frontiers | Frontiers in Animal Science

TYPE Original Research
PUBLISHED 13 November 2024
DOI 10.3389/fanim.2024.1454843



OPEN ACCESS

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Purdue University, United States

*CORRESPONDENCE
Elisa Bayer
elisa.bayer@uni-goettingen.de

†These authors have contributed equally to this work and share first authorship

RECEIVED 25 June 2024
ACCEPTED 28 October 2024
PUBLISHED 13 November 2024

CITATION
Bayer E and Kühl S (2024) What lies ahead? Consumer expectations and wishes for organic animal farming: analyzing improvements to boost confidence in organic livestock farming.
*Front. Anim. Sci.* 5:1454843.
doi: 10.3389/fanim.2024.1454843



# What lies ahead? Consumer expectations and wishes for organic animal farming: analyzing improvements to boost confidence in organic livestock farming

Elisa Bayer[1*†] and Sarah Kühl[2†]

[1]Marketing for Food and Agricultural Products, University of Göttingen, Göttingen, Germany, [2]Agricultural Marketing, Department of Sustainable Agriculture and Energy Systems, University of Applied Sciences Weihenstephan-Triesdorf, Freising, Germany

**Introduction:** To meet the policy target of increasing the share of organic farming in the EU to 25% by 2030, it is also essential to increase consumer demand for organic products. For many consumers, animal welfare is one of the main reasons to buy organics. Trust is inherently important when purchasing organic food, as most of the standards on which organic farming relies, such as more space, cannot be verified by the consumer. Consumer trust in organic animal farming is therefore an important factor in the expansion of the market share of organic products. The aim of this study is to identify specific trust-building "changes" in organic livestock husbandry to strengthen consumer trust in the long term.

**Method:** A total of eight regulations or practices, e.g. early cow-calf separation or regulations on the use of antibiotics, were assessed in terms of consumer awareness. Further described changes to these practices or regulations were ranked regarding their potential to improve trust in organic animal husbandry.

**Results:** The results show that most of the regulations and practices mentioned were not known to consumers, confirming a low level of consumer knowledge about specific aspects of organic farming. All eight possible changes would increase consumer trust, at least somewhat.

**Discussion:** The ranking shows that, in particular, the practice of dam rearing and an even stronger limitation of flock sizes for poultry have the highest potential to increase consumer trust in organic animal husbandry and can therefore be recommended as important strategies to meet consumer demands in the future.

KEYWORDS

**consumer trust, organic animal husbandry, organic regulations, dam rearing, building trust, small flock sizes**

# 1 Introduction

In 2021, the European Commission initiated the "Action plan for organic production in the EU" under the umbrella of the Green Deal. The goal is to increase the share of organic agriculture in Europe to 25% by 2030 as one means to "transform the EU into a modern, resource-efficient and competitive economy" (European Commission, 2021). The share of organic farmland in the total utilized agricultural area differs widely between the European countries: Austria has the largest share with 26%, whereas the share is the lowest in small countries such as Iceland (0.3%). But also in larger countries such as Spain (10%), Germany (9%), and France (9%) the share of organic farmland is significantly lower than in Austria (Statista, 2023). Furthermore, in animal husbandry, the share of organic farms is even lower: While 8% of all German cattle farms are operated organically, the share for poultry is about 5% and for pigs 1% (Destatis, 2021). In order to achieve the goal of a significant increase in the share of organic food production, not only incentives on the production side are needed but consumer demand should also be boosted.

Various studies found that, in addition to motivation, knowledge, awareness, availability and product quality, trust in particular is decisive for the purchase of green or organic products (Thorsøe, 2015; Tonkin et al., 2015; Nuttavuthisit and Thøgersen, 2017; Ladwein and Sánchez Romero, 2021). Trust usually describes the willingness to make oneself vulnerable, as (detailed) knowledge is lacking (Besley and Tiffany, 2023). Thereby trust can be also seen as a multidimensional construct. In literature, trustworthiness is mostly defined by the three dimensions of competence, care and transparency regarding the trusted actor (De Jonge et al., 2008; Macready et al., 2020). Moreover, trust is important due to the high information asymmetry in the relationship of the food system and consumers. As consumers cannot verify most of the standards and regulations that organic farming relies on, such as higher animal welfare standards, they have to trust the organic system, and labels such as the organic one can serve as a source of trust (Pivato et al., 2008; Spiller and Cordts, 2010; Hamzaoui-Essoussi et al., 2017). A focal issue here is trust in the attributes that distinguish a product from others and thus motivate them to pay and justify a higher price (Padel and Foster, 2005). Therefore, a minimum level of knowledge about the label and its standards is also crucial to increase the purchase intention and willingness to pay a higher price for the product. According to Cornish et al. (2020), providing additional information about the benefits of a label significantly increases the intention to buy animal welfare products.

For organic animal products, it is known that animal welfare is one of the most important buying motives (e.g., Harper and Makatouni, 2002; Zander and Hamm, 2009; Lee and Yun, 2015; Von Meyer-Höfer et al., 2015). However, consumer knowledge about agricultural husbandry is quite low (Hall and Sandilands, 2007; Di Pasquale et al., 2014; Sonntag et al., 2018) and knowledge about organic standards is limited (Janssen and Hamm, 2012). That is why consumer expectations regarding organic husbandry are mostly not based on sound knowledge and can deviate from reality. For example, the majority of consumers do not expect the common procedure of early cow–calf separation to be practiced in organic farming (Kühl et al., 2023) or they falsely assume that there are specific regulations for the slaughtering of organic animals in place (Kühl et al., 2022).

Psychological phenomena such as the "halo-effect" can reinforce high expectations, as people tend to ascribe more positive attributes to things they like (Von Meyer-Höfer et al., 2015). When knowledge is lacking, and therefore decisions cannot be made on a rational basis, the belief that one's own expectations will be met is a crucial criterion (Zagata and Lostak, 2012).

According to Nocella et al. (2010), in the absence of knowledge, trust is based on consumer expectations. If these expectations are not met, it can cause lasting damage to the organic sector and can lead to a feeling of disappointment, which can also lead to a loss of trust (Möllering, 2008). Furthermore, Wu et al. (2021) found that higher levels of trust lead to higher trust that products comply with expected standards. Mistrust, on the other hand, is associated with lower expectations and reduces the purchase intention and willingness to pay for the labeled product (Nuttavuthisit and Thøgersen, 2017; Canova et al., 2020).

The findings thus demonstrate convincingly that trust is crucial for the long-term success of organic products. However, more recent studies show that there is a discrepancy between the assessment of organic production criteria in terms of importance and the confidence that these criteria are adhered to (Britwum et al., 2021). The authors conclude that trust is limited and that strategies need to be developed to increase trust, as they also showed that trust has a direct impact on the willingness to pay. Trust among German consumers in particular is comparatively lower than in other countries, such as Italy or Poland, and trust in organic meat is lower than in organic vegetables (Murphy et al., 2022). In addition, the organic label is facing increasing competition from other animal welfare labels or products produced on local or small farms (Berlin et al., 2009; Gerini et al., 2016). For example, studies show that consumers favor small-scale farming and that organic farming is associated with small-scale and local production (Berlin et al., 2009; Spooner et al., 2014; Busch et al., 2022). The study by Berlin et al. (2009) shows that consumers often see little difference in food from small, regional, and organic farms in terms of quality, freshness, and animal welfare. This increases the challenge of meeting consumer expectations in the future, as organic farming tends to adapt to industrialized structures (Berlin et al., 2009). Further, in 2019, the German food retail industry introduced a four-level husbandry label ("Haltungsformkennzeichnung") in which the premium level includes labels besides the organic label, which meet high animal husbandry standards (including 100% more space, outdoor access), but other criteria that must be met for the organic label are not required. The demand for organic products for reasons of animal welfare may be jeopardized by this concurrence, which is especially true for consumers who are more price sensitive (Gerini et al., 2016). Additionally, Kühl et al. (2023) have found that the main reason customers want to continue buying organic is that they still perceive organic as the best option in terms of animal welfare, even when confronted with a reality that does not match their expectations of organic farming. If this perception were to change as a result of the increasing availability of alternative animal welfare products, this could in the long-term lead to a decline in demand

and therefore market share, which would be contrary to the policy objectives. Therefore, the organic industry should not rest on the existing positive image and trust of consumers but actively develop strategies for future alignment to maintain its pioneering role in terms of high animal welfare and therewith generate new and retain existing customers. One possible strategy would be to address existing expectation gaps (e.g., flock sizes, animal health) and also push innovative approaches, such as dam rearing, to distinguish itself even more from conventional animal husbandry and emphasize the advantages (Hoischen-Taubner and Sundrum, 2012; Bayer et al., 2023a). However, less is known about consumers' expectations and wishes regarding the future alignment of organic animal husbandry and which changes might increase trust. Accordingly, this study addresses the question of how selected changes are perceived and would increase trust in organic animal husbandry. Analysis was done for low-, medium-, and high-frequency buyers of organic animal products. The results of this study can provide some guidance on which organic farming practices have the potential to improve the image and trust of organic farming from a consumer perspective. The generated insights are useful for the further development of organic farming and therefore of interest to actors in the organic sector such as associations, farmers and retailers.

# 2 Materials and methods

## 2.1 Ethics approval

The study was approved by the ethics commission at the university before data collection. Participants were informed about data use and provided written informed consent online. They were informed that they could end participation and withdraw consent at any time without any consequences by leaving the survey by closing their internet browser.

