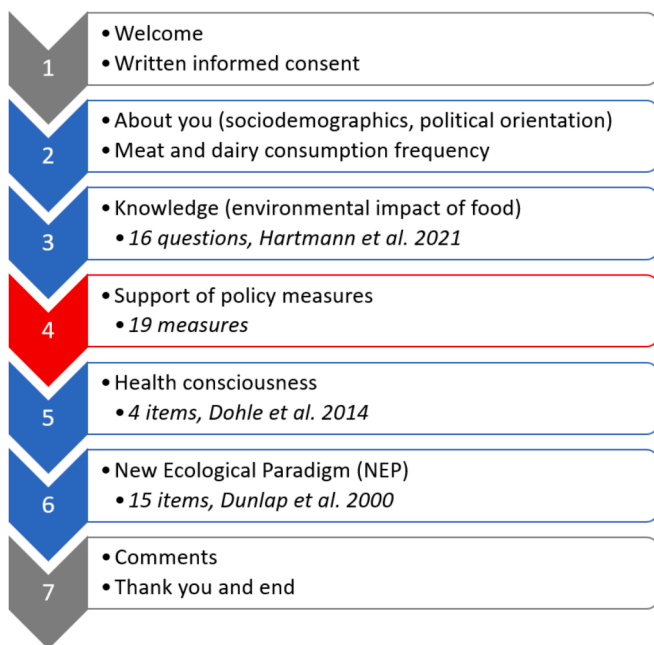


Fig. 2. Overview of the survey design.

$$Y_i = \beta_0 + \beta_1 \text{Sex} + \beta_2 \text{Age} + \beta_3 \text{Education} + \beta_4 \text{MeatCons} + \beta_5 \text{DairyCons} + \beta_6 \text{PoliticalOrient} + \beta_7 \text{HealthConsc} + \beta_8 \text{EnviroAttitude} + \beta_9 \text{FSKQ} + \epsilon_i$$

where Y_i denotes the dependent variable, that is, individuals' policy support. β_0 depicts the intercept. β_1 captures the effect of participants' sex. The variable *sex* represents a binary variable, indicating whether participants were female (value = 1) or male (value = 0). β_2 captures the effect of participants' age and β_3 captures the effect of the variable *Education*, which takes a continuous form where increasing values indicate higher education levels. In terms of behaviour, β_4 captures the effect of the variable *MeatCons*, whereas β_5 captures the effect of the variable *DairyCons*. Both variables take a continuous form, where increasing values indicate more frequent meat or dairy consumption. The effect of

Table 2

Consumption frequency of meat and dairy products (N = 453).

	Frequency	Percentage
Meat consumption		
Several times a day	9	2.0
Daily	64	14.1
4 to 6 times per week	131	28.9
1 to 3 times a week	169	37.3
Rarely	50	11.0
Never	30	6.6
Dairy consumption		
Several times a day	28	6.2
Daily	190	41.9
4 to 6 times per week	105	23.2
1 to 3 times a week	93	20.5
Rarely	29	6.4
Never	8	1.8

participants' political orientation is captured by β_6 , their health consciousness by 7, environmental attitude by β_8 and food sustainability knowledge by β_9 . The error term is represented by ϵ_i .

We report both the unstandardised and the standardised coefficients. The benefit of the standardised values is that they are not dependent on the units of measurement of the variables (Field, 2009). They indicate the number of standard deviations that the outcome will change as the result of a one standard deviation change in the predictor (Field, 2009).

We controlled for multicollinearity by scanning the correlation matrix to make sure that none of the independent variables correlate very highly (correlations above 0.80) and by checking the variance inflation factor (no values above 2) (Field, 2009). All statistical analyses were performed using the SPSS Statistics software package version 26 (SPSS Inc., Chicago, IL). There were no cases of missing data, as the participants were required to answer all questions in order to proceed with the online survey.

