

## RESEARCH ARTICLE

# To trust or not to trust? Trust landscape of organic animal husbandry: Mapping consumer attitudes and information demands in Germany

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## Abstract

A mainly positive attitude of consumers towards organic animal husbandry with its higher keeping standards compared to the legal regulations is evident. However, less is known about consumers' detailed expectations of organic husbandry and in particular their attitude and trust along the value chain of organic animal products. Which consumers trust the most, and how do they want to be informed about organic animal husbandry? Where along the chain are trust deficits that should be addressed in the future to support sustainable food consumption with high animal welfare standards? To answer these important questions a survey was conducted among 729 German meat consumers. Using a cluster analysis, various consumer groups were identified based on their trust levels. Further, these groups were characterized regarding their general attitude, their information behavior, their evaluation of current media reporting, and their preferred way to be informed (emotional/rational) about organic animal products. The results revealed three clusters that clearly differ in their trust level of organic husbandry. Respondents assigned to the first cluster are committed organic consumers with high trust and the most positive attitude. The second cluster, combines respondents who are generally open to organic meat consumption and showing the second highest trust level and positive attitude towards organic. They show a slight favor for a more rational presentation of information. The third cluster is the smallest and can be described as the skeptics with a low interest in organic. The results indicate a general moderate to high trust level along the value chain of organic animal products, with the highest trust in organic retailers and farmers and the least trust in processing and conventional retailers. These are important insights for the organic sector in order to improve consumer trust and therewith increase the market share of organic meat products.

## Author summary

In the discussion surrounding sustainable agriculture and consumption, organic production plays a key role. Especially in terms of high animal welfare standards, organic animal

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farming takes a pioneering role. To support market-driven transformation to a more sustainable consumption, an understanding of consumers’ attitudes, perspectives, and trust regarding these production systems is essential. Thus, this study identifies trust levels along the production chain of organic animal products and gives insights into the characteristics of different consumer groups regarding their trust in organic husbandry. Three clusters could be identified, with the first two clusters showing moderate to high trust levels along the production chain and a positive attitude towards organic husbandry. We identified scandals, poor product quality, a high expectation–reality gap and, especially for the second and third clusters, too emotional and uncritical reporting about organic husbandry as possible trust barriers. We provide recommendations for increasing trust in a particular animal welfare-friendly husbandry system based on this study.

## Introduction

For consumers of organic animal products, animal welfare is one of the main reasons to buy organic [1,2], and a generally positive attitude towards organic animal husbandry is evident [3,4,5]. However, less is known about consumers’ detailed expectations of organic animal farming and in particular their attitude and trust along the value chain of organic animal products. Organic farming is based on EU standards for organic production. For livestock, this means 100% more space and access to free range for the animals, and that the number of animals on the farm is linked to the area of land (170 kg N/ha). As most of the standards and regulations of organic animal farming, such as higher animal husbandry standards or regulations concerning feeding or medicine application, cannot be examined by the consumers themselves, trust is inherently important when purchasing organic products [6,7,8,9]. Along the production chain, there are many steps where consumers have to trust the value chain and its actors. Here it can be distinguished between systemic and personal trust. Systemic trust is an impersonal form of trust related to the function of a system, such as organic food production and certification. In contrast, personal trust is related to an individual. As today many actors are involved in food chains and food production, systemic trust is the predominant form of trust in food production [10].

Nevertheless, a study showed that consumers have the significantly highest trust in individuals in the supply chain for food products, organic and conventional, namely farmers and inspectors. Less trust in food retailers and manufacturers has been found. Overall, consumers place significantly higher trust in the organic food chain than in the conventional sector, and agencies are trusted less than farmers (both conventional and organic) [11]. This is supported by another study which states that systemic trust can be trumped by personal trust. However, the authors also detected high systemic trust in the organic label among Danish consumers [12]. Furthermore, it was found that organic labels can be seen as a major source of trust, provided that they are well known and perceived as trustworthy [9]. The labeling system can serve as a source of trust, as it reduces complexity in the food system [13]. Studies show that trust in organic food is generally quite high [12,14,15] and also robust in the face of disappointment [16]. But e.g. fraud in the organic sector can cause serious trust problems, as consumer trust is abused for profit [17].

Trust can be seen as a multidimensional construct. In literature trustworthiness is defined by the three dimensions of competence, care, and openness/transparency [14,18,19]. In particular, the belief in openness of an actor is related to consumer trust [14]. It was found that openness is more important than knowledge exchange with respect to trust in organizations [10].

In contrast, another study found that perceived care for, e.g., public wellbeing of an actor, is the most important trust dimension [19]. However, the impact of different trust dimensions on building general trust varies between actors. For manufacturers, especially the dimension of perceived competence seems to be important [19].

In addition to these dimensions of trust, the dimensions of reliability and skepticism can be added to the construct of trustworthiness. A study showed that a loss of reliability affects trust in a negative way [20]. Further the component of skepticism can be added, referring to a skeptical view of an actor's trustworthiness [18].

Moreover, trust is important due to the high information asymmetry in the relationship of the food system and consumers. A high level of trust reduces the need to acquire knowledge about food production [5]. Studies also acknowledge that more knowledge exchange does not generate more trust [21,22]. However, information can be helpful to increase buying intention of high-priced animal welfare products [23]. Furthermore, a positive correlation between trust, knowledge, and a positive attitude towards organics can be found [12,24]. Thus, suitable information is able to bring consumers' expectations closer to reality. However, most consumers have little motivation to inform themselves about organic farming, despite easy access to detailed information about organic husbandry these days. Reasons for this may be a lack of interest, information overload such as too many labels, or a lack of a convenient way of providing information [25]. This results in a more fragile state of "blind trust", which is not based on information evaluation [5]. Thus "blind trust" can be defined as the opposite of reflexive trust [26]. Besides the dimensions of personal and institutional trust, literature shows different ways of how consumers build their trust. The more rational or reflexive trust type relies on fact-based evaluation of knowledge. The emotional trust type is based on personal trust relations, feelings, and the sharing of similar values [27], whereas habitual trust is built on routinized behavior [28].

To promote sustainable consumption, e.g. of organically produced food, trust in the production process of these foods is essential. To date, there is a lack of understanding of trust along the value chain of the organic livestock production chain (standards, farmers, control system, processing, sale). It is important for the organic sector to know where trust is most lacking in order to increase it in the future. In addition, this study aims to provide insights into how consumers with different levels of trust in organic farming build their trust, how they perceive current media reporting and how they prefer to be approached with information. It is known that animal welfare is important to many consumers [1,2] and may therefore be a particularly emotive issue to communicate so it seems important to gain a deeper understanding of how such information should be provided to specific consumer segments in order to increase trust. Consumer trust is crucial to expand the market share of organic animal products [6] and is particularly important for organic animal products, such as meat, where consumers have to pay significantly higher prices. A lack of trust in production and/or certification processes can be a reason for the low market share [29] of higher-priced organic meat products, in addition to high prices [7,8,9]. Against the background that European and German policies set the aim to expand the total organic production by 25% (EU) and 30% (Germany) by 2030, it seems necessary to understand how trust in organic animal products is generated and maintained to increase the sales of organic products [30,31]. Summing up, due to the low market shares for organic meat products and the fact that trust in organic animal products is comparatively low in Germany [15], the German organic market was chosen to conduct this study on trust in organic animal farming.

