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Consumers' Evaluation of Stockfree-Organic Agriculture—A Segmentation Approach

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Abstract: Recently, more and more research has been conducted on what sustainable nutrition could look like. Stockfree-organic agriculture is one possible approach but a relatively new and unstudied cultivation method. In addition to organic agriculture, it excludes any animal by-products during the whole cultivation process. Among the consumers of organic food are especially many vegetarians and vegans. To attract this target group, first farms in Europe have started to follow the stockfree-organic agriculture principles. As it is important to know the consumers' point of view on new developments in agriculture at an early stage of the diffusion process, this study deals with consumers' evaluation of stockfree-organic agriculture to draw conclusions about a possible market potential. This is especially important for stockfree-organic farmers, as well as for organic farmers who are considering converting their cultivation method, and for retailers who wonder whether it is worthwhile to offer these products. The data was collected in 2019 by means of an online survey. The sample consisted of 500 German respondents. Principal component and cluster analyses were used to identify consumer segments according to their attitudes towards the acceptance, advantages, and disadvantages of stockfree-organic agriculture. Additionally, the different segments were compared with each other according to various attitudes and eating behaviours. Overall, animal welfare considerations and environmental aspects were of particular importance to consumers. Animal usage was clearly rejected by one segment, which contained 24% of the sample. Nearly all vegetarians and all vegans supported stockfree-organic agriculture, whereas heavy meat consumers tended to refuse the support of stockfree-organic agriculture. The supporting group valuing high animal welfare and health concerns was much larger than the current status of this niche segment would suggest. This could be a major challenge for the agricultural sector in the long term, but could also include opportunities for greater sustainability.

Keywords: veganic; vegan-organic; vegan; stockless; sustainability; attitudes

1. Introduction

It is widely recognised that nutrition is responsible for a high share of environmental impact in agriculture [1]. In Europe, human nutrition accounts for 20% to 30% of the environmental impact on the global warming potential [2]. Therefore, it is important to find approaches to produce food which minimises the environmental impact of human nutrition. It is well known that meat production is the greatest contributor to climate change within agriculture [1,3]. Hallström et al. [4] found that greenhouse gas [GHG] reductions mainly depend on the amount and type of meat included in the diet as well as the foods used as meat substitutes. Willett et al. [3] recommend a reduction of 50–75% of meat consumption in Western countries for a sustainable diet. Eker et al. [5] state that "if the world's average diet became flexitarian by 2050, meaning that red meat consumption is limited to one serving

per week and white meat to half a portion per day, the GHG emissions of the agriculture sector would be reduced by around 50%". The Intergovernmental Panel on Climate Change (IPCC) states that a reduction in meat consumption and an increase in plant-based food is beneficial to human health and the climate [6].

In recent years, more and more people have adopted a flexitarian [7], vegetarian, or vegan diet [8]. A recent literature review shows that the GHG emissions caused by a vegan diet are lower than those of a vegetarian or omnivore diet [9]. Baroni et al. [10] have even shown that a vegan diet based on organic products has the lowest environmental impact based on life cycle assessments. The vegan diet excludes all animal products, such as meat, eggs, and dairy products. There are three main reasons why people follow a vegan diet. First, 90% of vegans mention ethically-related attitudes (animal rights); second, health-related attitudes (70%); and third, environment-related attitudes (47%) [11–13]. Other reasons given are the influence of peer groups and disgust [13,14]. Within the European Union, vegan foods can be identified by a voluntary vegan label on the product packaging [15]. The label refers to the list of ingredients but not to the cultivation method of the product. This means, for example, that carrots included in ready-to-eat carrot soup were treated with animal manure during cultivation but are labelled as vegan, because the ingredients of the carrot soup are vegan per se. Thus, the vegan label does not state if animal by-products (e.g., animal manure, blood, or bone meal) were used as fertilizer during cultivation. Another important point is that currently, some manufacturers label their products as 100% organic and 100% vegan. However, these labels only refer to the organic cultivation method and the vegan ingredients of the product. An exclusion of animal by-products during cultivation is not taken into account.

As stockfree-organic agriculture considers vegan and organic aspects, it is important to better understand consumers who prefer to purchase organic food [16–21]. The frequency of organic food consumption is associated with a higher level of education, healthier food intake, and vegetarianism [17]. Onyango et al. [22] found that the number of vegetarians/vegans among organic food consumers is higher than among non-organic consumers. Moreover, organic food supports consumers' ethical food purchase decisions [23]. The food safety of organically grown food was mentioned as a key motivation for buying organic food [24,25]. Salleh et al. [26] found that organic food purchase is influenced by the health-consciousness of consumers. Moreover, consumers from developed countries perceive organic agriculture to be better for animal welfare, climate protection, and the environment [27]. Generally, consumers are willing to pay a price premium for socially responsible produced products [24].

Stockfree-organic agriculture is an emerging cultivation method. It states that no animals are included in any part of the production process, and the farm uses no animal by-product as fertiliser for the soil such as manure, blood meal, bone meal, and fish emulsion [28]. This is important for vegans, since many vegans reject animal husbandry for ethical reasons, and some might even feel disgust with regard to animal manure being used as fertiliser. Stockfree-organic agriculture is the only cultivation method where food products do not come into contact with animal-based products. Therefore, it is an exclusive cultivation method which fully aligns with the contesting of animal use.

As a main source of fertility, plant-based compost or green manure from one's own property is recommended [29]. Companies whose products are certified with the stockfree-organic label operate according to the International Federation of Organic Agriculture Movements, the so-called "(IFOAM) Family of Standards". The IFOAM is an international association with the aim of introducing worldwide ecological, social, and economically sound systems based on the principles of organic agriculture [30].