3. Results

3.1. Support of policy measures for sustainable food consumption

On average, participants were supportive of the 15 product-specific

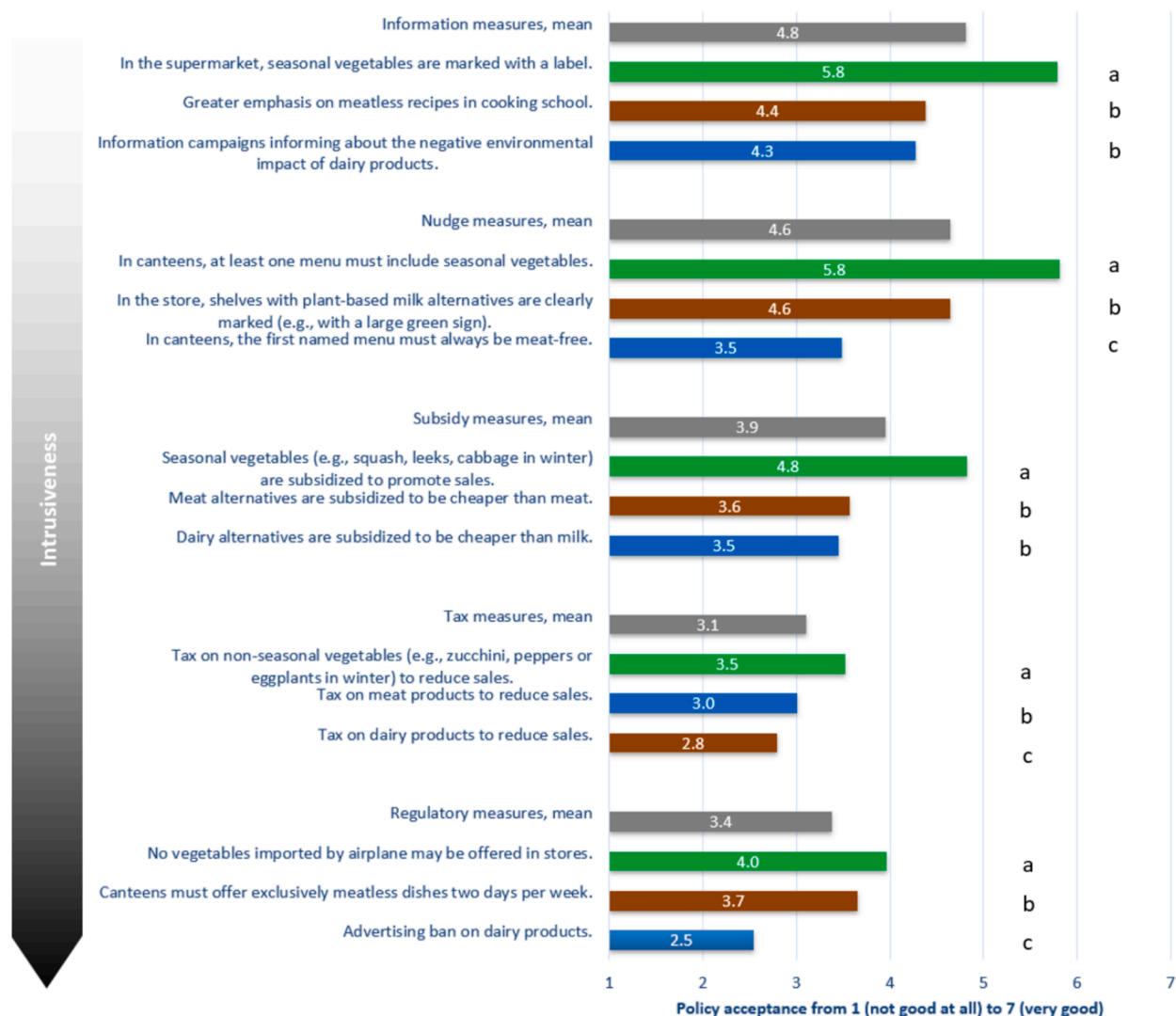


Fig. 3. Support for the 15 policy measures sorted by policy category, intrusiveness and support (N = 453). Targeted food categories are indicated with colouring of the bars (vegetables = green, meat = red, dairy = blue). Mean values per policy category are indicated with grey bars. Different letters (a, b, c) indicate significant differences (p < 0.05) between the support of policy measures within a certain category based on the results of a repeated measures ANOVA.

policy measures (M = 4.0, SD = 1.2). Fig. 3 shows the mean support for all 15 policy measures and the mean support for each policy category. A repeated measures ANOVA (with a Greenhouse-Geisser correction because sphericity was not given) showed that support levels differed significantly between the five instrument categories, $F(3.52, 1590.55) = 288.06, p < 0.001$. Post hoc analysis with Bonferroni adjustment revealed that support statistically significant decreased with increasing intrusiveness with the exception of taxes, which were the least supported (see Fig. 3).

Looking at differences within policy categories, repeated measures ANOVAs (with a Greenhouse-Geisser correction because sphericity was not given) showed that support levels differed significantly between the measures (see Fig. 3). Significant differences were found for information ($F(1.94, 876.70) = 180.17, p < 0.001$), nudges ($F(2, 904) = 180.17, p < 0.001$), taxes ($F(1.77, 798.03) = 40.92, p < 0.001$), subsidies ($F(1.72, 778.53) = 136.38, p < 0.001$) and bans ($F(1.94, 875.03) = 97.58, p < 0.001$). Post hoc analysis with Bonferroni adjustment revealed that policy support differed between most measures. It did not significantly differ for subsidies on meat and dairy (M = 3.6 and M = 3.5) and information on meat and dairy (M = 4.4 and M = 4.3).

To identify the underlying structure of the 15 items that measure the support of policies to increase sustainable food consumption, we ran a

PCA. The sampling adequacy for analysis (KMO = 0.91) was verified and the correlation of the structure was satisfactory following Bartlett's test for sphericity ($\chi^2 [105, N = 453] = 3134.6, p < 0.001$). Following visual inspection of the scree plot, a unidimensional solution was retained. Table 3 shows the factor loadings after rotation. The 15 items explained 42.5 % of the variance, with an average support of 4.0 and a standard deviation of 1.2. The reliability for policy support was good (Cronbach's alpha = 0.90, 15 items). Thus, results indicate that the 15 items measure the same construct of policy support and are therefore considered as average value across the 15 items for all subsequent analyses.

3.2. Predictors for the support of policy measures for sustainable food consumption

Looking at the relationships between policy support and individual characteristics of participants, we found that females tended to be more accepting of the policy measures than males ($r = 0.13, p < 0.01$) and left-leaning individuals were more accepting of the policy measures than right-leaning participants ($r = -0.19, p < 0.001$; see Table 4). It is interesting to note that sex is significantly correlated to all policy categories except for tax measures.

Further, health consciousness and environmental attitudes are

Table 3

The 15 items used to measure support of policy measures for sustainable consumption, including component loadings, mean values, and standard deviations (N = 453).

#	Item	Component loading	Mean	SD
1	Greater emphasis on meatless recipes in cooking school.	0.77	4.4	1.9
14	Dairy alternatives are subsidised to be cheaper than milk.	0.77	3.5	2.1
9	Tax on meat products to reduce sales.	0.77	3.0	2.0
13	Meat alternatives are subsidised to be cheaper than meat.	0.75	3.6	2.1
17	Canteens must offer exclusively meatless dishes two days per week.	0.75	3.7	2.1
5	In canteens, the first named dish must always be meat-free.	0.74	3.5	1.9
10	Tax on dairy products to reduce sales.	0.72	2.8	1.8
2	Information campaigns informing about the negative environmental impact of dairy products.	0.71	4.3	1.8
6	In the store, shelves with plant-based milk alternatives are clearly marked (e.g. with a large green sign).	0.65	4.6	1.8
18	Advertising ban on dairy products.	0.63	2.5	1.8
11	Tax on non-seasonal vegetables (e.g. zucchini, peppers or eggplants in winter) to reduce sales.	0.58	3.5	1.9
15	Seasonal vegetables (e.g. squash, leeks, cabbage in winter) are subsidised to promote sales.	0.57	4.8	1.8
19	No vegetables imported by airplane may be offered in stores.	0.44	4.0	1.9
3	In the supermarket, seasonal vegetables are marked with a label.	0.36	5.8	1.5
7	In canteens, at least one dish on the menu must include seasonal vegetables.	0.34	5.8	1.5

significantly positively correlated ($r = 0.13, p < 0.01$). In terms of behavioural characteristics, we found that with increasing consumption frequency for meat, the participants showed lower support of the policy measures ($r = -0.22, p < 0.001$). For knowledge, we found that with increasing knowledge regarding sustainable food consumption, as measured with the FSKQ, participants were more supportive of the policy measures ($r = 0.35, p < 0.001$). Lastly, participants' policy support increased with both increasing health consciousness and environmental attitudes as measured with the New Ecological Paradigm scale ($r = 0.36$ and $r = 0.30, p < 0.001$).

3.3. Predicting the support of food policy instruments

Next, we conducted a linear regression analysis to predict the participants' policy support from sociodemographic, behavioural, and psychological variables (see Table 5). The model was significant and predicted 42 % of the variance ($F(9, 453) = 35.86, p < 0.001, R^2 = 0.42$). In terms of behaviour, we found that meat and dairy consumption were significant, negative predictors of policy support, indicating that individuals with higher frequency of meat and dairy consumption tended to be less supportive of sustainable food policies ($\beta = -0.18$ and $\beta = -0.16, p < 0.001$). In terms of individual characteristics, we found that health consciousness and the NEP were significant positive predictors of policy support ($\beta = 0.28$ and $\beta = 0.36, p < 0.001$).