In this context, it is known that consumer groups have different trust levels along the value chain for organic animal products [4,24,32]. However, so far no relation has yet been established with knowledge, information behaviour, perception of media coverage and types of

trust in order to understand these groups more precisely. Thus, we calculated a trust index along the chain of organic meat products, based on the above described five dimensions of trustworthiness (competence, care, openness, reliability and skepticism). These trust indices were used as cluster building variables for a subsequent cluster analysis to identify different consumer groups in terms of their trust in organic livestock farming. Further, we assess how respondents evaluate the current media reporting on organic farming, which provides an initial understanding of how information provision and communication is perceived. In addition, we identify trust deficits along the value chain of organic meat products and investigate whether emotional or rational information is preferred by different consumer groups when promoting organic meat products.

The results are important to improve trust along the value chain and to market organic animal products successfully and therewith support the political aim to expand the organic market.

## Data and methods

### Research context

In terms of transferring food production in the EU to more substantiality, the European Commission initiated the “Action plan for organic production in the EU” under the umbrella of the Green Deal. The aim is to increase organic production in the EU to 25% by 2030 [30]. The proportion of organic farmland varies between European countries. Austria has the highest share with 26% of organic farm land, which is significantly higher compared to Spain (10%), Germany and France (9%) [33]. Germany aims to increase it to 30% by 2023 [31]. This might be challenging as Germany has a comparatively low share of organic farmland so far and trust in organic farming, especially in organic animal farming is comparatively low [15]. Therefore, Germany was chosen as the research setting for this study. In the last years there was a constant rise of organic animal products on the market, resulting in an overall market share of 7% for organic products of [34]. Thereby organic eggs are one of the most bought organic products, whereas the market share for organic meat ranges constantly at 1–2% [29]. In order to achieve the goal of a significant increase in the share of organic food production, consumer demand has to be increase significantly in the future. An understanding of expectations and trust-building behavior is crucial.

### Research framework

The aim of this study was to examine consumer trust along the entire value chain of organic livestock products, to identify which actors in the chain are perceived as trustworthy and where trust is lacking. On the basis of the perceived level of trust along the value chain, consumer groups with different trust levels are identified. Furthermore, it has been analysed how these consumer segments build up their trust, how they evaluate current media reporting and how they want to be approached with information about organic animal husbandry (emotional/rational).

The considered value chain in this study included the following steps and actors: standards, farmers, control system, processing, retailer (organic shop/organic supermarket vs. supermarket/discounter).

In this study, trustworthiness is defined by five dimensions based on the literature, namely: Competence (skilled people, competent, doing a good job), Care (listening to concerns, acting in public interest) Openness/Transparency (being honest, being sufficiently open and providing relevant information), Reliability (being reliable, to be sure of someone) and skeptical attitude (being skeptic about something/someone) [14,18,19]. Table 1 displays the dimensions

**Table 1. Statements to assess trustworthiness using the example of standards in organic animal husbandry.**

Trust dimension	Statement
Competence	I trust that the organic animal husbandry standards have been developed with the best knowledge for animal welfare.
Care	In the development of the husbandry standards for organic animals, animal welfare is the top priority.
Openness/ Transparency	Potential problems with organic animal husbandry specifications are honestly presented.
Reliability	I believe that the standards of organic animal husbandry can reliably ensure animal welfare.
Skeptical attitude	In order for me to feel good about eating products from organic animal husbandry, the regulations must be improved significantly.

Adapted from: [14,18,19]; Scale: 1 = Does not apply at all; 5 = Fully applies

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used to assess the trustworthiness of the food chain for organic animal products on the example of “standards”. These dimensions were also queried regarding the actors in the value chain. A full table with all statements used for the analysis can be found in the appendix (S1 Table).

To get an idea of the perceived trustworthiness of each actor along the chain, a trust index was calculated for each actor in the chain, consisting of the mean values of the five statements about trustworthiness. Subsequently, the indexes of the statements on the perceived trustworthiness of actors along the chain were used as cluster-building variables. The variables of the cluster analysis are shown in Table 2.

Two factor analyses were carried out to consolidate information about different types of trust (habitual, rational, emotional) and the preferred way of information approach (rational/emotional) (Table 3).

The factor analysis on the preferred way how to be addressed with information about organic animal husbandry, identified two factors, namely “*preference for more emotional information*” and “*refusal of a too idyllic communication*”, with the latter factor also indicating a wish for more fact-based communication (see section “clusters and information”).

Differences regarding the types of trust (habitual, rational, emotional) were analyzed based on the respective factors: The first factor was named “trust through habit and information” and was based on participants’ statements saying that organic consumption was normal for

**Table 2. Variables used in the cluster analysis.**

Cluster-building variables	Trustindex: standards
	Trustindex: farmers
	Trustindex: control system
	Trustindex: processing
	Trustindex: organic retailer (organic shop/organic supermarket)
	Trustindex: conventional retailer (supermarket/discounter).
Descriptive variables	Sociodemographic (gender, age, education, income)
	Consumption of organic animal products
	General trust towards others
	Self-assessed knowledge of organic farming
	Expectations towards organic husbandry
	Information behavior and evaluation
	Factor analysis: Preferred way to be addressed with information (emotional/rational)
	Factor analysis: Trust building behaviour: trust types (habitual, rational, emotional)

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Table 3. Statements of the two Factor analysis'.

<b>Statements Factor Analysis on different trust types (rational, emotional, habitual)</b>	I'm used to buying organic meat and don't think too much about it anymore
	For me there is no alternative to food from organic animal husbandry
	For me it is normal to trust organic animal husbandry
	My family has always bought mostly organic meat
	Buying organic meat makes me feel good
	I have informed myself in detail about organic animal husbandry to be able to decide whether I can trust it
	To trust organic animal husbandry, I need to know all the facts
	To trust organic animal husbandry, I need to look closely at the pros and cons
	It is important for me to know a farmer so that I can trust him/her
	I make my purchase decision mainly based on instinct
	It is possible to form an opinion about organic animal husbandry without informing oneself in detail
<b>Statements Factor Analysis on preferred way of information (emotional/rational)</b>	I'm happy to read personal stories about organic farmers
	It is important to present the advantages of organic animal husbandry, e.g., through pleasant reports from farms
	I prefer photos of organic animal husbandry more than written information
	Picture book portrayals of organic animal husbandry in advertising raise false expectations
	Organic animal husbandry is portrayed as a too ideal world
	Too few facts are communicated about organic animal husbandry

Sources: [27,28]

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them, that there was no alternative to food from organic husbandry, and that buying organic meat made them feel good. Further, a good information base concerning organic animal farming added to this factor. The second factor summarized statements concerning a more rational approach to trusting organic husbandry. Interestingly, the importance to know a farmer to be able to trust organic animal farming was also ascribed to this factor. This second factor can be named "trust through rational analysis and personal connections". Statements concerning a more emotional way to trust without much information did not form a reliable factor, and no significant differences between the clusters could be detected here (Table 6).

The factors resulting from the two factor analysis' were used to describe the clusters.

## Survey design

A quantitative online survey with 729 German meat consumers was conducted to answer the research questions in this study. The questionnaire began with data protection consent, which was followed by sociodemographic questions. Further, participants were asked about their consumption of organic animal products and how they evaluated their own knowledge in different areas of organic farming, such as breeding, husbandry, and slaughter. Afterwards, their expectations towards organic compared to conventional animal farming were assessed. This was followed by a question about their general trust level towards others and by questions about their attitude and trust towards organic animal husbandry in general. Thereafter,



trustworthiness of standards and the control system as well as involved actors in the production process of organic animal products (farmers, processing, and organic/non-organic retailers) were assessed in more detail.

At the end of the questionnaire, participants were asked to provide details about their information behavior concerning organic husbandry, how they evaluate any given information, and what kind of information (emotional/rational) about organic animal farming they prefer, using 5-point Likert scales (1 = Do not agree at all, 5 = Fully agree).