## 2.2 Survey design

In the first part of the quantitative online survey, sociodemographic questions and questions about food consumption behavior were asked. The second part surveyed general statements regarding the participants' perception of and trust in organic animal farming. The subsequent third part deals with the assessment of eight common practices and possible changes. The procedure is described in the following and the exact questions and scales can be found in Table 1. Firstly, participants were confronted with the eight current common practices in organic animal farming in a randomized order. It was asked whether participants were aware of these practices and how they assessed them. In the next step, possible improvements were presented, and it was gathered to what extent this improvement would influence participants' trust in and willingness to buy organic animal products. The change in trust was assessed by direct questioning. Although trust is a complex construct, direct measuring of trust was done in other studies (e.g. Siegrist, 2002; Sturgis and Smith, 2010; Curvelo et al., 2019). In our study it seems sufficient as the aim was not to analyses all dimensions of trust but the change in trust and survey all dimensions would have been too extensive for eight proposals. Afterwards, participants were asked, when answering the question, whether they had also considered that realization of the proposals would be accompanied by higher costs for the organic products, and their agreement with statements regarding the costs was recorded.

The selection of the practices was based on existing literature showing that those practices are criticized by society or are at least not perceived as fitting with organic animal production (Table 2). The possible improvements chosen for this study were developed in a workshop with experts working in the areas animal science, retail, and politics/organizations in the organic sector. The chosen practices included some in which organic animal farming already has specific regulations and some in which this is not the case. In a final step, participants were asked to rank the eight presented possible improvements in organic animal farming by what they think is most important to establish trust in organic animal farming.

It should be noted that the improvement scenarios are theoretical. They were chosen and developed based on literature and discussion with experts in the workshop. However, other aspects such as practicability, financial reasons, and management aspects were not considered here. The aim was to see, from the consumer's point of view, which of these practices have the potential to improve consumer trust in organic livestock farming.

## 2.3 Data collection and sample description

In order to answer the research questions, an online survey with German citizens was conducted in January 2023. The participants were recruited by an online panel provider. Quotas were set for gender, age, education, and income to generate an approximately representative sample for Germany concerning these aspects. The survey contained a quality check question to make sure that participants read all questions thoroughly. A total of 483 people failed this quality check and were directly excluded from the survey. Overall, 1,464 participants

TABLE 1 Structure of the questioning of the eight regulations/practices in organic animal husbandry.

| Questions | Scale |
|---|---|
| Did you know the regulations/ practice of XY in organic animal farming? | • yes, I knew<br>• no, I did not know |
| How you assess the regulations/ practice XY? | • very bad, rather bad, partly good/partly bad, rather good, very good |
| Introducing possible change/improvements | Texts (see Table 2) |
| Would this change affect your trust in organic animal husbandry? | My trust would….<br>• strongly reduce, slightly reduce, stay the same, slightly increase, strongly increase |
| Would this change affect your willingness to buy organic animal products? | My willingness to buy would…<br>• stay the same, increase very slightly, increase slightly, increase strongly, increase very strongly |

TABLE 2 Overview of practices to be assessed by consumers to build trust in organic livestock production.

| InfoText: Current EU regulations and common practices in organic animal farming | InfoText: Possible change for improvement | Reference for consumers' attitudes |
|---|---|---|
| Currently, there are no specific requirements in the legal regulations for organic animal husbandry regarding how organic animals are slaughtered. This means that for the slaughter of organic animals mostly the same specifications apply as for the slaughter of conventional animals. | Introduction of specifications, e.g., on the maximum waiting time on the transporter after arrival at the slaughterhouse or stricter specifications for the stunning of organic animals for slaughter. | Duval et al., 2020<br>Kühl et al., 2022<br>Bayer et al., 2023a |
| Currently, there are no specific requirements in the legal regulations for organic animal husbandry regarding how organic animals are transported. This means that organic animals may usually be transported for the same length of time (maximum of 8 hours) as conventional animals. | Reduce the maximum allowed transport time of organic animals to a maximum of 4 hours. | Wille et al., 2017<br>Duval et al., 2020<br>Bayer et al., 2023b |
| In dairy farming, cows must have calves regularly in order to give milk. In dairy production, it is normal to separate calves and mothers after birth in order to use the milk. This is also mostly the case in organic animal husbandry. | Introduction of cow-tied rearing, i.e., calves are allowed to stay with their mothers or a foster mother and also drink their milk. | Placzek et al., 2021<br>Kühl et al., 2023<br>Busch et al., 2017 |
| Antibiotics are an effective drug to treat diseases. The use of antibiotics is also permitted in organic animal husbandry for the targeted treatment of sick animals. | A complete ban on treating animals with antibiotics. This means that even if the animals are sick, antibiotics may no longer be used for treatment. | Lusk et al., 2006<br>Goddard et al., 2017<br>Busch et al., 2020 |
| In organic animal husbandry, smaller herd sizes are required compared to conventional animal husbandry. For laying hens, for example, a maximum of 3,000 animals per housing unit is allowed. In conventional poultry farming, there are no such upper limits. | Implementation of smaller herd sizes for laying hens, e.g., a maximum of 1,000 instead of 3,000 laying hens per housing unit. | Chang and Zepeda, 2005<br>Meas et al., 2014<br>Busch et al., 2022 |
| In organic animal husbandry, depending on the species, at least 30–60% of the feed must come from the farm or from the region. Imports of feed, i.e., the purchase of feed from abroad or overseas, especially to cover the need for concentrate and protein feed, are also common in organic livestock farming. | A ban on the import of feed from faraway countries, which would mean that only local feed could be used and that this would then also have to be increasingly grown in Germany.[1] | Wägeli and Hamm, 2016<br>Wägeli et al., 2016<br>Profeta and Hamm, 2019 |
| In conventional dairy farming, cows are used for milk production for an average of 3 years. The majority is slaughtered after use due to diseases. In organic livestock farming, dairy cows live about 1 year longer than conventional dairy cows and are therefore slaughtered later. | Implementation of an even longer duration of use on average (e.g., 5 years) of organic dairy cows. This means that dairy cows must be in better health and thus can be used longer. | Vanhonacker et al., 2010<br>Horn et al., 2012<br>Witkowska and Poniewaz, 2022 |
| Digital aids such as sensors that measure the feeding and movement behavior of the animals can detect diseases at an early stage and thus promote rapid treatment of the animals.[2] | Implementation of the use of digital sensors in organic livestock farming in order to detect and treat diseases as quickly as possible. | Pfeiffer et al., 2021<br>Groher et al., 2020<br>Wilmes et al., 2022 |

[1]Here it has to be noted that this proposal is not seen as a real option to be implemented in practice, as a complete ban of antibiotics in organic husbandry might also have a negative impact on animal health when sick animals cannot be treated with this kind of medicine. However, we wanted to see how consumers assess this aspect in terms of increased trust in organic farming, as it is known that some consumers have a very critical view on the use of antibiotics.
[2]This practice is not yet very widespread, but was included to assess the consumers' views on it for the future.

completed the survey. In addition, 99 participants were excluded from the sample due to speeding or straight-lining behavior (speeder: participants with a shorter response time than half of the median; straight-lining behavior: giving more than twice the same answer to all items in a statement battery). Further, vegans (n=20) were excluded as they are not the target group for animal-based products, resulting in a final sample of 1,365. The mean response time was 16 min 20 sec (median: 13 min 37 sec). Table 3 shows the sociodemographic description of the final sample (n=1,365).

## 2.4 Data analysis

It is known that there are differences between consumer groups with different levels of interest in organic products (Padel and Foster, 2005; Spiller, 2006; Van Loo et al., 2010; Verain et al., 2012) which differ in terms of sociodemographic aspects, buying behavior, and attitudes toward sustainability issues (Gerini et al., 2016). Therefore, as a first step, respondents were clustered based on the frequency of buying organic quality when purchasing meat, milk, and eggs. The question asked was *"In the last month, how often have you bought the following organic products?"* (answer options: never, seldom, sometimes, often, nearly always, I do not buy this product at all). We used hierarchical cluster analysis based on the variables of frequency of consumption of organic meat, milk, and eggs using the Ward method and squared Euclidean distance to identify the number of clusters. For this purpose, both the dendrogram and the agglomeration table (elbow criterion) were examined (Blashfield and Aldenderfer, 1978). Additionally, we checked the cluster number for its interpretability in terms of content. The resulting clusters were used to reveal differences in consumer groups regarding knowledge about as well as assessment of the different practices and improvements.

In order to reveal significant differences between clusters, chi-squared tests and standardized residuals were used for categorical variables (Everitt and Skrondal, 2003; Hazra and Gogtay, 2016) and ANOVA and *post-hoc* tests for metric variables (Kucuk et al., 2016). Furthermore, bivariate correlations were conducted. All analyses were executed using IBM SPSS Version 27.

TABLE 3 Socio-demographics of the sample, n=1,365.

| | Sample | German population |
|---|---|---|
| Age (Ø; [min, max]) | 48.0 [18,80] | 51.0 |
| 18–34 years | 25.5% | 23.9% |
| 35–49 years | 23.7% | 22.1% |
| 50–64 years | 32.3% | 27.5% |
| 65+ years | 18.5% | 26.3% |
| Male | 49.4% | 49.4% |
| Female | 50.3% | 50.7% |
| Diverse | 0.3% | |
| Low education[1] | 36.1% | 34.5% |
| Medium education | 29.2% | 31.9% |
| High education | 34.7% | 33.6% |
| Monthly net household income | | |
| <1,300 € | 19.3% | 18.3% |
| 1,300–2,599 € | 34.6% | 36.6% |
| 2,600–4,499 € | 29.0% | 28.7% |
| ≥4,500 € | 17.1% | 16.2% |
| Vegetarian | 5.5% | |
| High organic meat consumption (often/very often) | 25.9% | |
| Medium organic meat consumption (sometimes) | 33.1% | |
| Low organic meat consumption (never/seldom) | 41.0% | |
| High organic milk consumption (often/very often) | 36.7% | |
| Medium organic milk consumption (sometimes) | 30.2% | |
| Low organic milk consumption (never/seldom) | 33.1% | |

[1]Low education: No school leaving certificate or lower secondary education, medium education: secondary school, high education: A-levels

# 3 Results

## 3.1 Buying groups of organic animal products, trust, and information behavior

The group with the lowest purchasing frequency of organic animal products contains 29.8% of the respondents. The percentage of women (43.8%), people with high income (7%) and high education (18.4%) is the lowest in this group, whereas age (51.9 years) and the percentage of respondents with comparatively higher meat consumption are the highest (24.4%). The largest group is the one that comprises respondents with a medium purchasing frequency of organic quality when buying animal products (45.8%). Respondents in this "medium" group are between the other two, but the percentage of women (52.1%) and vegetarians is highest (6.8%). The group with the highest purchasing frequency of organic is the smallest (24.3%). Respondents who buy organic animal products more often are younger and have a higher income and education. Self-assessed knowledge about, trust in organic animal husbandry, as well as information frequency about husbandry conditions and openness to more problem-oriented communication increase with the frequency level of consumption of organic animal products (Table 4).