Finally, we conducted a linear regression analysis to predict the participants' policy support for the five different policy categories from sociodemographic, behavioural, and psychological variables (see Table 6). All models were statistically significant and predicted between 23 and 39 % of the variance. In terms of behaviour, we found that meat consumption was a significant, negative predictor of policy support for taxes, indicating that individuals with higher frequency of meat consumption tended to be less supportive of tax measures for meat ($\beta =$

Table 4

Pearson's correlation coefficients for sociodemographic, behavioural, knowledge, and psychological variables and policy support (N = 453).

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Sex	1														
2 Age	-0.08	1													
3 Education	-0.03	0.04	1												
4 PoliticalOrient	-0.19***	0.08	-0.10*	1											
5 MeatCons	-0.22***	-0.03	-0.04	0.12**	1										
6 DairyCons	0.07	0.17***	0.04	-0.02	0.27***	1									
7 HealthConsc	0.02	0.00	0.07	-0.09	-0.14**	-0.14**	1								
8 EnviroAttitude	0.09	0.08	-0.01	-0.19***	-0.15**	0.03	0.13**	1							
9 FSKQ	-0.02	-0.03	0.13**	-0.14**	-0.16**	0.00	0.16**	0.28***	1						
10 Information	0.11*	-0.14**	0.07	-0.30***	-0.25***	-0.16***	0.35***	0.37***	0.40***	1					
11 Nudge	0.15**	-0.09*	0.03	-0.29***	-0.27***	-0.14***	0.37***	0.32***	0.37***	0.73***	1				
12 Subsidy	0.14**	-0.31***	-0.01	-0.32***	-0.27***	-0.21***	0.24***	0.21***	0.28***	0.63***	0.60***	1			
13 Tax	0.06	-0.17***	-0.01	-0.24***	-0.30***	-0.21***	0.25***	0.14***	0.22***	0.50***	0.52***	0.59***	1		
14 Regulatory	0.10*	-0.13**	-0.08	-0.27***	-0.26***	-0.23***	0.31***	0.24***	0.20***	0.58***	0.60***	0.60***	0.65***	1	
15 Policy support	0.13**	-0.21***	0.00	-0.34***	-0.33***	-0.23***	0.36***	0.30***	0.35***	0.82***	0.82***	0.84***	0.81***	0.83***	1

Note: sex = 0 (male), 1 (female); PoliticalOrient: Political orientation = 0 (very left), 100 (very right); MeatCons/DairyCons: Meat and dairy consumption frequency; 1 (never) to 6 (several times a day); FSKQ: food-related environmental knowledge questionnaire (Hartmann et al., 2021) with a higher score indicating more knowledge; HealthConsc: Health consciousness scale from Dohle et al. (2014) containing 4 items on a 7-point Likert scale ranging from 1 (do not agree at all) to 7 (totally agree); EnviroAttitude: Environmental attitudes: NEP scale from Dunlap et al. (2000) 15 items on a 5-point Likert scale, with a higher score indicating more environmental world views, Policy support: average support for the 15 policy measures on a scale from 1 (I do not think it is good at all) to 7 (I think it is very good).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5
Linear regression predicting policy support from sociodemographic, behaviour, knowledge, and psychological variables (N = 453).

	Policy support		
	Unstandardised coefficients		Standardised coefficient
	B	SE	
Constant	3.419***	0.48	
Sex	0.08	0.09	0.03
Age	-0.01***	0.00	-0.17
Education	-0.05	0.03	-0.06
MeatCons	-0.18***	0.04	-0.17
DairyCons	-0.16***	0.04	-0.15
PoliticalOrient	-0.01***	0.00	-0.23
HealthConsc	0.28***	0.04	0.25
EnviroAttitude	0.36***	0.09	0.16
FSKQ	0.07***	0.01	0.21
R ²	0.42		
F (9, 443)	35.86***		

Note: Sex = 0 (male), 1 (female); PoliticalOrient: political orientation = 0 (very left), 100 (very right); MeatCons/DairyCons: Meat and dairy consumption frequency: 1 (never) to 6 (several times a day); FSKQ: food-related environmental knowledge questionnaire (Hartmann et al., 2021) with higher scores indicating more knowledge; HealthConsc: Health consciousness scale from Dohle et al. (2014) containing 4 items on a 7-point Likert scale ranging from 1 (do not agree at all) to 7 (totally agree); EnviroAttitude: Environmental attitudes: NEP scale from Dunlap et al. (2000) 15 items on a 5-point Likert scale, with higher scores indicating more environmental world views. Dependent variable: policy support as average support for the 15 policy measures on a scale from 1 (I do not think it is good at all) to 7 (I think it is very good).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

-0.31, $p < 0.001$). In terms of individual characteristics, we found that health consciousness and environmental attitudes (as assessed through the NEP) were significant positive predictors of policy support for all categories except taxes. Environmental attitudes were particularly strong predictors of support for information measures ($\beta = 0.61$, $p < 0.001$).

4. Discussion and policy implications

The aim of the present study was to investigate consumer support of policy measures for sustainable consumption and its predictors. Furthermore, we compared how different policy measures and food

Table 6
Linear regression with the unstandardised coefficients B and SE and the standardised coefficient β predicting policy support of the policy measure categories from sociodemographic, behaviour, knowledge, and psychological variables (N = 453).