## Data collection and cleaning

The data was collected in February and March 2022. The participants were recruited by an online panel provider. In order to obtain an approximately representative sample of the German population, quotas were set for gender, age, education, and place of residence according to the population in Germany aged 18 and older (Table 4). Vegetarians and vegans were excluded from the survey, as many questions related to the attitudes towards and buying behavior of (organic) meat, and the focus of the study was on meat eaters' trust in organic livestock farming. Due to the length of the questionnaire, the survey was split in two parts (part 1 mean time: 14.36 min; part 2 mean time: 15.14 min). The final sample of the first part after data cleaning consisted of 1,199 participants. Two weeks later, the same participants were invited to answer the second part of the questionnaire. In total, 779 people completed the second part. In order to identify the participants, the panel provider assigned each participant an individual identification number, which was used to merge the two survey results at the end. Further, we have checked the matched sample for consistency in sociodemographic data, which were determined in both splits, and answering behaviour. During data cleansing, 44 participants were excluded due to speeding or straight-lining behavior (speeder: participants with a shorter response time than half of the median; straight-lining behavior: giving the same answer to all items in statement batteries more than once). Both surveys contained two quality check questions to ensure that participants read all questions thoroughly. Participants who failed these questions were excluded from further participation during the survey. Outliers in the cluster analysis ( $n = 6$ ) were also excluded from the sample, resulting in a final sample of 729 participants.

The sample contained slightly fewer old people (65+ years, 3.4%) and 9.3% less people with a low education compared to the German population.

**Table 4. Description of the sample;  $n = 729$ .**

	Sample $n = 729$	German population
Age ( $\bar{O}$ ; [min, max])	50.7 years [19, 96]	51.0
18–34 years	23.5%	23.9%
35–49 years	24.6%	22.1%
50–64 years	29.1%	27.5%
65+ years	22.9%	26.3%
Male	49.0%	49.40%
Female	50.8%	50.72%
Low education	25.2%	34.5%
Medium education	33.2%	31.9%
High education	41.6%	33.6%

Sources: [35,36,37]

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## Data analyses

Data were analyzed using IBM SPSS Statistics 28.

The cluster analysis comprised several steps. First, outliers were identified using the single-linkage method. In total,  $n = 6$  outliers were removed. Afterward, a hierarchical cluster analysis with Ward's algorithm and squared Euclidean distance was used to determine the optimal number of clusters. The dendrogram and agglomeration table (elbow criterion) were examined and suggested a three-cluster solution. Further, the identified number of clusters was checked for its interpretability in terms of content. Afterwards, K-means clustering was used to receive homogeneous clusters [38]. To describe the characteristics of the clusters, an ANOVA and post hoc tests were conducted. Finally, a discriminant analysis was carried out to assess the classification accuracy. The discriminant analysis confirmed a classification accuracy of 99.9%.

Further, we conducted two factor analyses concerning the preferred form of information (emotional/rational) and types of trust (habitual, rational, and emotional). A principal component analysis (PCA) with orthogonal varimax rotation was used. In advance, the data were tested for their suitability to perform a PCA by using the Kaiser-Meyer-Olkin (KMO) criterion and Bartlett's test [38]. The KMO values were 0.607 and 0.820 and therewith above the recommended level of 0.50 [39]. Bartlett's test was significant for both factor analyses. Further, factors with an eigenvalue greater than 1 were extracted as well as items with loadings below 0.50 and significant double loadings were removed from the analysis [40,41]. After the factors were determined, Cronbach's alpha was calculated to check the reliability of the factors. It ranged from 0.52 to 0.85 (shown in Tables 6 and 8 below). The threshold for good reliability, Cronbach's alpha, should reach a value of 0.7 [42]. However, literature shows that factors with a lower Cronbach's alpha can also be considered reliable [42,43]. This is in line with a study which stated that low levels of Cronbach's alpha must not necessarily lead to the exclusion of the respective factor [43]. The factors with lower Cronbach's alpha levels in this study were considered plausible in terms of contention and meaning. Further, they were only used to describe clusters, which is why we decided to keep these factors despite their lower reliability.

## Ethics approval

The study was approved by the ethics committee at the university before data collection. Participants were informed about the use of data, and they provided written informed consent online.

## Results

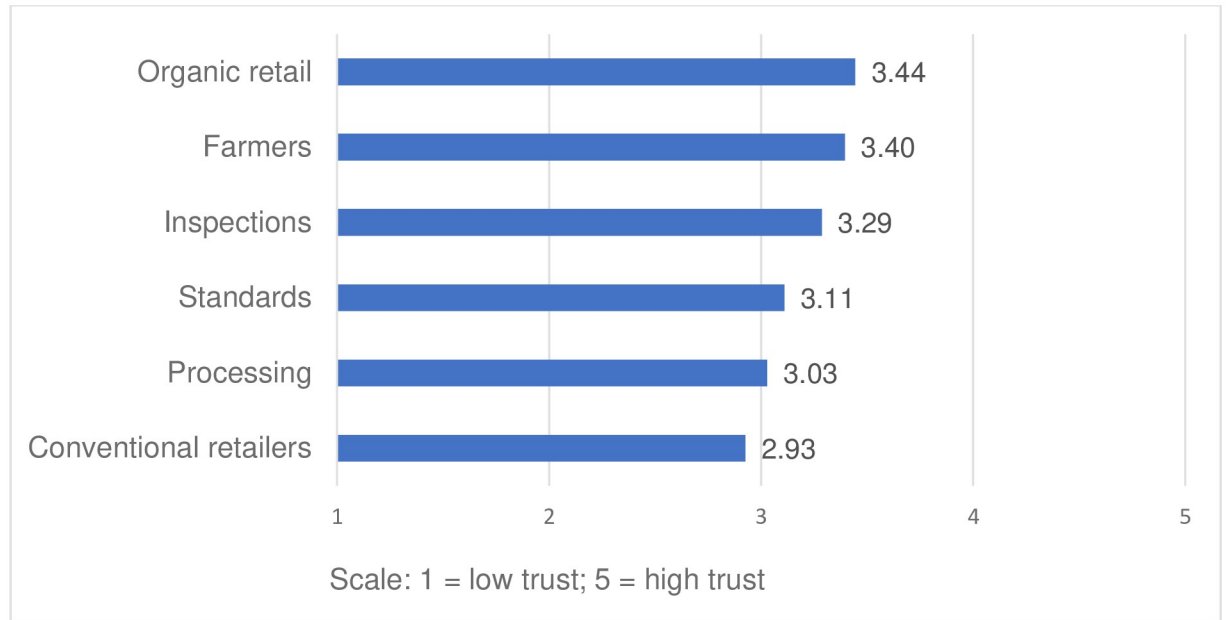
### Trust along the value chain of organic animal products

Fig 1 presents the trust indexes along the chain of organic animal products and shows that participants had the highest trust in farmers and organic retailers, whereas processing and conventional retailers were trusted less. However, even the lowest trust level (conventional retailer mean: 2.93) was on a moderate level.

### Cluster analysis according to trust along the value chain

Three clusters could be identified with significantly different trust levels, namely high, moderate, and low trust in all levels of the value chain (Fig 2). This shows that trust in the different actors was highly interrelated, as none of the clusters showed especially high or low trust in a specific actor. The clusters are described below. Their sociodemographic characteristics, attitudes, and general trust towards organic animal husbandry are displayed in Table 5.