In 2016, there were approximately 80 farms in Greece and Cyprus operating according to stockfree-organic agriculture [31]. Furthermore, for example, in the UK and Ireland 22 [32] and in Germany 21 farms [31] operate accordingly [33]. As the number of farms and thus the distribution in stationary retail is nearly non-existent, online sales play a certain role. In Germany, in September 2019, there were approximately five online shops with a limited choice of product variety, which means, in this context, up to 25 different products [34]. Due to the low distribution of stockfree-organic agriculture in Germany, it can be assumed that the awareness of stockfree-organic products among the

population is low. The current research is therefore an attempt to estimate their market potential by means of a survey on consumer perceptions of stockfree-organic products at a very early stage of the diffusion process.

2. Literature Review

A main discussion topic is whether stockfree-organic agriculture could contribute to a more sustainable agriculture. In order to discuss this aspect, literature on organic agriculture is taken into account first. In the literature, it is contested whether organic agriculture is sustainable compared to conventional agriculture. A land-based comparison of organic and conventional agriculture showed that organic farming makes a positive contribution in the areas of water protection, biodiversity, climate adaptation, and soil quality [35–39]. However, since organic farming requires more arable land, a yield-based comparison is more suitable for certain topics. It can be seen that the positive environmental contribution of organic farming is lower in a yield-based comparison than in a land-based comparison [25,27]. Meta-analyses show that organic farming has an average yield 19–25% lower than conventional farming [33]. To compensate for the yield gaps in organic farming, 23–33% more land is needed [40]. One way to feed the world with smaller yields and harvests would be to change global diets. A lower consumption of animal products plays a decisive role here. Muller et al. [40] show that 60% of the world's agriculture could be converted to organic farming without requiring much more land. The prerequisite for this is that food losses would need to be reduced by 50% and arable land for animal feed production by 50%. Of course, if feed production is to be reduced, animal production also has to be reduced by 1/3 [40]. To conclude, in general, it is not clear if organic agriculture is more sustainable than conventional agriculture as long as current dietary patterns are maintained.

The research on sustainability aspects of stockfree-organic agriculture is quite limited. Schmutz and Foresi [41] dealt with the common standards (e.g., plant-based compost, hay, or mulch for soil fertility from one's own farm or purchased from other organic farms) and challenges (e.g., in a greenhouse, only pollination by wild bees is allowed, the exclusion of coir) of stockfree-organic agriculture. Besides, Visak [42] concluded that stockfree-organic agriculture has advantages on sustainability (e.g., less water and energy required, higher biodiversity) compared to the western conventional farming practices. Additionally, stockfree-organic agriculture is animal-friendly. Colomb et al. [43] focused on the strengths and weaknesses of the sustainability of stockfree-organic agriculture and developed a sustainability model. Overall, their results show that the potential for developing more sustainable organic farming systems in stockfree-organic farms is high. The assessment of stockfree-organic agriculture as sustainable is even more difficult than for organic farming. The existing literature is very limited. Therefore, it is still unclear how to answer the question of whether stockfree-organic agriculture can be considered as more sustainable than organic farming. Further research is needed to give a clear answer regarding this aspect.

Consumer research about stockfree-organic agriculture is limited as well. One study by Jürkenbeck et al. [44] analysed the marketing potential of biocyclic-vegan (stockfree-organic) products. The results showed that most consumers and experts could define the meaning of biocyclic-vegan. Moreover, the purchase reasons for consumers were to support the new cultivation method, while experts mentioned ethical reasons. Kilian et al. [45] show that vegan consumers are willing to pay higher prices for stockfree-organic products than for organic products.

To conclude, organic agriculture has received intensive research attention, while stockfree-organic agriculture has so far been a fairly unstudied field in agricultural sciences. The existing literature about stockfree-organic agriculture to date is mainly concerned with the strengths and weaknesses as well as with the assessment of the sustainability of the production method. Therefore, it is important to expand the existing knowledge from the consumers' viewpoint to find out how consumers evaluate this cultivation method. In addition, it should be analysed whether the stockfree-organic cultivation method is accepted by consumers. This is important in order to be able to assess, for example, whether consumers would buy products from stockfree-organic agriculture if these were offered more

widely at the points-of-sale. It is therefore helpful to evaluate the demand for stockfree-organic products. The aim of the current study is to reveal the consumers' evaluation of stockfree-organic agriculture. Therefore, consumer segmentation was carried out to analyse the level of consumer acceptance of stockfree-organic agriculture. Additionally, the different segments are described and compared against each other to better understand the differences in their level of acceptance. Stockfree-organic agriculture is at a very early stage of the diffusion process. If widespread, it would lead to substantial changes in agriculture. In addition, it could have a major sustainability impact but would also pose massive challenges for agriculture. Overall, it is unclear whether there is any potential at all for this cultivation method. For this reason, this study can only be regarded as trend research.

3. Materials and Methods

3.1. Data Collection and Survey Design

In order to get information on how consumers view stockfree-organic agriculture, an online survey was carried out in June 2019. This survey method was chosen because it saves time, is cost efficient, guarantees anonymity, and minimises social desirability effects [46]. Furthermore, most people have access to the internet and therefore the possibility to participate. Additionally, a pre-test of the questionnaire was conducted including marketing experts, scientists, and consumers to ensure common understanding and reduce the misunderstanding of the questions. A professional online access panel provider was included for data collection. The URL of the online questionnaire was sent to their clients, who could choose to participate. To be able to use multivariate data analysis and to mimic the German population, the literature suggests sample sizes between 200 and 1,200 respondents [47]. As sampling method, quota sampling was used with quotas set for gender, age, education, and income according to the characteristics of the German population [48]. To ensure the good quality of the dataset, strict quality checks were performed. First, two quality check questions were distributed within the survey and had to be answered correctly, otherwise the respondents were directly excluded from the survey. Second, subjects who answered too fast (below 1/3 of the average response time (9)) or with stereotypical behaviour (e.g. straight-liners (15) within item batteries) were also removed from the dataset. Therefore, 500 of the originally collected data of 549 respondents remained in the sample for analysis.