	Information			Nudge			Subsidy			Tax			Regulatory		
	B	SE	β	B	SE	β	B	SE	β	B	SE	β	B	SE	β
Constant	2.24***	0.55		2.47***	0.54		4.77***	0.71		4.43***	0.75		3.14***	0.65	
Sex	0.10	0.11	0.04	0.20*	0.10	0.08	0.13	0.14	0.04	-0.10	0.14	-0.03	0.06	0.13	0.02
Age	-0.01**	0.00	-0.12	-0.01	0.00	-0.06	-0.03***	0.00	-0.27	-0.01**	0.00	-0.14	-0.01*	0.00	-0.09
Education	0.01	0.03	0.01	-0.03	0.03	-0.03	-0.05	0.04	-0.05	-0.06	0.04	-0.06	-0.11**	0.04	-0.12
MeatCons	-0.10*	0.05	-0.09	-0.12*	0.05	-0.11	-0.21***	0.06	-0.14	-0.31***	0.07	-0.22	-0.16**	0.06	-0.12
DairyCons	-0.13**	0.05	-0.11	-0.11*	0.05	-0.10	-0.18**	0.06	-0.12	-0.16*	0.06	-0.11	-0.22***	0.06	-0.17
PoliticalOrient	-0.01***	0.00	-0.17	-0.01***	0.00	-0.17	-0.02***	0.00	-0.22	-0.01***	0.00	-0.18	-0.01***	0.00	-0.20
HealthConsc	0.28***	0.05	0.23	0.31***	0.04	0.27	0.23***	0.06	0.16	0.26***	0.06	0.18	0.30***	0.05	0.23
EnviroAttitude	0.61***	0.10	0.23	0.43***	0.10	0.17	0.32*	0.13	0.10	0.09	0.14	0.03	0.37**	0.12	0.13
FSKQ	0.09***	0.01	0.26	0.08***	0.01	0.24	0.08***	0.02	0.18	0.06**	0.02	0.13	0.04*	0.02	0.10
R ²	0.39			0.35			0.33			0.23			0.27		
F (9, 453)	F(9, 443) = 30.87***			F(9, 443) = 26.79***			F(9, 443) = 24.09***			F(9, 443) = 14.51***			F(9, 443) = 17.90***		

Note: Sex = 0 (male), 1 (female); PoliticalOrient: political orientation = 0 (very left), 100 (very right); MeatCons/DairyCons: Meat and dairy consumption frequency: 1 (never) to 6 (several times a day); FSKQ: food-related environmental knowledge questionnaire (Hartmann et al., 2021) with higher scores indicating more knowledge; HealthConsc: Health consciousness scale from Dohle et al. (2014) containing 4 items on a 7-point Likert scale ranging from 1 (do not agree at all) to 7 (totally agree); EnviroAttitude: Environmental attitudes: NEP scale from Dunlap et al. (2000) 15 items on a 5-point Likert scale, with higher scores indicating more environmental world views. Dependent variable: policy support as average support for the 15 policy measures on a scale from 1 (I do not think it is good at all) to 7 (I think it is very good).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

categories vary in terms of consumer support. Overall, we found that less intrusive policy measures (i.e. nudges and information) and measures focusing on vegetables were better accepted than more intrusive measures (i.e. taxes or regulations) and measures addressing meat or dairy products.

Adding to the policy measure categories used by previous studies (Ammann, Arbenz, et al., 2023), our study considered the two market-based instruments of taxes and subsidies separately. We found that taxes were the least accepted. Subsidies, however, were more accepted than regulatory measures and taxes. Increasing the appeal of taxes is a challenging endeavour. Results from Norway indicated that acceptance of a tax on red meat remained low, even after participants were informed about its benefits (Grimsrud et al., 2019). Still, the framing of taxes matters. Consumers in Germany were found to prefer a tax aimed at improving animal welfare to one aimed at mitigating climate change (Perino & Schwickert, 2023). As argued elsewhere (Ammann, Mack, et al., 2024), it seems unlikely that food choices are made solely on the basis of environmental sustainability. Scholars have shown that emphasising the urgency of the climate crisis can boost support for low-cost policies but has a limited effect on high-cost policies (Fesenfeld & Rinscheid, 2021). As a consequence, more arguments or benefits need to be provided to consumers.

An original contribution of the present study lies in the exploration of individual predictors of policy support. We identified individual behaviour, that is, meat and dairy consumption as significant negative predictor of policy support. Similar results were reported for participants who weighed animal welfare as agricultural policy goal. Individuals with higher meat commitment and meat consumption tended towards preferring the conflicting goal over animal welfare (Ammann, Mack, et al., 2023). Similarly, other research found that certain risk groups were more strongly opposed to policies aiming to reduce sugar consumption (Hagmann et al., 2018) and higher levels of support for policies targeting children than those targeting adults (Mazzocchi et al., 2015). We hypothesise that participants own involvement plays a role in these assessments, which is similar to the concept of intrusiveness. When participants' involvement is higher or the policy more intrusive, their individual freedom is affected more severely, which in turn leads to lower support of the policy.

We further found that personal attitudes, that is, health consciousness and environmental attitude were significant positive predictors of policy support. Our findings align with Lemken et al. (2018), who identified healthy eating patterns as a predictor of climate policy

acceptance. Similarly, several studies observed that dietary changes (e.g. reduction of meat and dairy consumption) could be beneficial for an individual's health but also for reaching environmental goals (Tilman & Clark, 2014; Tukker et al., 2011; Westhoek et al., 2014). For policy-makers, this is a key realisation, as it seems possible that policy measures can simultaneously address two issues (i.e. sustainability and health).

Another important contribution of this study is the inclusion of different product categories. Animal products and vegetables are distinctly different both in terms of environmental footprint (Poore & Nemecek, 2018) but also in terms of how they are addressed through policy measures. Most of the measures focussing on meat and dairy aim to restrict consumption, with possible exemptions for the more sustainable options (Siegerink et al., 2024). The climatic and topographic conditions that prevail in Switzerland impose significant limitations on the types of agricultural activities that can be undertaken. In fact, approximately two-thirds of the country's land area is only suitable for grassland (Mack & Kohler, 2018). This has had a significant impact on the country's culinary heritage, with dairy products and meat forming an integral part of the diet (Krieger et al., 2018). In particular, approximately one-third of the protein consumed in Switzerland is derived from plant sources, while two-thirds are derived from animal sources (Kopf-Bolanž & Walther, 2021). In the case of vegetables, however, there is both the strategy of promoting more sustainable products (e.g. seasonal products or vegetables) and the strategy of restricting the consumption of less sustainable products (e.g. transport by plane). Still, even measures restricting less sustainable products do not completely exclude vegetables as such from the market. As individual freedom is an important factor for policy support (Bendz et al., 2023; Ejelöv & Nilsson, 2020), this is a crucial difference between the product categories.

For those who seek to implement strategies to change consumer behaviour towards more sustainability, we recommend to find a balance between coercion and support of a policy measure. Our results show that participants prefer the government promoting sustainable choices (information, nudges, subsidies) over discouraging unsustainable choices (regulation, taxes). The first come with little coercion, informing participants and keeping the choice structure, which makes them appear overwhelmingly acceptable (Espinosa & Nassar, 2021; Mazzocchi et al., 2015). However, governments prefer the latter, as they are easier to monitor (e.g. bans), produce revenues (e.g. taxes) and tend to be less costly than huge information campaigns for which the actual impact is almost impossible to measure (Espinosa & Nassar, 2021). Policy makers must find a balance and choose an appropriate level of coercion, at the same time maximising impact of the policy and ensuring sufficient public support (Espinosa & Nassar, 2021). In line with this, it has been recommended that well-designed instrument mixes might be the most effective approach to achieve change towards food sustainability (European Commission, 2020).