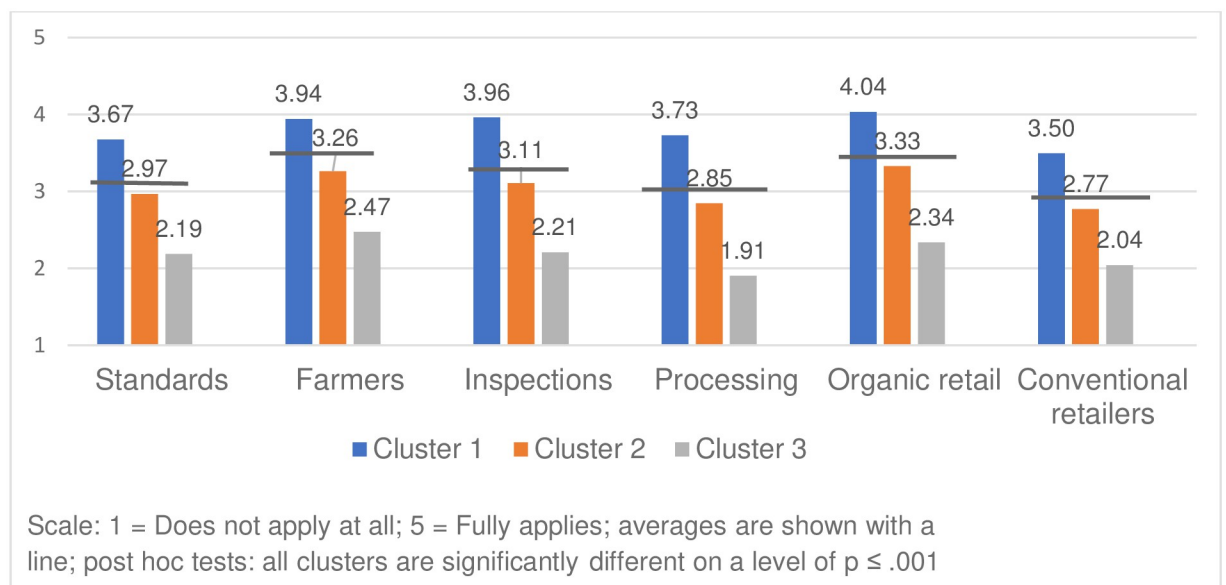




**Fig 1. Trust indexes along the value chain of organic animal products.**

<https://doi.org/10.1371/journal.pstr.0000102.g001>

The first cluster (n = 252 ~ 34.6%) can be called “strongly trusting”. Respondents in this cluster had the overall highest trust in organic animal husbandry along the value chain. They put especially high trust in organic retailers, inspections, and farmers. Participants in cluster 1 were slightly older than the other clusters (52.5 years) and more often had a high education (44.2%) and a high income than the other clusters. People in this cluster stated to buy organic meat most frequently. Further, they had the most positive attitude towards organic husbandry. These



**Fig 2. Trust index of actors along the chain of organic animal products, according to the three clusters (n = 729).**

<https://doi.org/10.1371/journal.pstr.0000102.g002>

Table 5. Socio-demographics, attitude, and trust in organic animal husbandry.

<i>Socio-demographics</i>	<i>Cluster distribution</i>	<b>Cluster 1</b>	<b>Cluster 2</b>	<b>Cluster 3</b>	<b>Total</b>
	Age [years]	52.5	49.7	49.3	50.6
	Female [%]	50.2	52.4	45.3	50.7
	High education [%]	44.2	40.3	38.9	41.5
	<€1,300 [%]	15.5	20.2	16.8	18.1
	€4,500 and more	11.9	10.7	7.4	10.7
	Always or often organic meat buyers [%]	35.7	26.1	7.4	26.9
<i>Attitude towards and trust in organic animal husbandry</i>	<b>Positive attitude:</b> Index of attitude towards organic animal husbandry (Appendix: S2 Table shows the statements; Cronbach's alpha: 0.826)	4.29 (0.67) <sup>a</sup>	3.76 (0.69) <sup>b</sup>	2.85 (0.99) <sup>c</sup>	3.83 (0.86)
	<b>General trust level:</b> In general, you would say that most people can be trusted or that you can never be too careful when dealing with people. [1 = low trust; 7 = high trust]	4.13 (1.49) <sup>a</sup>	3.69 (1.41) <sup>b</sup>	2.85 (1.41) <sup>c</sup>	3.73 (1.49)
<i>Own experience</i>	Scandals have already affected my trust in organic animal husbandry before.	2.96 (1.14) <sup>a</sup>	3.41 (1.02) <sup>b</sup>	3.97 (1.12) <sup>c</sup>	3.33 (1.12)
	When buying organic animal products, I have often been disappointed by the quality (e.g., spoiled quickly, tough meat, etc.).	2.15 (1.01) <sup>a</sup>	2.69 (1.06) <sup>b</sup>	3.29 (1.25) <sup>c</sup>	2.56 (1.12)
<i>Knowledge of organic husbandry conditions</i>	Knowledge about organic husbandry conditions (self-evaluation) [1 = no knowledge; 5 = high knowledge]	2.92 <sup>a</sup>	2.61 <sup>b</sup>	2.48 <sup>b</sup>	2.70

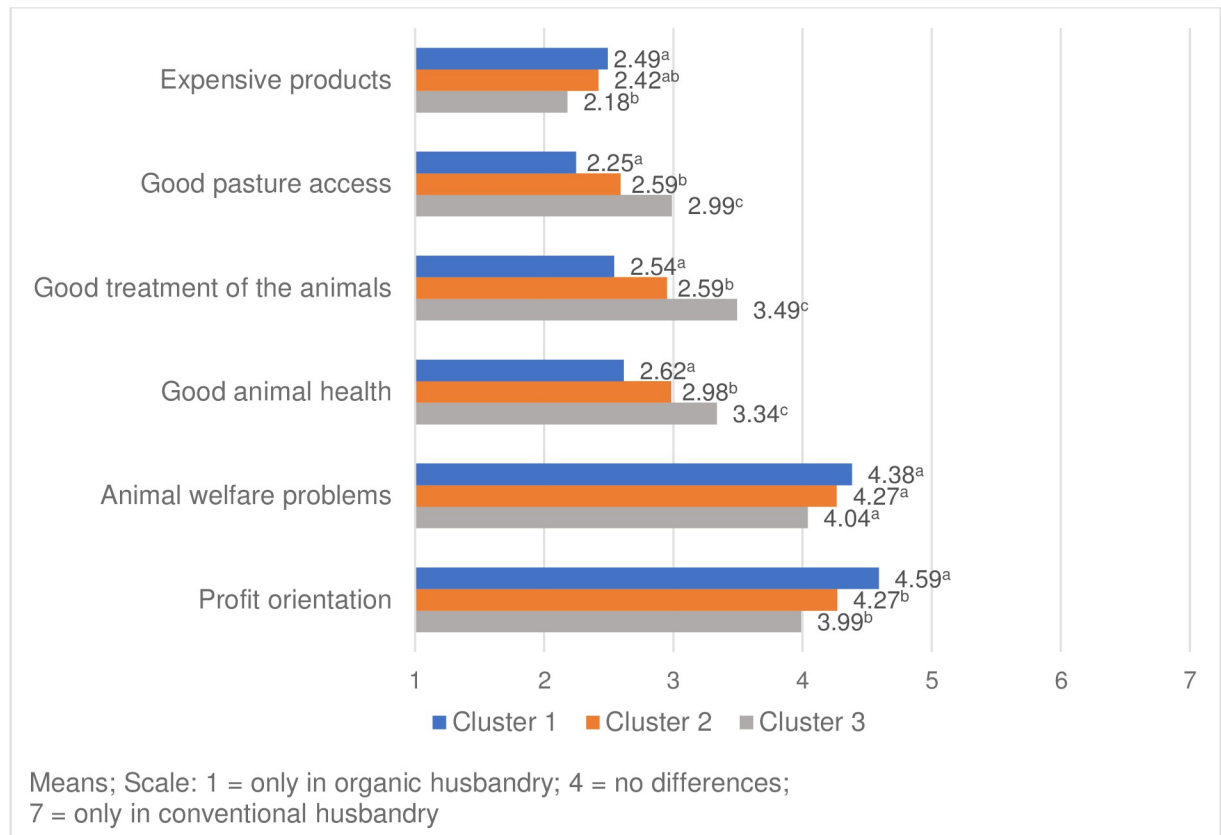
Sources: [17,44,45,46,47]; Scales: 1 = I totally disagree; 5 = I totally agree; a–c according to post hoc tests, clusters with different letters differed significantly ( $p \leq 0.05$ )