First, the respondents answered sociodemographic questions and general questions about their dietary behaviours. The concept of stockfree-organic agriculture was explained to the respondents to ensure a common understanding, as the concept is not well known (Appendix A). Hereafter, respondents had to evaluate 16 statements about the advantages and disadvantages of a stockfree-organic agriculture on a five-point Likert scale ranging from –2 = "It is not important to me at all" to +2 = "It is very important to me". The statements were developed by the authors based on the existing literature about the characteristics of stockfree-organic agriculture. The number of the advantages and disadvantages mentioned was balanced to avoid over- and underrepresentation of one concept, to increase the reliability of the calculation. Furthermore, respondents had to evaluate statements about acceptance, ethical values, animal welfare concerns, and spiritual, social, and environmental attitudes on a five-point Likert scale ranging from –2 = "It is not important to me at all" to +2 = "It is very important to me". These items were selected on the basis of the existing literature [44], and corresponding statements for each attitude were developed by the authors.

3.2. Data Analysis

Descriptive calculations and multivariate data analyses were performed in SPSS 25. The quota setting of gender, age, education, and income worked in such a way that these parameters mimicked the German population. The German population was also well reflected in the information on the diets of the respondents. The data analysis consisted of two steps. First, a principal component analysis (PCA) with varimax rotation on the advantages and disadvantages of stockfree-organic agriculture

was performed, in order to reduce the complexity of the data and to see if the concepts regarding the advantages and disadvantages were consistent. Additionally, a confirmatory factor analysis of the three statements about the acceptance of stockfree-organic agriculture was undertaken. The Kaiser Meyer Olkin (KMO) criterion provides information about sampling adequacy. The internal consistency of the three factors was tested with Cronbach's alpha. In a second step, a cluster analysis was performed to obtain homogenous groups based on the factor values of the three factors. First, outliers were identified using the single linkage clustering, followed by Ward algorithms, including the elbow criteria and a dendrogram to identify the best solution for the number of classes. This resulted in a four-cluster solution. The cluster centroids were used as starting points for the third K-means clustering method. K-means was used to classify the group membership of the respondents. A discriminant analysis was performed to validate the accuracy of the classification.

To further compare the clusters, a second principal component analysis of the specific attitudes was conducted. The sociodemographic characteristics and the consumers' own dietary behaviour were compared between the clusters by calculating mean scores for the whole sample and for each cluster. Additionally, a one-way analysis of variance (ANOVA) with the respective post-hoc tests (Games Howell or Tukey) was carried out, as well as a cross tabulation with a chi-square test and a z-test.

4. Results

4.1. Sample Description

The resulting sample size consisted of 500 German citizens. Table 1 shows that the German population was represented by the quota parameters. 16.7% of the respondents knew about stockfree-organic agriculture; however, only 1% of the sample follow a vegan diet.

Table 1. Sample description.

		Sample (in %)	**German Population (in %) [48]**
Gender*	Male	50.2	49.3
	Female	49.6	50.7
	Divers	0.2	-
Age *	16–24	7.4	9.1
	25–39	20.2	22.1
	40–64	43.8	43.7
	65+	28.6	25.1
Education *	No graduation (yet)	1.8	3.9
	Certificate of Secondary Education	34.4	34.5
	General Certificate of Secondary Education	31.6	30.8
	General qualification for university entrance	15.0	13.8
	University degree	17.2	17.1
Income *	Below €1,300	25.2	26.3
	€1,300–€2,599	40.8	39.6
	€2,600–€4,999	27.0	27.1
	Above €5.000	7.0	6.5
Diet	Omnivore	80.6	-
	Flexitarian	13.4	11.6 [49] /13.0 [50]
	Pescatarian	1.2	3.0 [51]
	Ovo-Lacto-Vegetarian	3.4	3.7 [49] /5.1 [52]
	Lacto-Vegetarian	0.4	
	Vegan	1.0	1.0 [53] /0.9 [52]
Stockfree-organic agriculture	Known	16.7	-
	Unknown	83.3	-

Source: * Quotas based on Federal statistical office [48].

4.2. Results of the Principal Component and Cluster Analyses

The PCA on the advantages and disadvantages led to two factors (Table 2) and the KMO had a very good value, of 0.933 [54,55]. The first factor was named "Advantages and perception of stockfree-organic agriculture" and had a Cronbach's alpha value of 0.922. The second factor, "Disadvantages and challenges of stockfree-organic agriculture", had a value of 0.778. Both Cronbach's alpha values showed that the items were measured reliably within each factor [56]. A confirmatory factor analysis was conducted for the statements about the acceptance. It resulted in one factor named "Acceptance" and had a KMO of 0.737 and a Cronbach's alpha value of 0.892 (Table 2).

Table 2. Results of the four-cluster solution based on the principle component analysis of the acceptance, advantages, and disadvantages of stockfree-organic agriculture.