Our study is not without limitations. The fact that we are studying the Swiss context, during a specific point in time and using a German questionnaire only limits generalisability of our study. Further, despite controlling for age and sex using quotas, education levels of our sample were lower than the Swiss average (Bundesamt für Statistik (BFS), 2023). Further, our study included a heterogeneous set of policy measures, aiming to cover a wide range of aspects and five different policy

categories. We tried to make sure to highlight the sustainability aspect in the phrasing of the question, however, sustainability is a complex construct that comes with various trade-offs. As for the example of meat consumption, various motivations exist to reduce it (Marcus et al., 2022). It remains an interesting question for future studies to determine the participants' motivations for the individual measures. Another limitation to mention is the fact that our study measured the general attitudes of consumers, which might differ from actual behaviour. Finally, as suggested elsewhere (Shukla et al., 2023), most policy problems are both economic and behavioural and therefore require hybrid interventions. Therefore, future studies should look into hybrid policy tools and how they can improve their acceptance and effectiveness.

5. Conclusion

In the present study, we found that consumers are more likely to support less intrusive policy measures for sustainable food consumption (i.e. nudges or information) than more intrusive measures (i.e. taxes or regulations). Moreover, they prefer policy measures that promote the sustainable choice (e.g. nudge or information) compared to measures restricting the unsustainable choice (e.g. tax), which at the same time reduce personal freedom. In similar vein, measures targeting meat and dairy tended to be less supported which could be due to the fact that most in most cases, they aim to reduce personal freedom. In contrast, the promotion of sustainable (e.g. seasonal) options and the restriction of unsustainable (e.g. transported by plane) options are both strategies that can be employed with regard to vegetables. As suggested elsewhere (Siegrist et al., 2024), more focus should be put on the most promising interventions. Our results indicate that well-designed instrument mixes might be the most effective approach to achieve change towards food sustainability (European Commission, 2020).

CRedit authorship contribution statement

Jeanine Ammann: Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Andreia Arbenz:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Gabriele Mack:** Writing – review & editing, Resources. **Michael Siegrist:** Writing – review & editing, Resources, Project administration, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors thank Dr. Christian Ritzel for his support with statistical notation. This research did not receive any specific grant from funding agencies in the public, commercial, or non-profit sectors.

Appendix A

Table 7

List of all 19 policy measures tested in the study (German original), their item number, mean support, food category targeted, and their English translation (N = 453).

Policy measure	Product Group	#	M	SD	German original	English translation
Information	Meat	1 ^a	4.4	1.9	Stärkeres Gewicht auf fleischlose Rezepte in der Kochschule.	Greater emphasis on meatless recipes in cooking school.
	Dairy	2 ^b	4.3	1.8	Informationskampagnen, die über die negativen Umweltauswirkungen von Milchprodukten informieren.	Information campaigns informing about the negative environmental impact of dairy products.
	Vegetable	3 ^b	5.8	1.5	Im Supermarkt werden saisonale Gemüse mit einem Label markiert.	In the supermarket, seasonal vegetables are marked with a label.
	Non-Specific	4 ^b	4.9	1.7	Am Verkaufspunkt muss zu allen Lebensmitteln Information zu ihrem Umwelteinfluss (z.B. mit einem Label) gegeben werden.	At the point of sale, information on the environmental impact of all food products must be provided (e.g. with a label).
Nudge	Meat	5 ^c	3.5	1.9	In Kantinen muss das erstgenannte Menü immer fleischlos sein.	In canteens, the first named dish must always be meat-free.
	Dairy	6 ^d	4.6	1.8	Im Laden werden Regale mit pflanzlichen Milchalternativen klar markiert (z.B. mit einem grossen grünen Schild).	In the store, shelves with plant-based milk alternatives are clearly marked (e.g. with a large green sign).
	Vegetable	7 ^d	5.8	1.5	In Kantinen muss mindestens ein Menü saisonale Gemüse beinhalten	In canteens, at least one dish on the menu must include seasonal vegetables.
	Non-Specific	8 ^d	5.1	1.8	In Kantinen werden kleinere Portionen ausgegeben mit der Möglichkeit eines Nachschlags.	In canteens, smaller portions are served with the possibility of a second helping.
Tax	Meat	9 ^d	3.0	2.0	Steuer auf Fleischprodukte, um den Absatz zu reduzieren.	Tax on meat products to reduce sales
	Dairy	10 ^d	2.8	1.8	Steuer auf Milchprodukte, um den Absatz zu reduzieren.	Tax on dairy products to reduce sales
	Vegetable	11 ^a	3.5	1.9	Steuer auf nicht saisonale Gemüse (z.B. Zucchini, Peperoni oder Auberginen im Winter), um den Absatz zu reduzieren.	Tax on non-seasonal vegetables (e.g. zucchini, peppers or eggplants in winter) to reduce sales
	non-Specific	12 ^a	3.7	2.0	Steuern auf umweltschädliche Lebensmittel.	Tax on foods that are harmful to the environment
Subvention	Meat	13 ^a	3.6	2.1	Fleischalternativen werden subventioniert, damit sie günstiger als Fleisch sind.	Meat alternatives are subsidized to be cheaper than meat.
	Dairy	14 ^a	3.5	2.1	Milchalternativen werden subventioniert, damit sie günstiger als Milch sind.	Dairy alternatives are subsidized to be cheaper than milk.
	Vegetable	15 ^a	4.8	1.8	Saisonales Gemüse (z.B. Kürbis, Lauch, Kabis im Winter) wird subventioniert, um den Absatz zu fördern.	Seasonal vegetables (e.g. squash, leeks, cabbage in winter) are subsidized to promote sales.
	Non-specific	16 ^a	4.5	1.9	Subventionen auf umweltfreundliche Lebensmittel	Subsidies on environmentally friendly food
Regulation	Meat	17 ^d	3.7	2.1	Kantinen müssen an zwei Tagen pro Woche ausschliesslich fleischlose Gerichte anbieten.	Canteens must offer exclusively meatless dishes two days per week.
	Dairy	18 ^b	2.5	1.8	Werbeverbot für Milchprodukte.	Advertising ban on dairy products
	Vegetable	19 ^d	4.0	1.9	Im Laden dürfen keine Gemüse angeboten werden, welche per Flugzeug importiert wurden.	No vegetables imported by airplane may be offered in stores.

Note: Support was measured on a scale from 1 (I do not think it is good at all) to 7 (I think it is very good). Items were based on: ^a authors, ^b (Hagmann et al., 2018), ^c(Brunner, 2022), ^d (Lemken et al., 2018).