<https://doi.org/10.1371/journal.pstr.0000102.t005>

respondents rated their knowledge about organic husbandry conditions significantly higher than those in the other two clusters. Further, individuals in cluster 1 had the most positive expectations towards organic animal farming (*good pasture access, good treatment of the animals, good animal health*) and ascribed negative aspects such as “*profit orientation*” and “*expensive products*” significantly less to organic farming. “*Animal welfare problems*” were slightly more attributed to conventional husbandry, but there were no significant differences between the three clusters concerning this aspect (see Fig 3). Overall, individuals in this cluster had the highest trust in other humans generally. Moreover, they stated that their trust was least often affected by scandals or that they were disappointed by the quality of organic animal products.

The second Cluster ( $n = 382 \sim 52.4\%$ ) is the largest cluster and can be called “moderately trusting”. People in cluster 2 had the second highest trust in organic husbandry. Their average age was 49.7 years and there were slightly more women in this cluster than in the other two clusters (52.4% of females). Participants in cluster 2 had the second highest education and the highest share of people with a low income, but the second highest share of people with a high income. In terms of their attitude towards and trust in organic animal farming, they had in all parts the second highest agreement, which mostly ranged near the average. Regarding self-evaluated knowledge about organic husbandry conditions, people in cluster 2 and 3 rated their knowledge significantly lower than people in cluster 1. The assessment of organic husbandry of cluster 2 members was between that of cluster 1 and 3 members.

The third Cluster ( $n = 95 \sim 13.0\%$ ) is the smallest cluster and can be described as “weakly trusting”. Participants in cluster 3 had the lowest trust in organic farming along the value chain, with the lowest trust in processing and conventional retailers. People in this cluster were slightly younger (49.3 years) than people in the others clusters. Members of cluster 3 had the overall lowest share of women (45.3%), and had the lowest share of people with a high education. Further, they had the smallest share of individuals with a high income. Only very few (7.4%) participants in this cluster stated to buy organic meat very often or often. The respondents in this cluster had the least positive general attitude towards organic animal farming. Respondents in



**Fig 3. Assessment of organic animal husbandry compared to conventional animal husbandry (means).**

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cluster 3 had a significantly more negative view and more negative expectations of organic husbandry than the other two clusters. They ascribed positive aspects, such as “good treatment of the animals”, significantly less to organic husbandry and negative aspects, such as “profit orientation”, significantly more to organic farming than the other clusters.

Further, individuals in cluster 3 claimed to have been disappointed in the quality of organic animal products most frequently, and their trust was most often affected by scandals compared to the other two clusters. Moreover, respondents in this cluster were characterized by the least trust in other humans.

Fig 3 shows consumers’ evaluations of organic animal husbandry compared to conventional husbandry. Respondents had to rate different aspects such as “good animal health” or “good pasture access” on a 7-point scale, ranging from 1 = “only in organic husbandry” to 4 = “no differences” to 7 = “only in conventional husbandry”. The results show that organic animal husbandry was associated with “expensive products”, “pasture access”, “good animal treatment”, and “good animal health”. “Animal welfare problems” and “profit orientation” were slightly more attributed to conventional husbandry.

### Clusters and types of trust

Differences regarding the types of trust (habitual, rational, emotional) were analyzed based on the respective factors: The first factor was named “*trust through habit and information*” and was based on participants’ statements saying that organic consumption was normal for them,

Table 6. Factor analysis regarding different types of trust (rational, habitual, emotional).

Factors	Cluster 1	Cluster 2	Cluster 3	Total
“Trust through habit and information” (Cronbach’s alpha: 0.851)	0.41 (0.89) <sup>a</sup>	−0.03 (0.91) <sup>b</sup>	−0.92 (0.92) <sup>c</sup>	0.00 (1.00)
“Trust through rational analysis and personal connections” (Cronbach’s alpha: 0.599)	0.00 (1.01) <sup>a</sup>	−0.02 (0.93) <sup>a</sup>	0.11 (1.18) <sup>a</sup>	0.00 (1.00)
Statements to the emotional type of trust (Cronbach’s alpha: 0.215)				

Displayed are means and standard deviations in parentheses. a–c according to post hoc tests, clusters with different letters differed significantly ( $p \leq 0.05$ ); explained variance: 58.95%, KMO: 0.820, Bartlett’s test:  $p < 0.001$

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that there was no alternative to food from organic husbandry, and that buying organic meat made them feel good. Further, a good information base concerning organic animal farming added to this factor. The second factor summarized statements concerning a more rational approach to trusting organic husbandry. Interestingly, the importance to know a farmer to be able to trust organic animal farming was also ascribed to this factor. This second factor can be named “trust through rational analysis and personal connections”. Statements concerning a more emotional way to trust without much information did not form a reliable factor, and no significant differences between the clusters could be detected here (Table 6).

Overall, the highest agreement was found for statements referring to rational trust and therewith the need for information (means: 3.95 and 4.05). Respondents agreed less that they were used to buying organic (mean: 2.48) and that it was possible to have an opinion without detailed information (mean: 2.53). With regard to the three clusters, they differ only in terms of the first factor “trust through habit and information”. Participants in cluster 1 agreed significantly more with this factor than cluster 2, and those in cluster 2 agreed more than those in cluster 3. S3 Table in the Appendix shows all statements of the factor analysis.

## Clusters and information

Table 7 displays consumers’ information behavior and their evaluation of given information concerning organic husbandry. The mean for information frequency was rather low (mean:

Table 7. Information behavior and evaluation of current media reporting according to the three clusters.

	Cluster distribution	Cluster 1	Cluster 2	Cluster 3	Total
Information behavior	Information frequency [1 = never; 5 = very often]	2.82 (0.75) <sup>a</sup>	2.69 (0.76) <sup>a</sup>	2.31 (0.91) <sup>b</sup>	2.69 (0.79)
	I find it easy to find good, understandable information about organic animal husbandry.	3.47 (0.90) <sup>a</sup>	3.01 (0.94) <sup>b</sup>	2.88 (1.02) <sup>b</sup>	3.15 (0.96)
	I am satisfied with the current information about animal organic foods.	3.14 (0.95) <sup>a</sup>	2.89 (0.88) <sup>b</sup>	2.82 (1.26) <sup>b</sup>	2.97 (0.96)
Evaluation of current media reporting	Trust in provided information [1 = low trust; 5 = high trust]	2.85 (0.95) <sup>a</sup>	2.40 (0.88) <sup>b</sup>	1.62 (0.77) <sup>c</sup>	2.45 (0.97)
	Presentation of organic husbandry [1 = too positive; 5 = too negative]	2.75 <sup>a</sup> (0.65)	2.69 <sup>a</sup> (0.75)	2.18 <sup>b</sup> (1.02)	2.64 (0.78)
	Presentation of organic husbandry [1 = credible; 5 = not credible]	2.65 <sup>a</sup> (0.84)	3.05 <sup>b</sup> (0.71)	3.77 <sup>c</sup> (0.90)	3.00 (0.86)
	Presentation of organic husbandry [1 = too uncritical; 5 = too critical]	2.77 <sup>a</sup> (0.71)	2.62 <sup>a</sup> (0.80)	2.35 <sup>b</sup> (1.14)	2.63 (0.83)

Scales: 1 = I totally disagree; 5 = I totally agree; a–c according to post hoc tests, clusters with different letters differed significantly ( $p \leq 0.05$ )

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2.69; scale from 1 = never to 5 = very often), meaning that most respondents seldomly informed themselves about organic husbandry. Participants in clusters 1 and 2 informed themselves significantly more often than those in cluster 3.