	Contesting the Use of Animals (1)	**Slight Supporter (2)**	**Slight Rejecter (3)**	**Not Interested (4)**	**Sample**
n (%)	108 (23.9)	227 (50.3)	60 (13.3)	56 (12.4)	N = 451 (100)
1. Acceptance (CA: 0.89)	**1.25^{a} (0.49)**	**0.13^{b} (0.48)**	**–0.83^{b} (0.74)**	**–1.01^{c} (0.83)**	**0.13 (0.96)**
Stockfree-organic agriculture should be supported. (0.92)	1.34^{a} (0.55)	0.23^{b} (0.63)	–0.78^{c} (0.85)	–0.93^{c} (0.97)	0.22 (1.04)
Stockfree-organic agriculture should receive more media attention. (0.92)	1.29^{a} (0.60)	0.07^{b} (0.73)	–1.05^{c} (0.89)	–1.05^{c} (0.84)	0.07 (1.11)
The idea behind stockfree-organic agriculture is … (0.88)	1.13^{a} (0.68)	0.09^{b} (0.61)	–0.67^{c} (1.00)	–1.04^{c} (0.97)	0.10 (1.02)
2. Advantages and perception of stockfree-organic agriculture (CA: 0.92)	**1.10^{a} (0.44)**	**0.29^{b} (0.39)**	**–0.21^{c} (0.58)**	**–1.13^{d} (0.64)**	**0.24 (0.81)**
People's knowledge of stockfree-organic agriculture should be increased in order to minimize prejudices. (0.82)	1.22^{a} (0.76)	0.20^{b} (0.80)	–0.82^{c} (0.87)	–1.29^{d} (0.73)	0.12 (1.13)
The stockfree-organic agriculture gets along without any animal components. (0.80)	0.94^{a} (0.79)	–0.02^{b} (0.79)	–0.78^{c} (0.99)	–1.23^{d} (0.73)	–0.04 (1.07)
A stockfree-organic diet is fairer. (0.79)	0.69^{a} (0.83)	–0.10^{b} (0.66)	–0.83^{c} (0.81)	–1.36^{d} (0.70)	–0.16 (0.97)
Stockfree-organic agriculture protects the groundwater. (0.76)	1.33^{a} (0.67)	0.64^{b} (0.74)	0.37^{b} (0.86)	–0.88^{c} (0.92)	0.58 (0.99)
The working conditions for farmers in stockfree-organic agriculture are good, as they do not come into contact with pesticides. (0.76)	1.30^{a} (0.65)	0,55^{b} (0.75)	0.15^{c} (0.90)	–0.98^{d} (0.90)	0.49 (1.02)
A stockfree-organic diet reduces the ecological footprint. (0.75)	1.03^{a} (0.86)	0.11^{b} (0.71)	–0.13^{b} (1.05)	–1.18^{c} (0.77)	0.14 (1.03)
Stockfree-organic foods contain no harmful substances such as antibiotics and sex hormones. (0.75)	1.37^{a} (0.68)	0.60^{b} (0.85)	0.38^{b} (1.11)	–1.11^{c} (0.89)	0.55 (1.11)
All foods (including vegetables, cereals, and fruit) are produced without animal suffering in stockfree-organic agriculture. (0.75)	1.25^{a} (0.75)	0.46^{b} (0.82)	0.13^{b} (1.20)	–1.05^{c} (0.92)	0.42 (1.10)
Since no fodder plants are needed in stockfree-organic agriculture, more land is available for human nutrition. (0.74)	0.81^{a} (0.74)	0.14^{b} (0.61)	–0.32^{c} (0.77)	–1.13^{d} (0.79)	0.08 (0.90)

Table 2. *Cont.*

	Contesting the Use of Animals (1)	Slight Supporter (2)	Slight Rejecter (3)	Not Interested (4)	Sample
2. Disadvantages and challenges of stockfree-organic agriculture (CA: 0.78)	**0.25[a] (0.52)**	**0.35[a] (0.44)**	**1.18[b] (0.44)**	**–1.04[c] (0.63)**	**0.26 (0.75)**
In stockfree-organic agriculture, the cultural landscape, e.g. the Alps, might get lost due to the loss of grazing animals. (0.78)	0.05[a] (0.96)	0.27[a] (0.70)	1.23[b] (0.79)	–0.95[c] (0.90)	0.20 (0.98)
Farm animal breeds may disappear if many people follow a stockfree-organic diet. (0.76)	–0.03[a] (0.99)	0.31[b] (0.76)	1.08[c] (0.83)	–0.78[d] (0.99)	0.20 (0.98)
Stockfree-organic foods do not offer all the necessary products for traditional dishes. (0.73)	0.12[a] (0.99)	0.24[a] (0.78)	1.27[b] (0.81)	–1.23[c] (0.92)	0.18 (1.08)
The stockfree-organic diet makes the supply of minerals and vitamins (e.g. B12) more complicated. (0.66)	0.52[a] (0.97)	0.45[a] (0.82)	1.02[b] (0.95)	–1.13[c] (0.88)	0.35 (1.06)
Stockfree-organic food is more expensive. (0.56)	0.60[a] (0.87)	0.49[a] (0.88)	1.18[b] (1.08)	–1.12[c] (1.00)	0.41 (1.11)

Notes: Question on advantages and disadvantages: "Again, we would like to know your opinion about stockfree-organic agriculture. Please state how important the following statements are to you." Question on acceptance: "How important are the following statements to you?" CA = Cronbach's Alpha for the factors; numbers in brackets behind the items indicate loadings on the factor above; factors: advantages and disadvantages—60.05% of total variance explained; Bartlett's test of sphericity: p = 0.000; KMO = 0.933; factor: acceptance—82.25% of total variance explained; Bartlett's test of sphericity: p = 0.000; KMO = 0.737; values for each cluster in the row of the factors are mean index values; n = number of respondents; means (standard deviation); different letters a, b, c, and d indicate a significant ($p < 0.05$) difference between groups according to Games–Howell; scale from −2 = "It is not important to me at all" to +2 = "It is very important to me"; due to the rounding of the decimal places of the cluster sizes, it is possible that the result is not exactly 100 percent.

The factor values of both PCAs were used for the subsequent cluster analysis as cluster-building variables. After case exclusion due to missing values (42) and the elimination of outliers (7), the remaining sample for the PCA consisted of 451 respondents. As described above, the cluster analysis was based on the three factors and resulted in four consumer segments. The first group consisted of 23.9%, the second of 50.3%, the third of 13.3%, and the fourth of 12.4% of the total sample. According to the discriminant analysis, 96.7% of cases were classified correctly. In Table 2, the results of the factor and cluster analysis including mean values of the corresponding statements are included. The mean values of the statements were used for the analysis because they were more suitable for the interpretation. The values allow a direct recognition of the differences.

Table 2 illustrates that two clusters (cluster 1 and 2, 74.2% of the total sample) rated the advantages of a stockfree-organic agriculture as important. The two clusters (1 and 2) differed, e.g., in the importance rating of the disadvantages.