Table 8

The 19 items used to measure support of policy measures for sustainable consumption, including component loadings, mean values, and standard deviations (N = 453).

#	Item	Component loading	Mean	SD
1	Greater emphasis on meatless recipes in cooking school.	0.77	4.4	1.9
9	Tax on meat products to reduce sales.	0.76	3.0	2.0
14	Dairy alternatives are subsidised to be cheaper than milk.	0.74	3.5	2.1
17	Canteens must offer exclusively meatless dishes two days per week.	0.74	3.7	2.1
13	Meat alternatives are subsidised to be cheaper than meat.	0.73	3.6	2.1
5	In canteens, the first named menu must always be meat-free.	0.72	3.5	1.9
12	Tax on foods that are harmful to the environment.	0.70	3.7	2.0
2	Information campaigns informing about the negative environmental impact of dairy products.	0.70	4.3	1.8
10	Tax on dairy products to reduce sales.	0.69	2.8	1.8
16	Subsidies on environmentally friendly food	0.67	4.5	1.9
6	In the store, shelves with plant-based milk alternatives are clearly marked (e.g. with a large green sign).	0.64	4.6	1.8
4	At the point of sale, information on the environmental impact of all food products must be provided (e.g. with a label).	0.62	4.9	1.7
15	Seasonal vegetables (e.g. squash, leeks, cabbage in winter) are subsidised to promote sales.	0.60	4.8	1.8
18	Advertising ban on dairy products.	0.60	2.5	1.8
11	Tax on non-seasonal vegetables (e.g. zucchini, peppers or eggplants in winter) to reduce sales.	0.59	3.5	1.9
19	No vegetables imported by airplane may be offered in stores.	0.46	4.0	1.9
3	In the supermarket, seasonal vegetables are marked with a label.	0.39	5.8	1.5
7	In canteens, at least one menu must include seasonal vegetables.	0.36	5.8	1.5
8	In canteens, smaller portions are served with the possibility of a second helping.	0.34	5.1	1.8