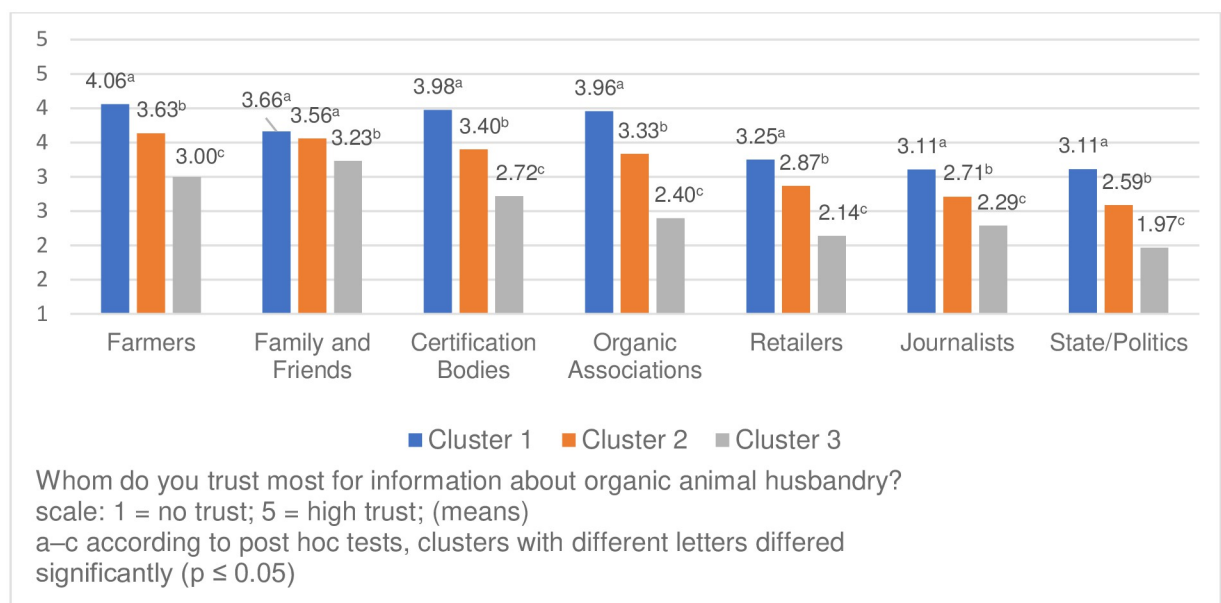
In general, trust in information about organic husbandry was rather low (mean: 2.45; scale from 1 = low trust to 5 = high trust). Participants in cluster 1 found it easier to find good information and were more satisfied with the given information than participants in the other two clusters.

The results further show that, on average, the current media reporting on animal husbandry was evaluated as rather balanced (not too positive, not too negative and not too uncritical, not too critical), with a slight tendency that it was perceived as too positive and too uncritical. Especially participants in cluster 3 (significant different to cluster 1 and 2) evaluate current media reporting on organic husbandry as too positive and too uncritical. With regard to credibility, participants in cluster 1 rated the media reporting on organic husbandry as significantly more credible than participants in clusters 2 and 3.

Regarding information about organic husbandry, consumers had highest trust in organic farmers and in their own friends and family (Fig 4). Also, certification bodies and organic associations were seen as credible sources of information about organic animal farming. Journalists, politics, and retailers were trusted less. Overall, participants in cluster 1 had the highest trust in all actors, followed by participants in cluster 2.

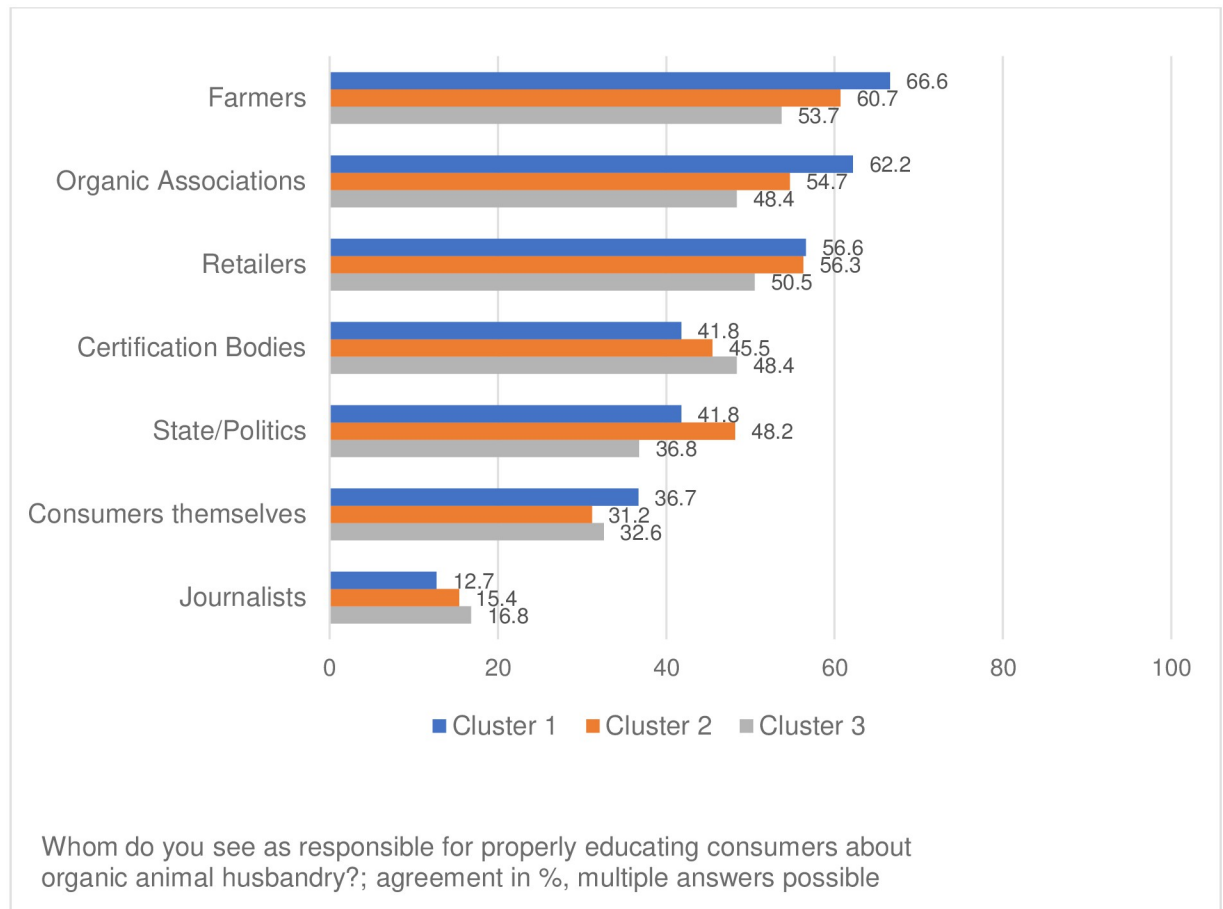
The respondents were further asked whom they see as responsible to provide consumers with adequate education about organic husbandry (Fig 5). The results show that consumers considered especially farmers, organic associations, and retailers as responsible for this. Journalists and the consumers themselves were seen as less responsible to ensure proper education about organic farming. There were no major differences between the three clusters. However, it is interesting to note that individuals in the second cluster placed a higher level of responsibility on the state and politics to provide proper education.