## 3.2 Knowledge and perception of status quo

Figure 1 shows that participants with a high organic product consumption stated that they were more aware of current practices in organic animal husbandry compared to respondents with a medium and low consumption. Also, there were clear knowledge deficits among consumers with a high organic product consumption: Only two practices were known by the majority of respondents, whereas the other practices were known by 21–49%. In the other groups, the percentage of respondents who were aware of the practices varied between 5% and 52%. Overall, respondents are mainly aware of the fact that the usage of antibiotics for sick animals is permitted in organic farming, followed by the practice of early cow–calf separation in organic dairy farming and that feed has to be partly produced on the farm but that imports are also permitted in organic farming.

There was also low knowledge regarding the possibility to use sensors for illness detection and the longer lifespan of organic dairy cows.

When looking at consumers' assessments of current practices, the early separation of cows and calves directly after birth, followed by the missing of specific regulations for the transportation and slaughtering of organic animals are seen most negatively by all buying groups (Figure 2). The possibility to use sensors for illness detection, the fact that organic cows are used longer for milk production, and that there are regulations regarding the maximum herd size of organic animals are perceived positively. There were mostly no significant differences between the buying groups, with the following exceptions: High-frequency organic buyers evaluate the current status quo of the permission to use antibiotics and the idea to use sensors significantly more positively ($p<0.05$) compared to the other groups.

## 3.3 Influence of changes on trust

After evaluating the respondents' assessment of current regulations and practices, possible changes were presented (Table 2) and participants were asked to indicate the extent to which it would change their trust in organic husbandry. The implementation of all queried proposals would increase consumer trust at least somewhat, with the exception of the ban on the use of antibiotics in the low consumption group (score 3.04) and also lowest scores within the other groups (3.29 and 3.30) compared to the other proposals. The highest increase in trust would come with the ban of early cow–calf separation and the least increase in trust was found for the complete ban of antibiotics in organic animal farming even for sick animals.

The differences between the buying groups are all significant ($p \leq 0.05$) with the exception of high- and medium-frequency buyers for prohibiting antibiotics (Figure 3). The largest increase in trust is seen among consumers with high organic purchase frequency, followed by medium and low organic livestock purchasing groups.

TABLE 4 Groups by consumption frequency of organic animal products, their socio-demographics, diet, and trust in organic husbandry.

| | Groups by purchasing frequency of organic animal products (meat, milk, eggs) | | | |
|---|---|---|---|---|
| Items | Low (n=402; 29.8%) | Medium (n=616; 45.8%) | High (n=328; 24.3%) | Total sample (n=1,348*) |
| Purchasing frequency of organic (mean, sd) | | | | |
| - Meat | 1.63 (0.68)[a] | 2.72 (0.69)[b] | 4.25 (0.56)[c] | 2.76 (1.17) |
| - Milk | 1.53 (0.54)[a] | 3.11 (0,78)[b] | 4.18 (0.79)[c] | 2.90 (1.22) |
| - Eggs | 1.75 (0.73)[a] | 3.75 (1.05)[b] | 4.68 (0.52)[c] | 3.38 (1.41) |
| Socio-demographics | | | | |
| - Gender (female %) | 43.8 | 52.1 | 50.9 | 49.3 |
| - Age (years) | 51.9[a] | 47.0[b] | 45.4[b] | 48.0 |
| - High income (>4,500 € %) | 7.0 | 17.0 | 29.6 | 17.1 |
| - High education | 18.4 | 38.2 | 47.6 | 34.6 |
| Diet (%) | | | | |
| - High meat consumption | 21.4 | 11.8 | 8.2 | 13.8 |
| - Low meat consumption | 22.6 | 40.0 | 49.7 | 37.2 |
| - Vegetarian | 3.0 | 6.8 | 5.5 | 5.3 |
| **Self-assessed knowledge about organic animal husbandry[1]** | 2.14 (0.86) | 2.63 (0.84) | 3.06 (0.86) | 2.59 (0.92) |
| Attitude index of organic husbandry[2] | 3.33 (0.84)[a] | 3.81 (0.69)[b] | 4.14 (0.69)[c] | 3.75 (0.80) |
| Trust in organic animal husbandry (mean, sd)[3] | 3.68 (1.43)[a] | 4.46 (1.20)[b] | 5.02 (1.07)[c] | 4.36 (1.34) |
| Information behavior | Low (29.8%) | Medium (45.8%) | High (24.3%) | Total sample (n=1,348) |
| When I buy animal products, I inform myself about how the animals are kept[4] | 2.45 (1.10)[a] | 3.14 (1.00)[b] | 3.78 (0.95)[c] | 3.09 (1.13) |
| Communication about possible solutions to problems strengthens my confidence in organic livestock production[4] | 2.71 (1.07)[a] | 3.31 (0.91)[b] | 3.79 (0.82)[c] | 3.25 (1.02) |

ANOVA: Bonferroni test. Different superscript letters (a, b, c) indicate differences between the clusters on a level of at least p≤.05. *17 respondents had missing values for consumption frequency of organic products and were excluded from the analysis.
[1]Scale: 1 very little – 5 very much, [2]Scale: 1 applies not at all – 5 fully applies (table of statements in the Appendix A.1), [3]Scale: 1 no trust – 7 full trust, [4]Scale: 1 totally disagree – 5 totally agree

A very similar picture emerges for the willingness to buy organic animal products if the proposals were implemented: Consumers are more willing to buy organic products for those proposals where trust increases most.

## 3.4 Ranking of possible changes

Figure 4 shows the percentage of respondents who ranked the eight improvement proposals from 1 (most important) to 8 (least important). The suggestion that calves should stay longer with their mothers is ranked most frequently as number 1 (25%). It is followed by the requirement of even smaller herd sizes (17%) and the complete prohibition of antibiotics even for sick animals (13%). The other suggestions are ranked quite similarly, suggesting no clear preference.

Interestingly, the complete ban on antibiotics is not only ranked as a relevant change in organic animal husbandry by a notable proportion of respondents (13%) on the first rank (and thus the third most frequent on the first rank) but is also ranked as least important (rank 8 by 28% and on rank 7 by 17%) by an even larger proportion of respondents. The other proposals with a relatively high share of bottom positions and thus a low relevance of change are the approaches to the use of sensors (21%) and the ban on the import of feed (18%).

There are no significant differences between the groups. For this reason, and for the sake of clarity, the ranking is shown for the entire sample.

## 3.5 Awareness of higher prices when implementing the proposals

As the proposed improvements would mostly be linked to higher production costs, we also asked the respondents if they were aware of this and how they saw the implementation of these proposals if products became more expensive. The vast majority (92.6%) stated that they were aware that the proposals presented were linked to higher costs, and 7.4% did not think about higher costs (scale: yes, that's what I thought; No, I haven't thought about that). Table 5 shows respondents' attitudes toward the improvements when linked to higher consumer prices, according to the groups and their purchase frequency of organic animal products.

The results in Table 5 show that consumers with an already high buying frequency of organic products were significantly more in favor for implementing the proposals despite rising costs and prices for consumers, followed by the medium and low consumption group. The agreement on statements concerning careful consideration when implementing the proposals and a currently

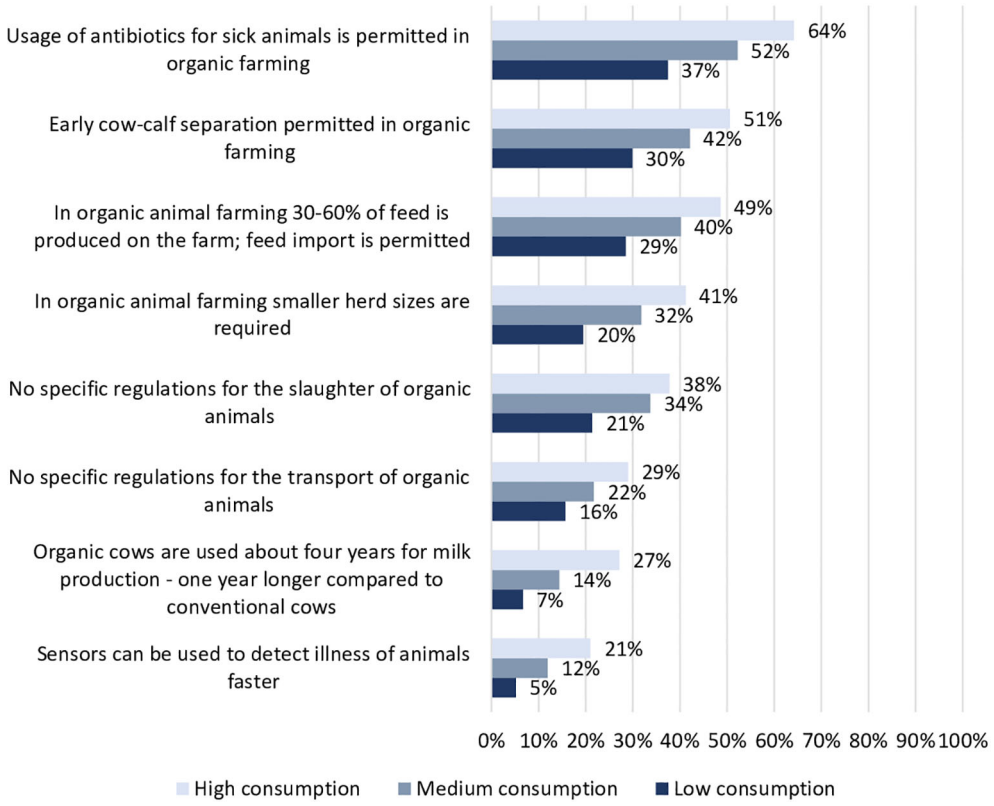


FIGURE 1
Awareness of current regulations and practices in organic animal husbandry according to consumption frequency groups of organic products; question: *Did you know that [x]?;* answer option: *Yes, I knew.*

low consumption frequency of organic products due to high price levels was significantly higher in the low and medium consumption groups. This is not surprising as seen in Table 3 where especially the high consumption group includes the most people with very high income. Whereas the proportion of people with very high income is the lowest in the low consumption group.