Cluster 1 (named "contesting the use of animals") evaluated the advantages of a stockfree-organic agriculture as the highest. Some disadvantages were not important to them while others were. Cluster 2 ("slight supporter") rated the advantages as important but not as high as the "contesting the use of animals (1)" cluster. Besides, the disadvantages were important to the "slight supporter (2)" cluster.

The other two clusters (clusters 3 and 4, 25.7% of the total sample) rated the acceptance and the advantages as not important. On the one hand, the "slight rejecter (3)" cluster considered the disadvantages as important while, on the other hand, the "not interested (4)" cluster regarded the disadvantages as highly unimportant. The "slight rejecter (3)" cluster evaluated the advantages in a more differentiated way. Some were rated as important and others as unimportant. The disadvantages were consistently regarded as important. The "not interested (4)" cluster regarded the advantages of stockfree-organic agriculture as very unimportant and therefore did not recognise them as advantages. Furthermore, they also considered the disadvantages to be unimportant. Moreover, it was analysed whether the clusters had different attitudes (Table 3) to support stockfree-organic agriculture.

Table 3. Results of the four-cluster solution based on the principle component analysis of consumers' attitudes evaluation.

	Contesting the Use of Animals (1)	**Slight Supporter (2)**	**Slight Rejecter (3)**	**Not Interested (4)**	**Sample**
n (%)	108 (23.9)	227 (50.3)	60 (13.3)	56 (12.4)	N = 451 (100)
Animal welfare attitude, CA: 0.88	**1.64^{a} (0.52)**	**1.30^{b} (0.69)**	**1.31^{b} (0.64)**	**0.56^{c} (1.16)**	**1.29 (0.78)**
In the production of animal food, animals should be treated with dignity. (0.82)	1.70^{a} (0.54)	1.37^{b} (0.73)	1.39^{b} (0.74)	0.68^{c} (1.28)	1.36 (0.84)
In the production of animal food, we should make sure that the animals had a good life. (0.79)	1.65^{a} (0.57)	1.34^{b} (0.73)	1.37^{b} (0.76)	0.51^{c} (1.30)	1.32 (0.86)
The right to physical integrity of animals should be respected in the production of animal-based foods (e.g. no castration, no removal of tails (piglets)). (0.73)	1.55^{a} (0.65)	1.20^{b} (0.85)	1.18^{b} (0.79)	0.50^{c} (1.30)	1.19 (0.92)
Rejection of animal use, CA: 0.70	**0.41^{a} (0.67)**	**–0.04^{b} (0.71)**	**–0.69^{c} (0.68)**	**–0.78^{c} (0.78)**	**–0.11 (0.82)**
The production of animal-based food should be avoided, as the use and keeping of animals is morally unacceptable. (0.78)	0.29^{a} (1.04)	–0.19^{b} (0.99)	–1.05^{c} (0.95)	–1.00^{c} (1.10)	–0.29 (1.11)
In the production of non-animalbased foods (e.g., cereals, fruit, vegetables), care should be taken to ensure that these are produced without animal by-products (e.g. animal meal, animal blood, slurry). (0.70)	1.07^{a} (0.86)	0.55^{b} (1.05)	–0.10^{c} (1.20)	–0.36^{c} (1.24)	0.48 (1.15)
In the production of non-animal based food (e.g., cereals, fruit, vegetables), animals should be completely excluded. (0.68)	0.94^{a} (0.92)	0.25^{b} (1.01)	–0.17^{bc} (1.15)	–0.39^{c} (1.26)	0.28 (1.13)
The keeping of dogs and cats is morally unacceptable. (0.58)	–0.65^{a} (1.21)	–0.78^{a} (1.10)	–1.40^{b} (0.89)	–1.36^{b} (0.80)	–0.91 (1.10)
Environmental attitudes, CA: 0.84	**1.38^{a} (0.51)**	**1.05^{b} (0.59)**	**1.00^{c} (0.65)**	**0.46^{b} (0.97)**	**1.05 (0.69)**
Food should be packaged in an environmentally friendly way. (0.77)	1.64^{a} (0.57)	1.35^{b} (0.75)	1.27^{b} (0.76)	0.69^{c} (1.16)	1.33 (0.82)
Food was produced in a way that did not affect the balance of nature. (0.75)	1.00^{a} (1.02)	0.77^{a} (0.91)	0.70^{a} (0.87)	0.20^{b} (1.06)	0.75 (0.97)
Food has been produced in an environmentally friendly way. (0.74)	1.26^{a} (0.80)	0.87^{b} (0.79)	0.82^{b} (0.89)	0.23^{c} (1.17)	0.88 (0.91)
If possible, food packaging should be avoided. (0.72)	1.44^{a} (0.73)	1.07^{b} (0.85)	0.93^{b} (1.02)	0.41^{c} (1.19)	1.06 (0.94)
When soil resources are used, it is important to return resources to the soil. (0.71)	1.58^{a} (0.53)	1.19^{b} (0.71)	1.34^{b} (0.71)	0.73^{c} (1.15)	1.24 (0.78)
Attitudes towards social justice with regard to farmers, CA: 0.56	**0.35^{a} (0.51)**	**0.09^{b} (0.44)**	**–0.01^{b} (0.48)**	**–0.05^{b} (0.56)**	**0.12 (0.50)**
*The farmer gets enough money for his products. (–0.76)	–0.76 (0.97)	–0.63 (0.98)	–0.72 (1.09)	–0.50 (1.21)	–0.65 (1.03)
*The working pressure in agriculture is high. (0.75)	1.28^{a} (0.72)	0.90^{bc} (0.89)	1.00^{abc} (1.03)	0.64^{c} (1.07)	0.97 (0.91)
*The health of farmers is at risk. (0.64)	0.54^{a} (0.83)	0.01^{b} (0.85)	–0.32^{b} (1.02)	–0.29^{b} (1.06)	0.05 (0.94)