Finally, the factor analysis identified two factors, namely “*preference for more emotional information*” and “*refusal of a too idyllic communication, which for more facts*”, with the latter



**Fig 4. Trust in actors concerning information about organic animal husbandry, n = 729.**

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**Fig 5. Responsibility to provide consumers with proper education about organic animal husbandry, n = 729.**

<https://doi.org/10.1371/journal.pstr.0000102.g005>

factor also indicating a wish for more fact-based communication. The first cluster preferred a more emotional way of information with pictures and personal stories about farmers, whereas respondents in clusters 2 and 3 desired more fact-based communication about organic animal farming (Table 8). S4 Table in the Appendix shows all statements of the factor analysis.

## Discussion

### Trust along the value chain and perception of organic animal production

The cluster analysis showed three clearly separated consumer groups according to their trust level along the value chain of organic animal products: cluster 1 “strongly trusting” (34.6%),

**Table 8. Factor analysis: preference for emotional vs. rational information about organic husbandry.**

Factors	Cluster 1	Cluster 2	Cluster 3	Total
Factor 1: “Preference for more emotional information” (Cronbach’s alpha: 0.60)	0.34 (0.89) <sup>a</sup>	-0.08 (0.93) <sup>b</sup>	-0.70 (1.14) <sup>c</sup>	0.00 (1.00)
Factor 2: “Refusal of a too idyllic communication, wish for more facts” (Cronbach’s alpha: 0.52)	-0.26 (1.07) <sup>a</sup>	0.05 (0.91) <sup>b</sup>	0.58 (0.86) <sup>c</sup>	0.00 (1.00)

Displayed are means and standard deviations in parentheses. a–c according to post hoc tests, clusters with different letters differed significantly ( $p \leq 0.05$ ); explained variance: 55.11%, KMO: 0.607, Bartlett’s test:  $p < 0.001$

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cluster 2 “moderately trusting” (52.4%), and cluster 3 “weakly trusting” (13.0%). The results indicate a strong interrelation of trust in the various actors; it was not possible to identify whether respondents had a high level of trust in certain actors and a low level of trust in others. Further, it is evident for all groups that the level of trust is rather high and mostly placed in organic retailers and farmers. The least trust is placed in the processing sector and conventional retailers. These findings are in line with other studies, which found an overall moderate to high trust level along the chain of organic food production, with especially high trust in farmers and less trust in food manufacturers [11,14]. The skeptical view of the processing sector could be explained by scandals in this area, where fraud for profit is detected periodically [48,49]. Due to organic price premiums, it is lucrative to label non-organic products as organic to maximize profits. This is a serious problem for the organic sector, as consumers and their trust are abused [17].

The low trust in conventional retailers (mean: 2.93) seems surprising, as most consumers buy their organic products in these locations [50]. Thus, the lower level of trust compared to farmers and organic retailers does not act as a hindrance to buying organic products in these places, which is certainly also due to the practicability in everyday life [51]. Trust is strongly linked to the buying behavior of organic meat products: Participants in cluster 1 stated to buy organic meat most often and had a high level of education and income. These characteristics are common for intensive organic consumers [50,51,52]. Cluster 2 shows the second highest consumption rate of organic meat products, and participants in cluster 3 consume organic meat very rarely. The correlation between trust and buying intention is in line with existing findings. A study found that trust in organic foods significantly influences buying behavior [32]. It is further known that knowledge about and perception of organic food positively influence buying intention [4,24,53,54]: Both are highest in cluster 1 and lowest in cluster 3.

The overall very positive attitude of cluster 1 and the rather skeptical attitude of cluster 3 could be explained by the choice-supportive bias, where people tend to attribute more positive/negative features to options they choose/do not choose [55]. Thus, it seems questionable whether respondents in cluster 3 are a potential target group for organic animal products, as their knowledge, interest, and perception are low or negative. In this context it must be noted that the income in cluster 3 is the lowest, and a low income is known to be the main obstacle to buying premium items such as organic products [51,56,57,58,59]. Thus, people in cluster 3 might rate organic animal husbandry more negatively to justify why they do not buy these products [55]. Political actions to make these products also affordable for people with a low income could be real cost accounting for animal products (reducing price differences between organic and conventional products, as organic production has lower environmental costs [60]), subsidization of products with high animal welfare standards, or cutting taxes for low-income households. Therewith, a possible choice-supportive bias could be reduced.

### Trust types

Respondents in cluster 1 show a higher general trust level compared to the other clusters, which supports the findings that people with higher “social trust” also place more trust in actors of the food chain [14]. The general trust level might be a deciding factor in how strongly pronounced the trust in specific actors is, which is consistent with the fact that the respondents trust all actors either to a greater or to a lesser extent. Thus, significantly lower general trust levels in clusters 2 and 3 could make it more difficult to gain and build trust in these two clusters, as the lower trust levels might be at least partly related to a personal trait.

Furthermore, the trust of respondents in cluster 1 is more based on habit. They also agree more that buying organic makes them feel good. Other studies have found that organic

consumption is often habitual and evokes positive feelings [52,61]. Also, a study concludes that trust in organic products is highly routinized, which would explain why there is a higher agreement to those statements in the cluster with the highest buying frequency of organic products [4]. However, another study states that habit might be the strongest source of trust, as it has a strong influence on people's everyday behavior [62]. It is further less susceptible to loss of trust [63]. Our results also show that, at least in subjective memory, consumers in this group had fewer bad experiences. It may therefore be possible that no or few negative experiences have actually been made and that confidence is therefore high. However, it is also known that people tend to focus on the positive aspects of (purchase) decisions and disregard information that is inconsistent with their decision (choice-supportive bias; [55]). This behavior was also detected in organic customers [51]. Additionally, it was found that trust in and buying intention of organic animal products are very consistent among organic consumers, even when they are disappointed by some (non-) existing regulations [16]. Especially in view of possible scandals or in view of unmet expectations, it seems valuable to build up such an impregnable trust among organic customers.

The habitual trust is significantly lower in cluster 2 and especially in cluster 3. This seems plausible since consumers in these groups also buy fewer organic products. In addition, these consumers are more likely to agree that they have already had a bad experience with organic products. Here too, the question arises as to whether this is an objective or rather distorted perception to justify the purchasing decisions. In general, however, it is known that product quality is an important criterion for safeguarding consumer trust in a producer or a retailer [46,47]. Thus, in general, it is of importance to avoid disappointment as this might lead to mistrust [64]. Furthermore, the combination of high expectations and low knowledge poses a risk of disappointment in these groups ("halo effect": [1,65]), which can in turn negatively affect trust, as it is not as solid as in cluster 1 that showed a high level of habitual trust.

However, as respondents in all clusters agreed the most with statements of rational trust, and therewith the needed information, a closer view at how this information should be presented and made available seems important.

### Information behavior and evaluation

Respondents in clusters 1 and 2 inform themselves significantly more frequently than participants in cluster 3 but still irregularly. Moreover, consumers in cluster 1 agree more that it is easy to find understandable information, which supports the findings of a study which found that those who buy organic products more often are also more satisfied with the given information [66].