# 4 Discussion

## 4.1 Consumer groups and their knowledge, trust, and attitude toward organic husbandry

The cluster analysis revealed three consumer groups according to their consumption frequency of organic animal products. The biggest group shows a medium (45.8%) consumption frequency of organic animal products, and two smaller groups show the highest (24.3%) and lowest (29.8%) consumption rates. This distribution is in line with other findings of organic consumer analysis. There is mostly one group of intensive buyers, one larger group that buys organic products occasionally, and a more skeptical group of low-frequency or non-organic buyers (Padel and Foster, 2005; Spiller, 2006; Van Loo et al., 2010; Verain et al., 2012; Ökobarometer, 2021). Further, it is known from literature that knowledge about, trust in, and attitude toward organic products is positively correlated with the consumption level (Padel and Foster, 2005; Van Loo et al., 2010; Gerini et al., 2016; Lee et al., 2019). The high correlation between trust and willingness to buy is also seen in our study, as changes in trust are very similar to changes in willingness to buy organic products if the proposals were implemented. The fact that consumption frequency is linked to trust in organic products might be reasoned by the so-called choice-supportive bias, where people tend to support their choices by attributing more positive/negative attributes to the decision made (Kafaee et al., 2021). Britwum et al. (2021) support this assumption for organic buying behavior by showing that consumers who value attributes ascribed to organic production are also more confident that those will be applied.

Meanwhile, people who never or rarely buy organic products are characterized by a lower interest in sustainability issues but also a higher price sensitivity due to a lower income (Gerini et al., 2016). Our results further support findings showing that people with a generally high meat consumption show fewer positive attitudes toward animal welfare and therewith interest in organic products (Binngießer et al., 2015).

## 4.2 Knowledge and perception of status quo regulations

Indeed, knowledge about current regulations and practices in organic animal farming is quite low—even in the high-frequency

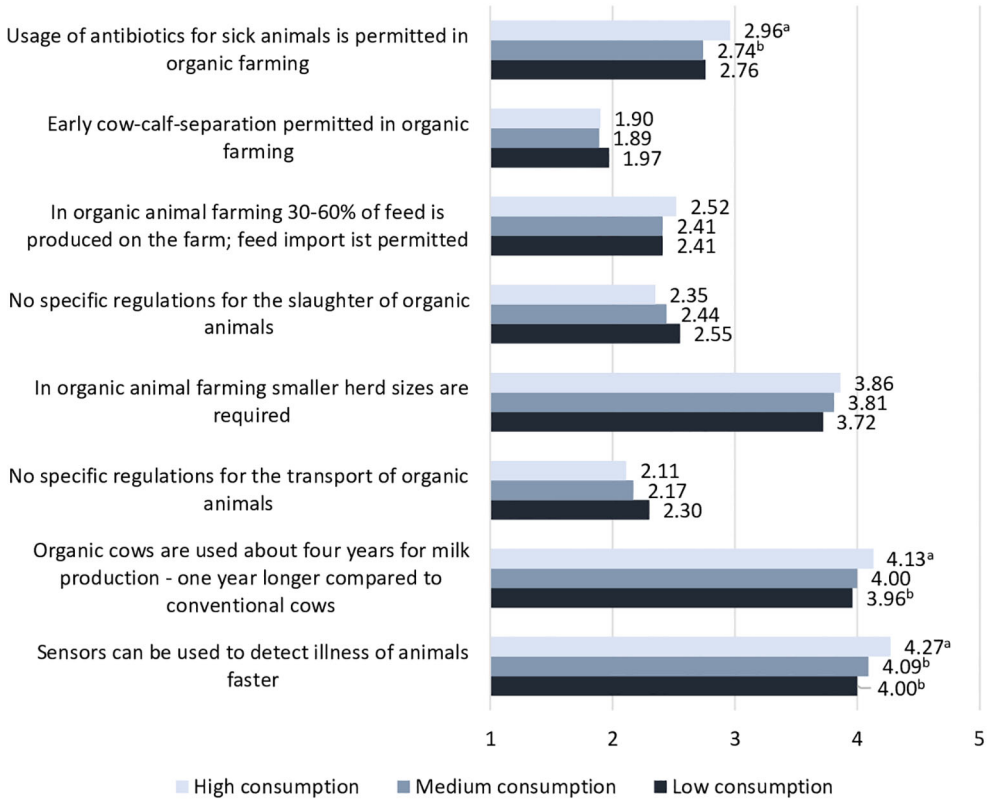


FIGURE 2
Assessment of current regulations and (mostly) common practices in organic animal husbandry according to consumption frequency groups of organic products; question: *What do you think of the current regulation/practice [x]?*; scale: *1 very bad – very good.* ANOVA: Bonferroni test. Different superscript letters (a, b) indicate differences between the clusters on a level of at least p≤.05. No letters symbolize no significant differences.

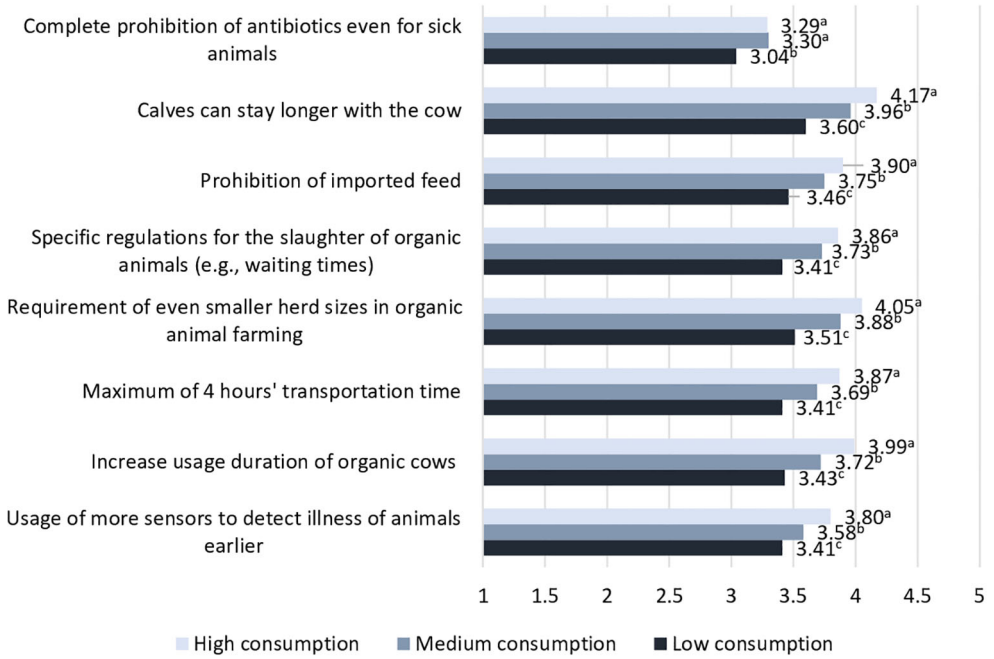


FIGURE 3
Changes in trust in organic husbandry when implementing the described changes in presented practices according to consumption frequency groups of organic products; question: *Would this change affect your trust in organic animal husbandry?*; Scale: *1 my trust would strongly decrease – 5 my trust would strongly increase.* ANOVA: Bonferroni test. Different superscript letters (a, b, c) indicate differences between the clusters on a level of at least p≤.05.

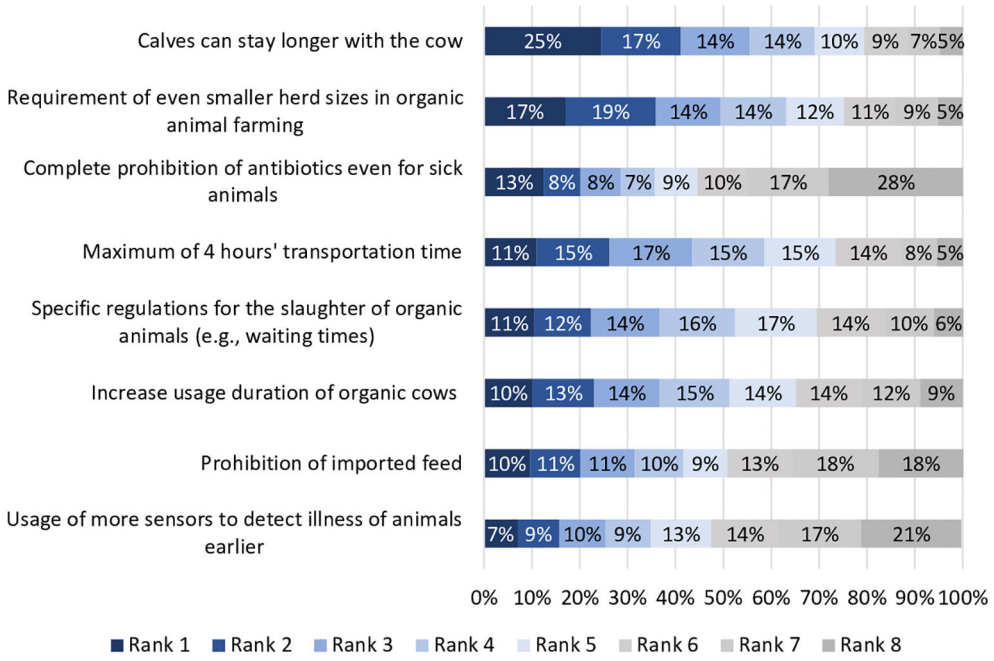


FIGURE 4
Ranking of the eight proposals for improvement from rank 1 to rank 8 in %; question: If you were allowed to decide which of the above options for future organic animal husbandry would be implemented, which would be particularly important to you and which less important? (1=most important, 8=least important).