Table 3. *Cont.*

	Contesting the Use of Animals (1)	Slight Supporter (2)	Slight Rejecter (3)	Not Interested (4)	Sample
Spiritual attitudes, CA: 0.60	**0.62[a] (0.78)**	**0.15[b] (0.68)**	**–0.03[b] (0.72)**	**–0.57[c] (0.79)**	**0.15 (0.80)**
I take the time to meditate, pray or something like that to find my inner peace/balance. (0.80)	–0.15[a] (1.29)	–0.67[b] (1.21)	–0.97[bc] (1.12)	–1.34[d] (1.08)	–0.67 (1.25)
When I am in nature, I feel a strong connection. (0.75)	1.22[a] (0.84)	0.76[b] (0.94)	0.90[bc] (0.86)	0.07[d] (1.23)	0.79 (1.01)
I try to make a significant contribution to society by reducing animal suffering. (0.44)	0.80[a] (0.94)	0.37[b] (0.82)	–0.02[bc] (1.07)	–0.43[c] (1.01)	0.32 (0.98)

Notes: Question: "How important are the following statements to you?", CA= Cronbach's alpha for the factors; numbers in brackets behind the items indicate loadings on the factor above; 64.15% of total variance explained; Bartlett's test of sphericity: p = 0.000; KMO = 0.864; values for each cluster in the row of the factors are mean index values; means (standard deviation); different letters a, b, c, and d indicate a significant ($p < 0.05$) difference between groups according to the post-hoc test (Games–Howell or Tukey); scale from −2 = "It is not important to me at all" to +2 = "It is very important to me"; * question: "To what extent do you agree with the following statements?"; scale from −2 = "I do not agree at all" to +2 = "I totally agree".

The evaluation of the different attitudes leads to the conclusion that the "contesting the use of animals (1)" cluster attached the greatest importance to all different attitudes. The "not interested (4)" cluster's answers assigned the lowest importance or highest unimportance to each attitude.

The "contesting the use of animals (1)" cluster considered it to be very important to ensure animal welfare and, as a result, that animals should be treated well during the production of animal-based food products. Respondents tended to reject the use of animals. The environmental attitude was very important to them as well. Food packaging played a particularly decisive role here and should be environmentally friendly or completely omitted. Spirituality was in some way important to respondents. The least importance was attached to the attitudes towards social justice with regard to farmers.

The "slight supporter (2)" cluster attached the greatest importance to animal welfare attitudes as well, i.e. respondents wanted animals to be treated well. The rejection of animal use was neither important nor unimportant to them. The environmental attitudes received the second-most importance to them. The attitudes towards social justice with regard to farmers and spiritual attitudes were judged to be neither important nor unimportant.

The "slight rejecter (3)" cluster rated animal welfare attitudes as important but considered the rejection of animal use as unimportant. Environmental motivation was as important to them as it was to the "slight supporter (2)" cluster. The attitudes towards social justice with regard to farmers and spiritual attitudes were assessed as neither important nor unimportant.

The "not interested (4)" cluster considered animal welfare attitudes as somewhat important to them but did not reject the use of animals. Environmental attitudes were assigned nearly the same importance as animal welfare attitudes. The attitudes towards social justice with regard to farmers were neither important nor unimportant, while spiritual attitudes were unimportant to them.

Overall, it can be seen that all clusters attached the greatest importance to animal welfare and environmental attitudes. In addition, the participants of the four clusters differed in their healthy eating behaviour and their food consumption in the past seven days (Table 4).

Table 4. ANOVA analysis of healthy eating and dietary variables of the four clusters.

	Contesting the Use of Animals (1)	Slight Supporter (2)	Slight Rejecter (3)	Not Interested (4)	Sample
n (%)	108 (23.9)	227 (50.3)	60 (13.3)	56 (12.4)	N = 451 (100)
I avoid fried food.	0.47^{a} (1.11)	0.24^{a} (1.15)	0.15^{a} (1.18)	-0.36^{b} (1.20)	0.21 (1.17)
I often eat legumes (e.g., beans, chickpeas, lentils).	0.21^{a} (1.04)	-0.06^{ab} (0.99)	-0.18^{ab} (0.95)	-0.38^{b} (1.05)	–0.05 (1.02)
I often eat nuts and seeds (e.g., sunflower seeds, walnuts, hazelnuts).	0.42^{a} (1.23)	-0.09^{ab} (1.11)	0.10^{ab} (1.15)	-0.25^{b} (1.28)	0.04 (1.19)
I do not consume much salt.	0.29^{a} (1.13)	0.30^{a} (1.06)	-0.05^{ab} (1.20)	-0.20^{b} (1.00)	0.18 (1.10)
I prefer whole grain products.	0.46^{a} (1.16)	0.28^{a} (0.97)	-0.03^{ab} (1.23)	-0.39^{b} (1.07)	0.20 (1.10)
*How often have you eaten organic products in the past 7 days?	3.06^{a} (1.14)	2.38^{b} (1.09)	2.02^{bc} (0.91)	1.55^{c} (0.78)	2.39 (1.14)
*How often have you eaten vegan meals (no animal products) in the past 7 days?	2.41^{a} (1.20)	1.93^{b} (0.94)	1.48^{c} (0.75)	1.34^{c} (0.67)	1.91 (1.02)
*How often have you eaten vegetarian meals (no meat and fish but other animal ingredients) in the past 7 days?	3.20^{a} (1.30)	2.57^{b} (1.15)	2.50^{b} (1.20)	1.70^{c} (1.03)	2.60 (1.25)
*How many times have you eaten meat in the past 7 days?	2.61^{a} (1.20)	3.07^{b} (0.91)	3.27^{bc} (0.86)	3.50^{c} (1.04)	3.04 (1.04)

Notes: n = number of respondents; means (standard deviation); different letters a, b, and c indicate a significant ($p < 0.05$) difference between groups according to post-hoc testes (Games–Howell or Tukey); scale from −2 = "Not applicable at all" to +2 = "Totally applicable ", and * scale from 1 = "never" to 5 = "very often".