Further, people in cluster 1 evaluate the provided information and reporting on organic husbandry as significantly more credible than the other clusters. This is again in line with findings on the selective exposure theory, which states that people who have a positive attitude towards a subject tend to search predominately for information that is less critical and supports their attitude [67,68]. Nevertheless, in our study, levels of trust in media reporting are moderate, whereas trust in information made available by farmers, certification bodies, and organic associations is clearly higher. This is true for all clusters, but the trust level is again higher in cluster 1. This is supported by another study which found that farmers and third-party certifiers are perceived as an especially trustworthy source of information regarding organic food [54]. When it comes to the question of who has the responsibility to inform consumers, there is again a clear preference for farmers and organic associations, but also retailers as the place of purchase. Even though the top three responsibilities are similar in all three groups, there are differences, especially in the attribution of responsibility to consumers and

policymakers. Compared to the other clusters, individuals in cluster 2 most strongly agree that policymakers should be made accountable and that consumers have the least responsibility to educate themselves about organic husbandry. This can be due to two reasons: Either these consumers are too uncertain to find helpful information, even though they would like to have some, or they shift the responsibility away to justify their uninformedness. In any case, the relevance of a political information campaign becomes evident. The preference for the presentation of information on organic animal husbandry is also different between the groups: Consumers with a high level of trust (cluster 1) have a slight preference for personal stories and photos, whereas this is slightly rejected by respondents in cluster 3 (cluster 2 is in the middle). However, although individuals in cluster 1 like emotional information, they also slightly agree that organic animal husbandry is portrayed too much as an “ideal world”. This statement is even more supported by people in cluster 2 and especially by those in cluster 3. The less critical attitude of participants in cluster 1 regarding actual media reporting and their slight favor of an “emotional way” of the communication might be reasoned by the fact that they prefer appealing photos, but this might also be a result of the high level of trust in and their positive attitude towards organic farming, which they want to maintain.

Summing up, the results show that consumer groups with the highest trust in organic animal husbandry seem to be less critical regarding given information and show a slight preference for emotional information, such as personal stories of farmers and pleasant pictures, whereas less convinced consumer groups reject a too idyllic way of information more and desire more facts. However, all respondents have a high preference for rational information. Especially individuals in cluster 2 seem to need more information/facts or at least do not know where to find them. Thus, information seems to be of importance and should be provided by farmers and other actors of the organic sector (organic associations, certifiers, retailers).

### Policy and practice recommendations

The three identified clusters are significantly different regarding their trust along the value chain. To consolidate trust for these consumer groups, we suggest the following:

Cluster 1: Consumer in this cluster have the highest trust level and are already in favor of organic husbandry, with quite unwavering trust and the highest consumption rate of organic meat. They are the most interested in information about organic husbandry. When communicating organic husbandry, these consumers can be reached through emotional information (photos, personal stories), but also facts are of importance to this group, while a “too ideal” presentation should be avoided.

Cluster 2: The second cluster is of interest, as here people have a positive attitude towards organic husbandry and a moderate trust level. Thus, to strengthen trust in this potential consumer group, good product quality along the chain should be ensured, as this group was significantly more often disappointed by the product quality of organic products than the highly trusting people in cluster 1. Further, especially in this group, the expectation–reality gap should be reduced by using a more realistic representation of organic animal farming. Consumers in this group should be addressed with a more fact-based communication. A “too idyllic” presentation of organic husbandry is seen critically. Scandals, for example fraud in processing and any other areas, should obviously be prevented in any case to gain and maintain consumer trust. This applies to all organic consumers, but as trust is less stable in clusters 2 and 3, people’s trust in these two clusters could be more affected by scandals.

Cluster 3: The third cluster has the lowest trust and interest in organic husbandry and is primarily not considered to be a target group for products from organic animal husbandry. Nevertheless, as people in this cluster also have the lowest income of all clusters, which might act

as a hindrance to buying organic animal products [58,59], the choice-supportive bias could play a role. Thus, political actions should be implemented to minimize price differences of organic/animal welfare products compared to conventional products and therewith enable people with a low income to choose products with higher animal welfare standards. This most skeptical group should be addressed with facts, as they reject a too idyllic presentation of the sector the most.

In general, farmers seem to play a special role in the perception of consumers regarding information about organic husbandry, as they are seen as the most trustworthy in terms of provided information. At the same time, consumers see farmers and other actors in the organic sector as responsible to ensure an adequate information level about organic animal farming. Thus, using farmers to transfer information about organic livestock farming, for example in an information campaign, could be a promising way to convey information in a credible manner. A broad information campaign should be considered to support the aim of extending the market for organic farming in the near future, as consumers mostly do not see themselves as responsible for educating themselves on organic husbandry. This information campaign should be seen as complementary to the more specific way in which the clusters identified in this study prefer to receive information about organic farming.

By considering these points when addressing the target groups purposefully, trust along the chain and the overall positive perception of organic livestock production could be strengthened and improved. Thus, the basis to expand sales from particularly animal welfare-friendly husbandry systems and sustainable food production can be established. The results of this study may contribute to reach the political aim of expanding organic production in the near future.

### Limitations and future research

In some areas, this study cannot provide a deeper analysis, for example on the reasons why trust in provided information about organic husbandry is low. This should be investigated in further research to be able to improve trust in supplied information. The study results are limited to German consumers, but the results on trust in organic animal husbandry as well as on trust building and information behavior is relevant to a broader public and it can be assumed that the underlying structures for building trust can be transferred to consumers in other countries where there are also known trust issues [15]. The cited literature on trust in organics and about organic consumer groups is partly quite old [18,51,19], but the old findings are supported by more recent data [50] and by newer studies referring to the older references [11], as no current studies are available on this topic. Further, the cluster analysis shows three clusters with high correlations and tendencies regarding trust levels. Thus, also other methods, such as a classification with fixed criteria, could have been considered as a suitable method. However, as we wanted to cluster the groups according to their trust levels and did not want to define fixed category thresholds, we considered the cluster analysis as a suitable method for the aims of this study.

### Conclusion

In summary, trust along the value chain of organic animal products is moderate to high. The processing sector and conventional retailers were identified as actors in which consumers place the least trust. The highest level of trust is placed in organic retailers and farmers. This study identified three distinct clusters with significantly different levels of trust, the distribution and characteristics of which are quite consistent with existing literature. Consumers with high trust show relatively stable habitual trust in organic farming whereas consumers with

moderate trust, and especially with low trust, see organic husbandry less positive and prefer a more rational/fact-based form of information. In addition to target-group specific communication to build trust, a broader information campaign is recommended to improve the knowledge of the general public about organic farming. This is important to support the goal of increasing demand for sustainably produced animal products and to achieve the policy goal of transforming agricultural and food systems towards greater sustainability.

## Supporting information

**S1 Table. Statements used for the trust index (cluster-building variables).** Scale: 1 = Does not apply at all; 5 = Fully applies.  
(DOCX)

**S2 Table. Statements building the index of attitude towards organic animal husbandry.** Scale: 1 = Does not apply at all; 5 = Fully applies.  
(DOCX)

**S3 Table. Factor analysis regarding different types of trust (rational, habitual, emotional).** Explained variance: 58.95%, KMO: 0.820, Bartlett's test:  $p < 0.001$ . Displayed are means and standard deviations in parentheses. Scale: 1 = Totally disagree; 5 = Totally agree. a–c according to post hoc tests, clusters with different letters differed significantly ( $p \leq 0.05$ ).  
(DOCX)

**S4 Table. Factor analysis: preference for emotional vs. rational information about organic husbandry.** Explained variance: 55.11%, KMO: 0.607, Bartlett's test:  $p < 0.001$ . Displayed are means and standard deviations in parentheses. Scale: 1 = Totally disagree; 5 = Totally agree. a–c according to post hoc tests, clusters with different letters differed significantly ( $p \leq 0.05$ ).  
(DOCX)

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**Project administration:** Elisa Bayer, Sarah Kühl.

**Supervision:** Elisa Bayer, Sarah Kühl.

**Visualization:** Elisa Bayer.

**Writing – original draft:** Elisa Bayer.

**Writing – review & editing:** Elisa Bayer, Sarah Kühl.

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