buyer group that nevertheless is most aware. This is in line with findings from Janssen and Hamm (2012) who found that consumers often lack knowledge about the concrete organic labeling scheme and their "perceptions are mostly limited to a comparison between 'strict' and 'low' standards". However, there are considerable differences in the consumers' awareness and assessment of the practices and regulations questioned: The best-known practices are that organic animals are treated with antibiotics when they are sick, the practice of early cow–calf separation in organic dairy farming, and that at least part of the feed supplies has to be produced on the farm. The use of antibiotics as well as the early separation of cows and calves are both issues that are strongly criticized by consumers (e.g., Placzek et al., 2021; Busch et al., 2020). This may be one reason why awareness is highest here. However, while the early cow–calf separation is evaluated worst by respondents, there is no clear assessment of the usage of antibiotics for sick animals, which may be due to uncertainty about this topic (Goddard et al., 2017).

The fact that the percentage of 30–60% of feedstuff has to be produced on the farm is also quite well known, but the assessment of this regulation and the mentioned permission for feed imports is mainly negative, thus supporting the findings by Profeta and Hamm (2019) that local origin of feed is of importance for consumers.

It is surprising that most respondents were not aware that in organic farming smaller herd sizes are required, as Busch et al. (2022) found that consumers associate organic farms with smaller

TABLE 5 Attitudes toward the improvements when linked to higher prices according to the purchase frequency of organic animal products.

| | Groups by purchase frequency of organic animal products (meat, milk, eggs) | | | |
|---|---|---|---|---|
| Items | Low (n=402; 29.8%) | Medium (n=616; 45.8%) | High (n=328; 24.3%) | Total sample (n=1,348*) |
| Despite possible additional costs, I am still in favor of introducing most of the mentioned proposals in organic livestock farming | 3.45 (1.07) | 3.93 (0.87) | 4.30 (0.87) | 3.88 (0.98) |
| Due to the price increases, very careful consideration should be given to which proposals should be introduced | 3.63 (1.03) | 3.39 (1.01) | 3.10 (1.13) | 3.39 (1.06) |
| I am still in favor of introducing most of the proposals mentioned, but I would not buy the products at a higher price | 3.55 (1.03) | 3.01 (1.04) | 2.66 (1.72) | 3.09 (1.15) |
| I would like to buy more organic products in general, but they are already too expensive for me | 3.82 (1.18) | 3.49 (1.06) | 2.96 (1.27) | 3.46 (1.19) |

Scale: 1 applies not at all – 5 fully applies; all groups differed significantly on a level p<0.001.

farm and herd sizes. Our findings support the notion that smaller herd sizes are viewed very positively, but also suggest that people lack knowledge about existing regulations in organic animal farming, even if they are in line with their expectations.

The dominant expectation that there are specific regulations for the transport and slaughter of organic animals is in line with findings by Kühl et al. (2023). The assessment that such regulations do not yet exist is correspondingly negative. The two aspects that are known the least, the longer usage duration of dairy cows and the usage of sensors, are assessed very positively. The latter finding is in line with Krampe et al. (2021), who found in focus group discussions about precision livestock farming (e.g., use of sensors) that people have little knowledge about these new technologies but see advantages in increasing animal welfare (Krampe et al., 2021). Summing up, the results reveal that only a small proportion of consumers is aware of the existing positive aspects of organic livestock farming, whereas the more negatively evaluated ones are better known. This might be influenced by the fact that public discussions and media reports often focus on negative aspects (Busch et al., 2022).

## 4.3 Which practices are the most trust-building ones?

All tested proposals would increase trust in organic husbandry, except the prohibition of antibiotics with lowest agreement. For all other proposals, trust is increasing in all groups, but especially in the high-frequency buyer group, which already has the highest level of trust. Macready et al. (2020) found that people who had higher trust in organic farming are generally more "trusting people". Along with the aspect that organic buyers also have a stronger tendency to want to trust (Zagata and Lostak, 2012), it therefore seems reasonable that trust increases more with higher organic consumption.

When the interviewees were asked to decide which of the proposed measures should actually be implemented, the proposals of "calves stay longer with the cows", "requirement of even smaller herd sizes", and "complete prohibition of antibiotics even for sick animals" were the most important "improveBments", with the highest frequency on the first rank. However, the prohibition of antibiotics is also the most ambivalent "practice", as it is also ranked most often on the last rank. In the following, these three interventions are discussed in more detail.

The common practice of early cow–calf separation in dairy farming is rejected by a majority of consumers (Busch et al., 2017; Hötzel et al., 2017; Placzek et al., 2021). This practice is seen as unnatural and is associated with animal welfare and ethical concerns (Boogaard et al., 2011; Ventura et al., 2013; Busch et al., 2017; Hötzel et al., 2017). Further, studies in animal science show that this practice puts high stress on the animals (Haley, 2006; Von Keyserlingk and Weary, 2007) and that prolonged cow–calf contact goes along with health benefits and benefits the calves' social behavior (Flower and Weary, 2023). Also, organic dairy farms are mainly dependent on the practice of early cow–calf separation to gain milk for sale. Whereas organic farming regulations stipulate a prolonged weaning time for piglets, there are no such regulations for calves in dairy production (EU-Öko-VO, 2018). Nevertheless, a rising number of initiatives for dam/cow rearing programs has recently been seen in the organic sector, such as *"Zeit zu Zweit für Kuh + Kalb"* (time for two for cow + calf), *"Elternzeit für unsere Kühe"* (parenting time for our cows), or *"Bruderkalb"* (brother calf) (Ökolandbau.de, 2022). These are promising developments to improve welfare of cow and calf and meet consumer demands. These initiatives should be further promoted and expanded in the future, as this study underlines the trust-building capacity of this practice.

The second most frequently ranked proposal on the first rank is "the requirement for even smaller herd sizes in organic farming". This is not very surprising, as it is known that organic farming is associated with small-scale farming and local production (Berlin et al., 2009; Briggeman and Lusk, 2011) and that consumers expect smaller farm and stable sizes in organic livestock production (Busch et al., 2022). Further, Busch et al. (2022) conclude that consumers also use small farm sizes as an indicator of sustainability. According to the "small is beautiful hypothesis", small businesses are perceived more positively in society (Schumacher, 1973; Ebel, 2020), whereas research in animal science found that farm size is not seen as a good indicator for sustainability or animal welfare (Andersson and Lindborg, 2014; Robbins et al., 2016; Ebel, 2020), but some practices which are associated with increased animal welfare are linked to smaller farm sizes: For example, pasture access tends to decrease with increasing farm size (Von der Meulen et al., 2014; Robbins et al., 2016), and practices such as dam rearing are more likely on smaller and organic farms (Pempek et al., 2017; Hansen et al., 2023). The positive association of consumers with small farms and herd sizes should be used to promote the existing organic regulations on limited herd sizes, which are currently not well known to consumers. However, naming the actual allowed herd sizes, especially in poultry farming, might be problematic, as even these herd sizes are seen as too large by many consumers (Busch et al., 2022).

The most ambivalently assessed proposal is the complete ban of antibiotics even for sick animals in organic livestock farming (first rank: 13%; last rank: 28%). First, it has to be noted that this proposal is not seen as a real option to be implemented in practice, as a complete ban of antibiotics in organic husbandry might have also a negative impact on animal health when sick animals cannot be treated with this kind of medicine (Goddard et al., 2017; Callaway et al., 2021). However, we wanted to see how consumers assess this aspect in terms of increased trust in organic farming. The results show that some consumers may be aware that a complete ban of antibiotics might negatively impact animal welfare, while others are clearly in favor of a complete ban of antibiotics in organic animal farming. Studies show that consumers are concerned about a high application of antibiotics in animal farming (Lusk et al., 2006; Goddard et al., 2017; Busch et al., 2020). In particular, a risk for human health due to bacteria resistance is associated with the application of antibiotics in livestock farming, with Germans being much more critical than Italians, Canadians, and US citizens concerning this aspect (Goddard et al., 2017; Busch et al.,

2020). In fact, 53% of Germans and 42% of Canadians agree that *"antibiotics should never be used in livestock production, even in medical need, since it is critical to maintain useful antibiotics for public health use"*. In that same study, a willingness to pay for products produced with reduced antibiotics could also be detected (Goddard et al., 2017). Thus, literature shows high support for a far more restrictive use of antibiotics in livestock production from a consumer point of view. Here, organic regulations clearly meet most consumers' demands, as medicine application is far more restricted than in conventional animal production. For example, the number of treatments with antibiotics is limited to a maximum of three treatments per year and animal or group of animals. If this number of treatments is exceeded, products from the treated animals are no longer considered organic. Furthermore, twice the prescribed waiting time must be observed, but at least 48 hours (EU-Öko-VO, 2018). These requirements in the health management of organic livestock may not be known in detail by most consumers and could be communicated. Before doing so, however, it should be researched how this sensitive topic can be communicated.