The "contesting the use of animals (1)" cluster followed the healthiest diet compared to the other clusters, e.g., they often ate legumes, nuts and seeds, whole grain products, and avoided fried food. When answering the questions about food consumption in the past seven days, it was noticeable that the "contesting the use of animals (1)" cluster most often ate organic products, vegan, and vegetarian meals. In addition, they consumed the least amount of meat. The "not interested (4)" cluster, on the other hand, followed the unhealthiest diet, as they rarely consumed foods such as whole grain products or legumes. In addition, they most frequently consumed meat and rarely vegan or vegetarian meals. The other two clusters (slight supporter (2) and slight rejecter (3)) were located between the two extreme clusters.

Moreover, the clusters were compared according to their diets (Table 5). The "contesting the use of animals (1)" cluster consisted of all vegans and lacto-vegetarians of the sample and the majority of flexitarians and ovo-lacto-vegetarians. The "slight supporter (2)" cluster included many omnivore and flexitarians and some ovo-lacto-vegetarians. The "slight rejecter (3)" and "not interested (4)" clusters did not differ in terms of their diets. Both clusters contained the highest proportion of omnivores and were even above the sample distribution (Table 5).

The group comparison based on sociodemographic characteristics (age, gender, income, education) led to minimal differences, while knowing about stockfree-organic agriculture did not lead to a higher acceptance (Appendix B).

Table 5. Mean comparison of consumers' diets between the four clusters using cross tabulation.

	Contesting the use of animals (1)	**Slight supporter (2)**	**Slight Rejecter (3)**	**Not interested (4)**	**Sample**
n (%)	108 (23.9)	227 (50.3)	60 (13.3)	56 (12.4)	N = 451 (100)
Omnivore	58.3^{a}	84.1^{b}	95.0^{c}	92.9^{bc}	80.5
Flexitarian	24.1^{a}	13.2^{b}	5.00^{b}	5.4^{b}	13.7
Pescatarian	0.9^{a}	1.3^{a}	0.0^{a}	1.8^{a}	1.1
Ovo-Lacto-Vegetarian	10.2^{a}	1.3^{b}	0.0^{b}	0.0^{b}	3.1
Lacto-Vegetarian	1.9^{a}	0.0^{b}	0.0^{ab}	0.0^{ab}	0.4
Vegan	4.6^{a}	0.0^{b}	0.0^{ab}	0.0^{ab}	1.1

Notes: Question: "Which diet do you follow?"; data in percent; differences between clusters were tested using Chi-square test and cross tabulation z-test ($p = 0.05$); different letters a, b, and c indicate a significant ($p < 0.05$) difference between groups.

5. Discussion

Currently, there are many discussions on how to further develop agricultural systems. Stockfree-organic agriculture is one of many emerging agricultural production systems. Therefore, the aim of this study was to find out consumers' attitudes towards stockfree-organic agriculture. This is important to better understand the potential of a relatively new cultivation method.

To our knowledge, the present study is the first consumer segmentation based on the acceptance and perceived advantages and disadvantages of stockfree-organic agriculture. Subsequently, different ethical, environmental, social, and spiritual attitudes as well as food consumption patterns were examined for the description of the cluster differences. Therefore, this study provides a deeper understanding of the individual target groups that accept and rate the advantages and disadvantages of stockfree-organic agriculture differently, and differ with regard to their attitudes towards animal welfare, their rejection of animal use, the importance they attribute to environmental, social, and spiritual aspects, and their dietary behaviour.

About a quarter of the German population judged stockfree-organic agriculture positively. The majority of consumers of all clusters rated several attitudes (animal welfare considerations and environmental aspects) to support stockfree-organic agriculture as important. The result that several attitudes played a role in the evaluation of stockfree-organic agriculture is in line with other studies that have already shown that common motivations to reduce meat consumption are based on animal welfare considerations, and environmental aspects [11,57].

The consumer segmentation resulted in a four-cluster solution. The first segment, "contesting the use of animals (1)", attributed the highest importance to the acceptance and the advantages of stockfree-organic agriculture, while the disadvantages were of no great importance to them. This segment was the second-largest and accounted for approximately 24% of the German population. It expressed concern about the consumption of animal-based food products and thereby showed a positive attitude towards stockfree-organic agriculture. However, this segment was somewhat uncertain with regard to assessing potential disadvantages. The high support of stockfree-organic agriculture in this cluster is reflected by the high number of vegetarians/vegans and consumers who rejected animal usage for food products. Comparatively, many more consumers in this cluster rejected the animal usage than actually followed a vegetarian or vegan diet. It can be assumed that they struggle with an inner conflict between their inner values and their actual behaviour (attitude-behaviour gap), which is known as 'meat paradox' in the literature [58,59]. Hölker et al. [52] also identified a segment which includes consumers who reject animal usage, and only a small proportion of them implemented this rejection in their diets. This segment also dedicated the highest importance to different attitudes. In particular, animal welfare and environmental attitudes need to be mentioned here. The consumers of this segment considered it very important not to use animals, and especially not to use animal by-products in the production of non-animal-based foods. Kilian

et al. [45] showed that vegans accept manure based on animal faeces more frequently than, for example, fertilization with horn meal. The lower acceptance of animal by-products can be seen as a logical conclusion of the rejection of livestock farming and clearly shows that this segment does not want animals to be used and be part of the food production chain. Consumers are willing to pay a price premium for stockfree-organic produces [45]. A study by Hölker et al. [60] shows that a part of the population completely rejects animal usage, which is in line with our results. Moreover, the highest share of vegetarians and all vegans of the sample are accumulated in this segment. In addition, the highest proportion of consumers following a flexitarian diet is represented here. Therefore, one explanation for the fact that these groups placed high importance on the acceptance and advantages, while low importance was placed on the disadvantages of stockfree-organic agriculture, could be that they are aware of the disadvantages and want to reduce them. Therefore, they might have already adjusted their diet accordingly. Pelletier et al. [61] have found that young adults who place a higher emphasis on alternative food production practices have a healthier diet. This result is also reflected in our results, as this cluster followed the healthiest diet (Table 4) [62–64] compared to the other clusters and showed the highest acceptance level. Lund et al. [65] and Hölker et al. [52] have also shown that there is a link between one's attitude to animal welfare considerations and dietary habits. Respondents who attached great importance to animal welfare aspects tended to follow a flexitarian, vegetarian, or vegan diet [52,65].