References

- Ammann, J., Arbenz, A., Mack, G., Nemecek, T., El Benni, N., 2023a. A review on policy instruments for sustainable food consumption. *Sustain. Prod. Consumpt.* <https://doi.org/10.1016/j.spc.2023.01.012>.
- Ammann, J., Arbenz, A., Meierhofer, C., Siegrist, M., Mack, G., 2024. Dataset on consumer acceptance of policy measures for sustainable food consumption Zenodo. Doi: 10.5281/zenodo.13373845.
- Ammann, J., Mack, G., El Benni, N., Jin, S., Newell-Price, P., Tindale, S., Hunter, E., Vicario-Modroño, V., Gallardo-Cobos, R., Sánchez-Zamora, P., Miškolci, S., Frewer, L.J., 2024b. Consumers across five European countries prioritise animal welfare above environmental sustainability when buying meat and dairy products. *Food Qual. Prefer.* 117. <https://doi.org/10.1016/j.foodqual.2024.105179>.
- Ammann, J., Mack, G., Irek, J., Finger, R., El Benni, N., 2023b. Consumers' meat commitment and the importance of animal welfare as agricultural policy goal. *Appetite* 112 (105010). <https://doi.org/10.1016/j.foodqual.2023.105010>.
- Ammann, J., Siegrist, M., Hartmann, C., 2019. The influence of disgust sensitivity on self-reported food hygiene behaviour. *Food Control* 102, 131–138. <https://doi.org/10.1016/j.foodcont.2019.03.023>.
- Anderson, B., Böhmelt, T., Ward, H., 2017. Public opinion and environmental policy output: a cross-national analysis of energy policies in Europe. *Environ. Res. Lett.* 12. <https://doi.org/10.1088/1748-9326/aa8f80>.
- Apostolidis, C., McLeay, F., 2019. To meat or not to meat? Comparing empowered meat consumers' and anti-consumers' preferences for sustainability labels. *Food Qual. Prefer.* 77, 109–122. <https://doi.org/10.1016/j.foodqual.2019.04.008>.
- Aschemann-Witzel, J., Bech-Larsen, T., Capacci, S., 2016. Do target groups appreciate being targeted? An exploration of healthy eating policy acceptance. *J. Consum. Pol.* 39 (3), 285–306. <https://doi.org/10.1007/s10603-016-9327-7>.
- Bendz, A., Bäckstedt, F., Harring, N., Martin Persson, U., 2023. Why do people accept or reject climate policies targeting food consumption? Unpacking justifications in the public debate in online social forums. *Food Pol.* 121. <https://doi.org/10.1016/j.foodpol.2023.102544>.
- Brunner, R. (2022). Weniger Fleisch essen? Das geht auch ohne Zwang. *Beobachter*, 27–29. https://occrdata.unibe.ch/press_coverage/pdf/Beobachter_23_12_22.pdf.
- Bundesamt für Statistik (BFS). (2023). *Bildungsstand [education levels]*. <https://www.bfs.admin.ch/bfs/de/home/statistiken/querschnittsthemen/wohlfahrtsmessung/alle-indikatoren/gesellschaft/bildungsstand.html>.
- Cadario, R., Chandon, P., 2019. Viewpoint: Effectiveness or consumer acceptance? Tradeoffs in selecting healthy eating nudges. *Food Policy* 85, 1–6. <https://doi.org/10.1016/j.foodpol.2019.04.002>.
- Diepeveen, S., Ling, T., Suhrcke, M., Roland, M., Marteau, T.M., 2013. Public acceptability of government intervention to change health-related behaviours: a systematic review and narrative synthesis. *BMC Public Health* 13 (756). <https://doi.org/10.1186/1471-2458-13-756>.
- Dohle, S., Hartmann, C., Keller, C., 2014. Physical activity as a moderator of the association between emotional eating and BMI: evidence from the Swiss Food Panel. *Psychol Health* 29 (9), 1062–1080. <https://doi.org/10.1080/08870446.2014.909042>.
- Dunlap, R.E., Van Liere, K.D., Mertig, A.G., Jones, R.E., 2000. New trends in measuring environmental attitudes: measuring endorsement of the new ecological paradigm: a revised NEP scale. *J. Soc. Issues* 56 (3), 425–442. <https://doi.org/10.1111/0022-4537.00176>.
- Edenbrandt, A.K., Lagerkvist, C.-J., 2021. Is food labelling effective in reducing climate impact by encouraging the substitution of protein sources? *Food Policy* 101. <https://doi.org/10.1016/j.foodpol.2021.102097>.
- Edjabou, L.D., Smed, S., 2013. The effect of using consumption taxes on foods to promote climate friendly diets – The case of Denmark. *Food Policy* 39, 84–96. <https://doi.org/10.1016/j.foodpol.2012.12.004>.
- Ejelöv, E., Nilsson, A., 2020. Individual factors influencing acceptability for environmental policies: a review and research Agenda. *Sustainability* 12 (6). <https://doi.org/10.3390/su12062404>.
- Espinosa, R., Nassar, A., 2021. The acceptability of food policies. *Nutrients* 13 (5). <https://doi.org/10.3390/nu13051483>.
- Commission, E., 2020. Towards a sustainable food system – moving from food as a commodity to food as more of a common good – independent expert report. Publications Office. <https://doi.org/10.2777/282386>.
- Fesenfeld, L.P., Rinscheid, A., 2021. Emphasizing urgency of climate change is insufficient to increase policy support. *One Earth* 4 (3), 411–424. <https://doi.org/10.1016/j.oneear.2021.02.010>.
- Fesenfeld, L.P., Wicki, M., Sun, Y., Bernauer, T., 2020. Policy packaging can make food system transformation feasible. *Nat. Food* 1 (3), 173–182. <https://doi.org/10.1038/s43016-020-0047-4>.
- Field, A. (2009). *Discovering statistics using SPSS (and sex and drugs and rock 'n' roll)* (3rd ed.). SAGE.
- Grimsrud, K.M., Lindhjem, H., Sem, I.V., Rosendahl, K.E., 2019. Public acceptance and willingness to pay cost-effective taxes on red meat and city traffic in Norway. *J. Environ. Econ. Policy* 9 (3), 251–268. <https://doi.org/10.1080/21606544.2019.1673213>.
- Grunert, K.G., Hieke, S., Wills, J., 2014. Sustainability labels on food products: consumer motivation, understanding and use. *Food Policy* 44, 177–189. <https://doi.org/10.1016/j.foodpol.2013.12.001>.
- Hagmann, D., Siegrist, M., Hartmann, C., 2018. Taxes, labels, or nudges? Public acceptance of various interventions designed to reduce sugar intake. *Food Policy* 79, 156–165. <https://doi.org/10.1016/j.foodpol.2018.06.008>.
- Hartmann, C., Lazzarini, G., Funk, A., Siegrist, M., 2021. Measuring consumers' knowledge of the environmental impact of foods. *Appetite* 167, 105622. <https://doi.org/10.1016/j.appet.2021.105622>.
- Jackson, P., Holm, L., 2024. Social and economic dimensions of food sustainability - a background paper for the Nordic Nutrition Recommendations. *Food Nutr Res* 68. <https://doi.org/10.29219/fnr.v68.10450>.
- Kopainsky, B., Frehner, A., Müller, A., 2020. Sustainable and healthy diets: synergies and trade-offs in Switzerland. *Syst. Res. Behav. Sci.* 37 (6), 908–927. <https://doi.org/10.1002/sres.2761>.
- Kopf-Bolanz, K.A., Walther, B., 2021. Proteinkonsum in der Schweiz - Auswertung des menuCH Datensatzes (Schweizer Ernährungsbulletin 2021, Issue. <https://www.blv.admin.ch/blv/de/home/lebensmittel-und-ernaehrung/ernaehrung/schweizer-ernaehrungsbulletin/schweizer-ernaehrungsbulletin-2021.html>.
- Krieger, J.P., Pestoni, G., Cabaset, S., Brombach, C., Sych, J., Schader, C., Faeh, D., Rohrmann, S., 2018. Dietary patterns and their sociodemographic and lifestyle determinants in Switzerland: results from the national nutrition survey menuCH. *Nutrients* 11 (1). <https://doi.org/10.3390/nu11010062>.
- Lenken, D., Kraus, K., Nitzko, S., & Spiller, A. (2018). Staatliche Eingriffe in die Lebensmittelwahl: Welche klimapolitischen Instrumente unterstützt die Bevölkerung? *GAIA - Ecological Perspectives for Science and Society*, 27(4), 363-372. Doi: 10.14512/gaia.27.4.8.
- Lusk, J.L., 2012. The political ideology of food. *Food Policy* 37 (5), 530–542. <https://doi.org/10.1016/j.foodpol.2012.05.002>.
- Mack, G., Kohler, A., 2018. Short- and long-run policy evaluation: support for grassland-based milk production in Switzerland. *J. Agric. Econ.* 70 (1), 215–240. <https://doi.org/10.1111/1477-9552.12284>.
- Majer, J.M., Henscher, H.A., Reuber, P., Fischer-Kreer, D., Fischer, D., 2022. The effects of visual sustainability labels on consumer perception and behavior: a systematic review of the empirical literature. *Sustainable Prod. Consumption* 33, 1–14. <https://doi.org/10.1016/j.spc.2022.06.012>.
- Marcus, N., Klink-Lehmann, J., Hartmann, M., 2022. Exploring factors determining German consumers' intention to eat meat alternatives. *Food Qual. Prefer.* 100. <https://doi.org/10.1016/j.foodqual.2022.104610>.
- Mazzocchi, M., Cagnone, S., Bech-Larsen, T., Niedzwiedzka, B., Saba, A., Shankar, B., Verbeke, W., Traill, W.B., 2015. What is the public appetite for healthy eating policies? Evidence from a cross-European survey. *Health Econ Policy Law* 10 (3), 267–292. <https://doi.org/10.1017/S1744133114000346>.
- Mondière, A., Corson, M.S., Auberger, J., Durant, D., Foray, S., Glinec, J.-F., Green, P., Novak, S., Signoret, F., van der Werf, H.M.G., 2024. Trade-offs between higher productivity and lower environmental impacts for biodiversity-friendly and conventional cattle-oriented systems. *Agr. Syst.* 213. <https://doi.org/10.1016/j.agsy.2023.103798>.
- Nuffield Council on Bioethics. (2007). Policy process and practice. In *Public health: ethical issues*. Nuffield Council on Bioethics. <https://www.nuffieldbioethics.org/publications/public-health>.
- Pacheco, M.H.S., Kuriya, S.P., Capobianco, C.S.C., Pimentel, T.C., Cruz, A.G., Esmerino, E.A., Freitas, M.Q., 2018. Exploration of gender differences in bottled mineral water consumption: A projective study of consumer's perception in Brazil. *J. Sens. Stud.* 33 (4). <https://doi.org/10.1111/joss.12434>.
- Panzone, L., Perino, G., Swanson, T., Leung, D., 2011. Testing for the best instrument to generate sustainable food consumption. *Int. J. Food Syst. Dynam.* 2 (3), 237–252. <https://doi.org/10.18461/ijfsd.v2i3.234>.
- Panzone, L., Ulph, A., Zizzo, D.J., Hilton, D., Clear, A., 2021. The impact of environmental recall and carbon taxation on the carbon footprint of supermarket shopping. *J. Environ. Econ. Manage.* 109. <https://doi.org/10.1016/j.jeem.2018.06.002>.
- Perino, G., Schwickert, H., 2023. Animal welfare is a stronger determinant of public support for meat taxation than climate mitigation in Germany. *Nat. Food* 4 (2), 160–169. <https://doi.org/10.1038/s43016-023-00696-y>.
- Poore, J., Nemecek, T., 2018. Reducing food's environmental impacts through producers and consumers. *Science* 360 (6392), 987–992. <https://doi.org/10.1126/science.aag0216>.
- Reisch, L., Eberle, U., Lorek, S., 2017. Sustainable food consumption: an overview of contemporary issues and policies. *Sustain. Sci., Pract. Policy* 9 (2), 7–25. <https://doi.org/10.1080/15487733.2013.11908111>.
- Richter, S., Muller, A., Stolz, M., Schneider, I., Schader, C., 2023. Acceptance of meat reduction policies in Switzerland. *iScience*, 26(3), 106129. Doi: 10.1016/j.isci.2023.106129.
- Saleh, R., El Benni, N., Masson, S., Ammann, J., 2024. Public acceptance and sustainability perceptions of food produced with chemical, digital and mechanical weed control measures. *Food Quality Preference*, 113. <https://doi.org/10.1016/j.foodqual.2023.105079>.
- Salmivaara, L., Lankoski, L., 2019. Promoting sustainable consumer behaviour through the activation of injunctive social norms: a field experiment in 19 workplace restaurants. *Organ. Environ.* 34 (3), 361–386. <https://doi.org/10.1177/1086026619831651>.
- Scarborough, P., Clark, M., Cobiaci, L., Papier, K., Knuppel, A., Lynch, J., Harrington, R., Key, T., Springmann, M., 2023. Vegans, vegetarians, fish-eaters and meat-eaters in the UK show discrepant environmental impacts. *Nat Food* 4 (7), 565–574. <https://doi.org/10.1038/s43016-023-00795-w>.
- Sharp, C.A., Bellis, M.A., Hughes, K., Ford, K., Di Lemma, L.C.G., 2020. Public acceptability of public health policy to improve population health: a population-based survey. *Health Expect* 23 (4), 802–812. <https://doi.org/10.1111/hex.13041>.
- Shukla, P., Messer, K.D., Ferraro, P.J., 2023. Applying behavioral science to agriculture, food, and agri-environmental policymaking [Article]. *Food Policy* 120, 102548. <https://doi.org/10.1016/j.foodpol.2023.102548>.