### 4.4 High prices as buying barriers

High costs are a major constraint on the implementation of the proposed improvements, resulting in higher prices for consumers. This applies in particular to people who currently buy organic products at a low and medium frequency. At present, organic meat products have a very small market share, with the price known to be a main buying barrier (Bölw, 2020; Padel and Foster, 2005). In addition, the relatively high agreement on the willingness to pay even higher prices for organic products needs to be viewed with caution, as citizens tend to rate animal welfare and their own willingness to pay for these products higher in surveys than in their actual purchasing decisions. This is known as the "citizen–consumer gap" (Sechi et al., 2015; Thorslund et al., 2016; Enneking et al., 2019). Therefore, high levels of support, such as those found in this study, cannot be directly translated into actual purchasing behavior. It should also be noted that societal expectations are not always an appropriate basis for setting targets in agriculture. Many aspects cannot be fully assessed from a consumer perspective. For example, a complete ban on antibiotics in organic livestock production is seen as very positive by some respondents but can be more critical in terms of good animal health care (Goddard et al., 2017). There is also not always a correlation between farm size and animal welfare, although consumers clearly view smaller farms more positively (Robbins et al., 2016). The results of this study must therefore be seen in this context. Nevertheless, they provide detailed information on how consumers view possible changes or improvements in organic livestock production, which may be useful for communication and recommendations for the sector from a consumer perspective. Further, it indicates that at least the group with a low organic consumption frequency cannot be solely addressed with the implementation of further improvements, as price is already a main limiting factor for their organic consumption. However, it remains also open whether consumers will receive relevant information on changes in organic animal farming as only the group of consumers with a high consumption level of organic products shows an active information behavior. Without being aware of the supported changes it is questionable whether consumers´ willingness to buy will increase.

## 5 Conclusion, limitations and future research

The results of this study show that knowledge about most practices is rather low and that the implementation, or better knowledge about the existence, of stricter rules would increase trust in organic farming. This was true for all eight proposals, except the ban of antibiotics with a quite heterogenous assessment, to varying extents. In order to increase consumer trust in organic animal farming and to emphasize the importance of animal welfare in the long term, it would be advisable to support organic dairy farms in practicing dam or cow rearing and to (further) reduce herd sizes, as these practices were evaluated as the most important improvements. Moreover, already existing regulations or practices in organic animal farming, such as the strict regulations on the use of antibiotics, the already existing limits on herd sizes for animals, or the longer production period in dairy cows, can be used in communication materials to gain and build consumers' trust. These practices are already in line with consumer expectations and preferences and are viewed positively by consumers, although respondents would like to see further improvements in these areas. A first step should be to communicate the already existing regulations, as they are not yet very well known by a large percentage of consumers. In this way, organic farming can strengthen its generally positive image in society and help to increase the market share of organic animal products in the future by distinguishing itself from other animal welfare labels.

This study is subject to some limitations. First, the methodology of the within-subject design, with eight scenarios presented, could have influenced the results. A repetition of the study as a between-subject design might be useful. However, through the final ranking, a relational importance should be determined, which appears relevant for the classification of the results. Furthermore, the direct assessment of trust does not allow for a detailed assessment of the different dimensions of trust, so a more discrete measurement of the multidimensional construct of trustworthiness would have been required. However, this approach was considered the most appropriate and convenient to answer the research questions in this study.

Second, the scenarios and possible adjustments were described in texts that had been discussed with experts, but they still could have had an influence, especially regarding the wording and are quite hypothetical. Furthermore, some of the current regulations chosen for the study are "positive", such as the already existing limitation of herd size or the longer life span of dairy cows. Other regulations or practices are more "negative", such as the common

practice of early cow–calf separation or the lack of regulations for the transport and slaughter of organic animals. However, it is evident that the top three changes rated as most relevant differ with regard to this aspect. This therefore does not appear to have an influence on the evaluation in this study. Rather, concrete ideas of ideal organic animal husbandry or critical perceptions of existing practices on the part of citizens seem to characterize the evaluation. Third, the results only refer to German consumers. Nevertheless, we consider the value of our study's findings to be high, as it is the first to provide a comparative insight into the importance of different aspects for organic animal husbandry.

For future research, the evaluation of practices and proposals could be done by providing more detailed information to consumers. This would enable them to make more informed choices and also to be aware of possible trade-offs and side-effects in relation to other aspects such as animal welfare, the environment or human health that could be affected by the possible changes.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## Ethics statement

The studies involving humans were approved by Ethics Committee of the Georg-August-Universität Göttingen. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

## Author contributions

EB: Conceptualization, Data curation, Formal analysis, Methodology, Visualization, Writing – original draft, Writing – review & editing. SK: Conceptualization, Data curation, Formal analysis, Methodology, Visualization, Writing – original draft, Writing – review & editing.

## Funding

The author(s) declare financial support was received for the research, authorship, and/or publication of this article. We acknowledge support by the Open Access Publication Funds of the Göttingen University. We are grateful to the Federal Office for Agriculture and Food (BLE) and Federal Program for Organic Farming and Other Forms of Sustainable Agriculture (BÖLN) for financing this research (grant number: 2818OE097).

Gefördert durch



aufgrund eines Beschlusses
des Deutschen Bundestages

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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## Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fanim.2024.1454843/full#supplementary-material

## References

Andersson, E., and Lindborg, R. (2014). Species richness and assemblages in landscapes of different farming intensity–time to revise conservation strategies? *PLoS One* 9, e109816. doi: 10.1371/journal.pone.0109816

Bayer, E., Spiller, A., and Kühl., S. (2023a). Consumer expectations towards slaughtering: Are there different expectations towards the slaughter of conventional and organic animals? *J. Agric. Food Res.* 14, 100695. doi: 10.1016/j.jafr.2023.100695

Bayer, E., von Meyer-Höfer, M., and Kühl, S. (2023b). Hotspot analysis for organic laying hen husbandry—identification of sustainability problems as potential risk points to lose consumers' trust. *Organic Agric.* 13, 261–292. doi: 10.1007/s13165-023-00426-5

Berlin, L., Lockeretz, W., and Bell, R. (2009). Purchasing foods produced on organic, small and local farms: A mixed method analysis of New England consumers. *Renewable Agric. Food Syst.* 24, 267–275. doi: 10.1017/S1742170509990111

Besley, J. C., and Tiffany, L. A. (2023). What are you assessing when you measure "trust" in scientists with a direct measure? *Public Understanding Sci.* 32, 709–726. doi: 10.1177/09636625231161302

Binngießer, J., Wilhelm, C., and Randler, C. (2015). Attitudes toward Animals among German Children and Adolescents. *Anthrozoös* 26, 325–339. doi: 10.2752/175303713X13697429463475

Blashfield, R. K., and Aldenderfer, M. S. (1978). The literature on cluster analysis. *Multivariate Behav. Res.* 13, 271–295. doi: 10.1207/s15327906mbr1303_2

Bölw (2020). *Branchen Report 2020*. Available online at: https://www.boelw.de/fileadmin/user_upload/Dokumente/Zahlen_und_Fakten/Brosch%C3%BCre_2020/B%C3%96LW_Branchenreport_2020_web.pdf (Accessed 07 April 2022).

Boogaard, B. K., Bock, B. B., Oosting, S. J., Wiskerke, J. S. C., and van der Zijpp, A. J. (2011). Social acceptance of dairy farming: the ambivalence between the two faces of modernity. *J. Agric. Environ. Ethics* 24, 259–282. doi: 10.1007/s10806-010-9256-4

Briggeman, B. C., and Lusk, J. L. (2011). Preferences for fairness and equity in the food system. *Eur. Rev. Agric. Economics* 38, 1–29. doi: 10.1093/erae/jbq033

Britwum, K., Bernard, J. C., and Albrecht, S. E. (2021). Does importance influence confidence in organic food attributes? *Food Qual. Preferences* 87, 104056. doi: 10.1016/j.foodqual.2020.104056

Busch, G., Bayer, E., Spiller, A., and Kühl, S. (2022). [amp]]lsquo;Factory farming'? Public perceptions of farm sizes and sustainability in animal farming. *PLoS Sustainability Transformation* 1, e0000032. doi: 10.1371/journal.pstr.0000032

Busch, G., Kassas, B., Palma, M. A., and Risius, A. (2020). Perceptions of antibiotic use in livestock farming in Germany, Italy and the United States. *Livestock Sci.* 241, 104251. doi: 10.1016/j.livsci.2020.104251

Busch, G., Weary, D. M., Spiller, A., and von Keyserlink, M. A. G. (2017). American and German attitudes towards cow-calf separation on dairy farms. *PLoS One* 12 (3), e0174013. doi: 10.1371/journal.pone.0174013

Callaway, T. R., Lillehoj, H., Chuanchuen, R., and Gay, C. G. (2021). Alternatives to antibiotics: A symposium on the challenges and solutions for animal health and production. *Antibiotics* 10, 1024. doi: 10.3390/antibiotics10050471

Canova, L., Bobbio, A., and Manganelli, A. M. (2020). Buying organic food products: the role of trust in the theory of planned behavior. *Front. Psychol.* 11. doi: 10.3389/fpsyg.2020.575820

Chang, H. S., and Zepeda, L. (2005). Consumer perceptions and demand for organic food in Australia: Focus group discussions. *Renewable Agric. Food Syst.* 20, 155–167. doi: 10.1079/RAF2004103

Cornish, A. R., Briley, D., Wilson, B. J., Raubenheimer, D., Schlosberg, D., and McGreevy, P. D. (2020). The price of good welfare: does informing consumers about what on-package labels mean for animal welfare influence their purchase intentions? *Appetite.* 148, 104577. doi: 10.1016/j.appet.2019.104577

Curvelo, I. C. G., de Morais Watanabe, E. A., and Alfinito, S. (2019). Purchase intention of organic food under the influence of attributes, consumer trust and perceived value. *Rev. Gestão.* 26, 198–211. doi: 10.1108/REGE-01-2018-0010

De Jonge, J., van Trijp, J. C. M., van der Lands, I. A., Renes, R. J., and Frewer, L. J. (2008). How trust in institutions and organizations builds general consumer confidence in the safety of food: A decomposition of effects. *Appetite.* 51, 311–317. doi: 10.1016/j.appet.2008.03.008

Destatis (2021). *Zahl der Betriebe mit ökologischer Tierhaltung um 41% gestiegen*. Available online at: https://www.destatis.de/DE/Presse/Pressemitteilungen/2021/07/PD21_N046_41.html:~:text=Die%20%C3%B6kologischen%20Rinderbest%C3%A4nde%20sind%20von,5%20400%20Betrieben%20%C3%B6kologisch%20gehalten (Accessed 16 May 2023). Pressemitteilung Nr. N 046 vom 14. Juli 2021.

Di Pasquale, J., Nannoni, E., Del Duca, I., Adinolfi, F., Capitanio, F., Sardi, L., et al. (2014). What foods are identified as animal friendly by Italian consumers? *Ital. J. Anim. Sci.* 13, 782–789. doi: 10.4081/ijas.2014.3582

Duval, E., von Keyserlingk, M. A. G., and Lecorps, B. (2020). Organic dairy cattle: do european union regulations promote animal welfare? *Animals* 10, 1786. Available at: https://www.mdpi.com/2076-2615/10/10/1786.

Ebel, R. (2020). Are small farms sustainable by nature?—Review of an ongoing misunderstanding in agroecology. *Challenges Sustainability* 8, 17–29. doi: 10.12924/cis2020.08010017

Enneking, U., Kleine-Kalmer, R., Dauermann, A., and Voigt, R. (2019). "Kaufbereitschaft bei verpackten Schweinefleischprodukten im Lebensmitteleinzelhandel – Realexperiment und Kassenzonen-Befragung," in *Bereich Lebensmittel und Agrarmarketing* (Bereich Agrar- und Lebensmittelmarketing: Hochschule Osnabrück). Available online at: https://www.hs-osnabrueck.de/fileadmin/HSOS/Homepages/Personalhomepages/Personalhomepages-AuL/Enneking/Tierwohlstudie-HS-Osnabrueck_Teil-Realdaten_17-Jan-2019.pdf.

EU-Öko-VO (2018). *Verordnung (EU) 2018/848 des europäischen Parlaments und des Rates vom 30. Mai 2018 über die ökologische/biologische Produktion und die Kennzeichnung von ökologischen/biologischen Erzeugnissen sowie zur Aufhebung der Verordnung (EG) Nr. 834/2007 des Rates*. Available online at: https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:32018R0848&qid=1687883183409 (Accessed May 15, 2023).

European Commission (2021). *Action plan for organic production in the EU*. Available online at: https://agriculture.ec.europa.eu/farming/organic-farming/organic-action-plan_de (Accessed 13 May 2023).

Everitt, B. S., and Skrondal, A. (2003). *The Cambridge Dictionary of Statistics 4th Edition, (2010)* (The Edinburgh Building, Cambridge, UK: Cambridge University Press).

Flower, F. C., and Weary, D. M. (2023). The effects of early separation on the dairy cow and calf. *Anim. Welfare* 12, 339–348. doi: 10.1017/S0962728600025847

Gerini, F., Alfnes, F., and Schjoll, A. (2016). Organic- and Animal Welfare-labelled Eggs: Competing for the same consumers? *J. Agric. Economics* 67, 471–490. doi: 10.1111/1477-9552.12154

Goddard, E., Hartmann, M., and Klink-Lehmann, J. (2017). Public acceptance of antibiotic use in livestock production Canada and Germany. *System Dynamics and Innovation in Food Networks* 2017, 424–437. doi: 10.18461/PFSD.2017.1743

Groher, T., Heitkämper, K., and Umstätter, C. (2020). Digital technology adoption in livestock production with a special focus on ruminant farming. *Animal* 14, 2404–2413. doi: 10.1017/S1751731120001391

Haley, D. B. (2006). The behavioural response of cattle (Bos taurus) to artificial weaning in two stages. University of Saskatchewan, Canada. Available at: https://harvest.usask.ca/bitstream/handle/10388/etd-07032006-130156/d_haley.pdf?sequence=1&isAllowed=y.

Hall, C., and Sandilands, V. (2007). Public attitudes to the welfare of broiler chickens. *Anim. welfare* 16, 499–512. doi: 10.1017/S0962728600027433

Hamzaoui-Essoussi, L., Sirieix, L., and Zahaf, M. (2017). Trust orientations in the organic food distribution channels: A comparative study of the Canadian and French markets. *J. Retailing Consumer Serv.* 20, 292–301. doi: 10.1016/j.jretconser.2013.02.002

Hansen, B. G., Langseth, E., and Berge, C. (2023). Animal welfare and cow-calf contact-farmers' attitudes, experiences and adoption barriers. *J. Rural Stud.* 97, 34–46. doi: 10.1016/j.jrurstud.2022.11.013

Harper, G. C., and Makatouni, A. (2002). Consumer perception of organic food production and farm animal welfare. *Br. Food J.* 104, 287–299. doi: 10.1108/00070700210425723

Hazra, A., and Gogtay, N. (2016). Biostatistics series module 4: comparing groups – categorical variables. *Indian J. Dermatol.* 61, 385–392. doi: 10.4103/0019-5154.185700

Hoischen-Taubner, S., and Sundrum, A. (2012). "Impact matrix: a tool to improve animal health by a systemic approach," in *Tackling the Future Challenges of Organic Animal Husbandry*. Eds. G. Rahmann and D. Godinho (Braunschweig, Germany: Thünen Institut), 362. Available at: https://www.thuenen.de/media/publikationen/landbauforschung-sonderhefte/lbf_sh362.pdf.

Horn, M., Knaus, W., Kirner, L., and Steinwidder, A. (2012). Economic evaluation of longevity in organic dairy cows. *Organic Agric.* 2, 127–143. doi: 10.1007/s13165-012-0027-6

Hötzel, M. J., Cardoso, C. S., Roslindo, A., and von Keyserlingk, M. A. G. (2017). Citizens' views on the practices of zero-grazing and cow-calf separation in the dairy industry: Does providing information increase acceptability? *J. Dairy Sci.* 100, 4150–4160. doi: 10.3168/jds.2016-11933

Janssen, M., and Hamm, U. (2012). Product labelling in the market for organic food: Consumer preferences and willingness-to-pay for different organic certification logos. *Food Qual. Preference* 25, 9–22. doi: 10.1016/j.foodqual.2011.12.004

Kafaee, M., Marhamati, H., and Gharibzadeh, S. (2021). Choice-supportive bias" in science: Explanation and mitigation. *Accountability Res.* 28, 528–543. doi: 10.1080/08989621.2021.1872377

Krampe, C., Serratosa, J., Niemi, J. K., and Ingenbleek, P. T. M. (2021). Consumer perceptions of precision livestock farming—A qualitative study in three European countries. *Animals* 11, 1221. doi: 10.3390/ani11051221

Kucuk, U., Eyuboglu, M., Kucuk, H. O., and Degirmencioglu, G. (2016). Importance of using proper *post hoc* test with ANOVA. *Int. J. Cardiol.* 209, 346. doi: 10.1016/j.ijcard.2015.11.061

Kühl, S., Bayer, E., and Busch, G. (2022). Should organic animals be slaughtered differently from non-organic animals? A cluster analysis of German consumers. *Organic Agric.* 12, 531–545. doi: 10.1007/s13165-022-00407-0

Kühl, S., Bayer, E., and Schulze, M. (2023). The role of trust, expectation, and deception when buying organic animal products. *Anim. Front.* 13, 40–47. doi: 10.1093/af/vfac080

Ladwein, R., and Sánchez Romero, A. M. (2021). The role of trust in the relationship between consumers, producers and retailers of organic food: A sector-based approach. *J. Retailing Consumer Serv.* 60, 102508. doi: 10.1016/j.jretconser.2021.102508

Lee, T. H., Fu, C. J., and Chen, Y. Y. (2019). Trust factors for organic foods: consumer buying behaviour. *Br. Food J.* 122, 414–431. doi: 10.1108/BFJ-03-2019-0195

Lee, H. J., and Yun, Z. S. (2015). Consumers´ perception of organic food attributes and cognitive and affective attitudes as determinants of their purchase intentions toward organic food. *Food Qual. Preference* 39, 259–267. doi: 10.1016/j.foodqual.2014.06.002

Lusk, J. L., Norwood, F. B., and Pruitt, J. R. (2006). Consumer demand for a ban on antibiotic drug use in pork production. *Am. J. Agric. Economics* 88, 783–1122. doi: 10.1111/j.1467-8276.2006.00913.x

Macready, A. L., Hieke, S., Klimczuk-Kochańska, M., Szumiałc, S., Vranken, L., and Grunert, K. G. (2020). Consumer trust in the food value chain and its impact on consumer confidence: A model for assessing consumer trust and evidence from a 5-country study in Europe. *Food Policy* 92, 101880. doi: 10.1016/j.foodpol.2020.101880

Meas, T., Hu, W., Batte, M. T., Woods, T. A., and Ernst, S. (2014). Substitutes or complements? Consumer preference for local and organic food attributes. *Am. J. Agric. Economics* 97, 1044–1071. doi: 10.1093/ajae/aau108

Möllering, G. (2008). Inviting or avoiding deception through trust? Conceptual exploration of an ambivalent relationship. *SSRN J.* 8, 4–25. doi: 10.2139/ssrn.1105060

Murphy, B., Martini, M., Fedi, A., Loera, B. L., Elliott, C. T., and Dean, M. (2022). Consumer trust in organic food and organic certifications in four European countries. *Food Control* 133, 108484. doi: 10.1016/j.foodcont.2021.108484

Nocella, G., Hubbard, L., and Scarpa, R. (2010). Farm animal welfare, consumer willingness to pay, and trust: results of a cross-national survey. *Appl. Econ. Perspect. Policy* 32, 275–297. doi: 10.1093/aepp/ppp009

Nuttavuthisit, K., and Thøgersen, J. (2017). The importance of consumer trust for the emergence of a market for green products: the case of organic food. *J. Business Ethic* 140, 323–337. doi: 10.1007/s10551-015-2690-5

Ökobarometer (2021). *Umfrage zum Konsum von Bio-Lebensmittel*. Available online at: https://www.bmel.de/SharedDocs/Downloads/DE/Broschueren/oekobarometer-2021.pdf?:blob=publicationFile&v=10 (Accessed 14 May 2023).