- Siegerink, V.E., Delnoij, J., Alpizar, F., 2024. Public preferences for meat tax attributes in The Netherlands: a discrete choice experiment. *Food Policy* 128. <https://doi.org/10.1016/j.foodpol.2024.102675>.
- Siegrist, M., Michel, F., Hartmann, C., 2024. The shift from meat to plant-based proteins: consumers and public policy. *Curr. Opin. Food Sci.* 58. <https://doi.org/10.1016/j.cofs.2024.101182>.
- Spiller, A., Zühlsdorf, A., Nitzko, S., 2017. Instrumente der Ernährungspolitik. Ein Forschungsüberblick - Teil 1. *Ernährungs. Umschau* 3. <https://doi.org/10.4455/eu.2017.012>.
- Thaler, R.H., Sunstein, C.R., 2003. Libertarian paternalism. *Am. Econ. Rev.* 93 (2), 175–179. <http://www.jstor.org/stable/3132220>.
- Thaler, R.H., Sunstein, C.R., 2008. *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press.
- Tilman, D., Clark, M., 2014. Global diets link environmental sustainability and human health. *Nature* 515 (7528), 518–522. <https://doi.org/10.1038/nature13959>.
- Tubiello, F.N., Karl, K., Flammini, A., Gütschow, J., Griffiths, O.-L., Conchedda, G., Pan, X., Qi, S.Y., Halldórudóttir Heiðarsdóttir, H., Wannner, N., Quadrelli, R., Rocha Souza, L., Benoit, P., Hayek, M., Sandalow, D., Mencos Contreras, E., Rosenzweig, C., Rosero Moncayo, J., Conforti, P., Torero, M., 2022. Pre- and post-production processes increasingly dominate greenhouse gas emissions from agri-food systems. *Earth Syst. Sci. Data* 14 (4), 1795–1809. <https://doi.org/10.5194/essd-14-1795-2022>.
- Tukker, A., Goldbohm, R.A., de Koning, A., Verheijden, M., Kleijn, R., Wolf, O., Pérez-Domínguez, I., Rueda-Cantucho, J.M., 2011. Environmental impacts of changes to healthier diets in Europe. *Ecol. Econ.* 70 (10), 1776–1788. <https://doi.org/10.1016/j.ecolecon.2011.05.001>.
- Van Loo, E.J., Caputo, V., Nayga, R.M., Verbeke, W., 2014. Consumers' valuation of sustainability labels on meat. *Food Policy* 49, 137–150. <https://doi.org/10.1016/j.foodpol.2014.07.002>.
- Weijers, R.J., Claessens, I.W.H., Gillebaart, M., de Ridder, D.T.D., 2024. Nudging towards sustainable dining: exploring menu nudges to promote vegetarian meal choices in restaurants. *Appetite* 198, 107376. <https://doi.org/10.1016/j.appet.2024.107376>.
- Westhoek, H., Lesschen, J.P., Rood, T., Wagner, S., De Marco, A., Murphy-Bokern, D., Leip, A., van Grinsven, H., Sutton, M.A., Oenema, O., 2014. Food choices, health and environment: effects of cutting Europe's meat and dairy intake. *Glob. Environ. Chang.* 26, 196–205. <https://doi.org/10.1016/j.gloenvcha.2014.02.004>.
- Wilson, A.L., Buckley, E., Buckley, J.D., Bogomolova, S., 2016. Nudging healthier food and beverage choices through salience and priming. Evidence from a systematic review. *Food Qual. Preference* 51, 47–64. <https://doi.org/10.1016/j.foodqual.2016.02.009>.
- Zhang, A.W., Wharton, C., Cloonan, S., Boronowsky, R., Magesh, V., Braverman, I., Marquez, A., Leidy, H., Wang, M.C., Cleveland, D.A., Jay, J., Stecher, C., 2024. Changing the default meal option at university events to reduce harmful environmental impacts: Six randomized controlled trials. *Appetite* 200, 107572. <https://doi.org/10.1016/j.appet.2024.107572>.