Ökolandbau.de (2022). *Mutter- und Kuhgebundene Kälberaufzucht*. Available online at: https://www.oekolandbau.de/bio-im-alltag/bio-fuer-die-umwelt/tierhaltung/mutter-und-kuhgebundene-kaelberaufzucht/ (Accessed 27 June 2023).

Padel, S., and Foster, C. (2005). Exploring the gap between attitudes and behaviour: Understanding why consumers buy or do not buy organic food. *Br. Food J.* 107, 606–625. doi: 10.1108/00070700510611002

Pempek, J. A., Schuenemann, G. M., Holder, G., and Habing, G. G. (2017). Dairy calf management—A comparison of practices and producer attitudes among conventional and organic herds. *J. Dairy Sci.* 100, 8310–8321. doi: 10.3168/jds.2017-12565

Pfeiffer, J., Gabriel, A., and Gandorfer, M. (2021). Understanding the public attitudinal acceptance of digital farming technologies: a nationwide survey in Germany. *Agric. Hum. Values* 38, 107–128. doi: 10.1007/s10460-020-10145-2

Pivato, S., Misani, N., and Tencati, A. (2008). The impact of corporate social responsibility on consumer trust: the case of organic food. *Business Ethics: A Eur. Rev.* 17, 3–12. doi: 10.1111/j.1467-8608.2008.00515.x

Placzek, M., Christoph-Schulze, I., and Barth, K. (2021). Public attitude towards cow-calf separation and other common practices of calf rearing in dairy farming—a review. *Organic Agric.* 11, 41–50. doi: 10.1007/s13165-020-00321-3

Profeta, A., and Hamm, U. (2019). Do consumers prefer local animal products produced with local feed? Results from a Discrete-Choice experiment. *Food Qual. Preferences* 71, 217–227. doi: 10.1016/j.foodqual.2018.07.007

Robbins, J. A., von Kevserlingk, M. A. G., Fraser, D., and Weary, D. M. (2016). Invited Review: Farm size and animal welfare. *J. Anim. Sci.* 94, 5439–5455. doi: 10.2527/jas.2016-0805

Schumacher, E. F. (1973). *Small is beautiful. Economics as If People Mattered* (London: Blond & Briggs).

Sechi, P., Baldinelli, C., Iulietto, M. F., and Cenci Goga, B. T. (2015). Animal welfare: data from an online consultation. *Ital. J. Food Saf.* 4, 5504. doi: 10.4081/ijfs.2015.5504

Siegrist, M. (2002). The influence of trust and perceptions of risks and benefits on the acceptance of gene technology. *Risk Analysis.* 20, 155–296. doi: 10.1111/0272-4332.202020

Sonntag, W. I., Golze, S., Kutschbach, A., Gassler, B., and Spiller, A. (2018). Bürgerreaktionen auf Zielkonflikte in der Hühnchenmast. In: SocialLab – Nutztierhaltung im Spiegel der Gesellschaft. *J. Consumer Prot. Food Saf.* 13, 145–236. doi: 10.1007/s00003-017-1144-7

Spiller, A. (2006). *Zielgruppen im Markt für Bio-Lebensmittel: Ein Forschungsüberblick* (Göttingen, Germany: Universität Göttingen, Diskussionsbeitrag 0608). Available at: https://www.uni-goettingen.de/de/document/download/aca1194d9bd45c8d6cac6af2584cff3e.pdf/Zielgruppen%20Endversion.pdf.

Spiller, A., and Cordts, A. (2010). "Nachhaltigkeits- und Gesundheitspositionierung der Bio-Branche," in *Abschlussbericht Auswertung der Daten der Nationalen Verzehrstudie II Eine integrierte verhaltens- und lebensstilbasierte Analyse des Bio-Konsums (Hrsg.)*. Eds. I. Hoffmann and A. Spiller (Karlsruhe and Göttingen, Germany: Max-Rubner-Institut Karlsruhe, Georg-August-Universität Göttingen).

Spooner, J. M., Schuppli, C. A., and Fraser, D. (2014). Attitudes of Canadian citizens toward farm animal welfare: A qualitative study. *Livestock Sci.* 163, 150–158. doi: 10.1016/j.livsci.2014.02.011

Statista (2023). *Anteil der Bio-Anbaufläche an der landwirtschaftlichen Nutzfläche in Europa nach Ländern im Jahr 2020*. Available online at: https://de.statista.com/statistik/daten/studie/5423/umfrage/anteil-der-oeko-flaeche-an-der-landwirtschaft-in-den-eu-27-laendern/:~:text=Dort%20konnte%20der%20%C3%96kolandbau%20mit,Union%20(EU%2D27) (Accessed 16 May 2023).

Sturgis, P., and Smith, P. (2010). Assessing the validity of generalized trust questions: what kind of trust are we measuring? *Int. J. Public Opin. Res.* 22, 74–92. doi: 10.1093/ijpor/edq003

Thorslund, C. A. H., Sandøe, P., Aaslyng, M. D., and Lassena, J. (2016). A good taste in the meat, a good taste in the mouth – animal welfare as an aspect of pork quality in three European countries. *Livestock Sci.* 193, 58–65. doi: 10.1016/j.livsci.2016.09.007

Thorsøe, M. H. (2015). Maintaining trust and credibility in a continuously Evolving organic food system. *J. Agric. Environ. Ethics* 28, 767–787. doi: 10.1007/s10806-015-9559-6

Tonkin, E., Wilson, A. M., Coveney, J., Webb, T., and Meyer, S. B. (2015). Trust in and through labelling – a systematic review and critique. *Br. Food J.* 117), 318–338. doi: 10.1108/BFJ-07-2014-0244

Vanhonacker, F., Van Poucke, E., Tuyttens, F., and Verbeke, W. (2010). Citizens' Views on farm animal welfare and related information provision: exploratory insights from Flanders, Belgium. *J. Agric. Environ. Ethics* 23, 551–569. doi: 10.1007/s10806-010-9235-9

Van Loo, E. J., Caputo, V., Nayga, R. M., Meullenet, J. F., Crandall, P. G., and Ricke, S. C. (2010). Effect of organic poultry purchase frequency on consumer attitudes toward organic poultry meat. *J. Food Sci.* 75, 384–397. doi: 10.1111/j.1750-3841.2010.01775.x

Ventura, B. A., von Keyserlingk, M. A. G., Schuppli, C. A., and Weary, D. M. (2013). Views on contentious practices in dairy farming: The case of early cow-calf separation. *J. Dairy Sci.* 96, 6105–6116. doi: 10.3168/jds.2012-6040

Verain, M. C. D., Bartels, J., Dagevos, H., Sijtsema, S. J., Onwezen, M. C., and Antonides, G. (2012). Segments of sustainable fodd consumers: a literature review. *Int. J. Consumer Stud.* 36, 123–132. doi: 10.1111/j.1470-6431.2011.01082.x

Von der Meulen, H. A. B., Dolman, M. A., Jager, V. H., and Venema, G. S. (2014). The impact of farm size on sustainability of dutch dairy farms. *Int. J. Agric. Manage.* 3, 119–123. doi: 10.22004/ag.econ.200241

Von Keyserlingk, M. A. G., and Weary, D. M. (2007). Maternal behavior in cattle. *Hormones Behav.* 52, 106–113. doi: 10.1016/j.yhbeh.2007.03.015

Von Meyer-Höfer, M., Nitzko, S., and Spiller, A. (2015). Is there an expectation gap? Consumers' expectations towards organic: An exploratory sur-vey in mature and emerging European organic food markets. *Br. Food J.* 117, 1527–1546. doi: 10.1108/BFJ-07-2014-0252

Wägeli, S., and Hamm, U. (2016). Consumers' perception and expectations of local organic food supply chains. *Organic Agric.* 6, 215–224. doi: 10.1007/s13165-015-0130-6

Wägeli, S., Janssen, M., and Hamm, U. (2016). Organic consumers' preferences and willingness-to-pay for locally produced animal products. *Consumer Stud.* 40, 357–367. doi: 10.1111/ijcs.12262

Wille, S. C., Busch, G., and Spiller, A. (2017). Transportation in pig husbandry: does an increase in consumers' Information and knowledge lead to a more positive attitude? *German J. Agric. Economics* 66, 1–12. doi: 10.30430/66.2017.1.1-12

Wilmes, R., Waldhof, G., and Breunig, P. (2022). Can digital farming technologies enhance the willingness to buy products from current farming systems? *PLoS One* 17 (11), e0277731. doi: 10.1371/journal.pone.0277731

Witkowska, D., and Poniewaz, A. (2022). The effect of housing system on disease prevalence and productive lifespan of dairy herds—A case study. *Animals* 12, 1610. doi: 10.3390/ani12131610

Wu, W., Zhang, A., van Klinken, R. D., Schrobback, P., and Muller., J. M. (2021). Consumer trust in food and the food system: a critical review. *Foods.* 10, 2490. doi: 10.3390/foods10102490

Zagata, L., and Lostak, M. (2012). In goodness we trust. The role of trust and institutions underpinning trust in the organic food market. *Sociologia Ruralis* 52, 470–487. doi: 10.1111/j.1467-9523.2012.00574.x

Zander, K., and Hamm, U. (2009). "Ethische Werte aus Sicht der Verbraucher - Das Beispiel von Lebensmitteln aus ökologischer Produktion," in *Agrar- und Ernährungsmärkte nach dem Boom* (Kiel: GEWISOLA), 1–12.