The second segment, "slight supporter (2)", was the largest in the study and contained an average consumer group (the mean values of this segment were close to the mean values of the overall sample). As they had the same mean values for both environmental attitudes and animal welfare considerations as the entire sample, it is evident that these two topics are of general importance to the population, which is also shown in other studies [1,52,66,67]. The "slight supporters (2)" had some animal welfare concerns, as the "slight rejecter (3)" segment. In contrast to the "slight rejecters (3)", however, they did not recognise any major disadvantages of stockfree-organic agriculture. When compared with the "contesting the use of animals (1)" segment, they did not realise the advantages of stockfree-organic agriculture. In more detail, "slight supporters (2)" differed from the "contesting the use of animals (1)" segment in terms of a lower importance of the advantages of a stockfree-organic agriculture. When evaluating the disadvantages, both clusters (1 and 2) differed only in one score (loss of farm animal breeds), the "slight supporters (2)" considering it more important than the "contesting the use of animals (1)" cluster. The "slight supporter (2)" cluster might have recognised the consequences of the exclusion of farm animals. From this it can be presumed that they recognised the advantages of stockfree-organic agriculture but may not have wanted to lose the traditional image of agriculture, which includes the idyllic scenery with farm animals on a meadow and the recreational value of the agricultural landscape [68]. The weaker evaluation of the advantages is also reflected in the diet of the "slight supporter (2)" cluster. There were no vegans and fewer ovo-lacto-vegetarians and flexitarians than in the "contesting the use of animals (1)" cluster, and thus they gave lower importance to the advantages. Hölker et al. [52] showed that the abolitionism argumentation (i.e., that humans are not allowed to use animals for their own purposes at all) leads to a reduction in the consumption of animal-based foods. "Slight supporters (2)" judged it as somewhat important not to use animal by-products in the production of non-animal-based foods. In this cluster, flexitarians were represented to the same extent as in the average sample. It is possible that this cluster was dissatisfied with the circumstances of the current livestock production and therefore reduced its meat consumption [12,69]. Overall, the eating behaviour in this cluster seems to be quite average (most values were very close to the average sample). In comparison to the "contesting the use of animals (1)" cluster, they consumed meat more frequently and vegetarian and vegan dishes less frequently. They ate a little less healthily than the "contesting the use of animals (1)" cluster, e.g., they ate fewer legumes, nuts, and seeds.

The third segment was the second smallest and was called "slight rejecter (3)". They did not really see the advantages and recognised possible disadvantages of stockfree-organic agriculture. Moreover, they differed from the "not interested (4)" cluster in that they considered the advantages as slightly unimportant, while the "not interested (4)" cluster did not see any advantages. In contrast, the

"slight rejecters (3)" regarded the disadvantages of a stockfree-organic agriculture as highly important. They considered environmental attitudes and animal welfare concerns as important. Consumer awareness of environmental and animal welfare aspects in food consumption has increased in recent years [70]. Other consumer segmentations also show clusters that pay attention to environmental and animal welfare aspects [52,70]. This cluster did not reject the use of animals for food products. In the production of non-animal-based foods, they did not value the exclusion of animal by-products. It is possible that vegan products (the word vegan) was met with rejection/reactance, a known defence reaction [71]. The majority of consumers in this cluster ate meat products regularly; however, 5.0% of the segment were flexitarians. The "slight rejecters (3)" did not differ from the "not interested (4)" cluster in the frequency of their meat consumption, but they ate vegetarian meals more frequently, and their meals were slightly healthier. Their current meat consumption, which was above that of the average sample, may have been due to their routine eating habits and cooking of well-known dishes. To change diet is difficult and long-lasting process for consumers [72,73].

The last segment was the smallest and was called "not interested (4)". It was characterised by the fact that its members judged the acceptance, advantages, and disadvantages of stockfree-organic agriculture as unimportant. The "not interested (4)" cluster considered the exclusion of animal by-products in the food production of non-animal-based foods to be extremely unimportant. This attitude may stem from the fact that these respondents consumed meat very frequently and were not interested in vegetarian/vegan dishes. 92.9% of the respondents in this cluster followed an omnivore diet, only 5.4% a flexitarian diet, and 1.8% a pescatarian diet, meaning that all respondents consumed animal products. Such a segment, consisting only of meat eating consumers, could also be identified in previous consumer segmentation [52]. The high consumption of meat can still originate from traditional German dishes, since German cuisine is originally very meaty [74]. A vegetarian/vegan diet has no rooted tradition in Germany, and therefore the participants may respond with reactance [71]. Other studies also show that meat lovers exist in the population [75,76]. Verain et al. [77] have carried out a consumer segmentation which examined the willingness to reduce meat consumption. They found that there was one segment which consistently rejected reducing meat consumption and consumed meat very frequently (six times a week) [77]. In addition, the "not interested (4)" cluster ate the unhealthiest food compared to the other three segments. Past research found out that high meat consumption is associated with an unhealthier food intake [78]. Another reason might be that consumers are more interested in the short-term enjoyment of tasty food than in the long-term consequences of an unhealthy diet. Another study found out that there are consumers who believe that taste and a healthy product correlate negatively [79]. For them, taste is more important than a healthy diet [79]. A further reason might be that they do not want to restrict their food choices to specific products, or that they are simply not interested in agricultural and nutritional topics.

6. Conclusions and Limitations

Surprisingly, stockfree-organic agriculture was known by 17% of respondents, although it is in an early phase of the diffusion process and not widespread. Because of that, this study can be classified as explorative. The majority of respondents were confronted with this topic for the first time in their lives during the survey. Because of that, the concept of stockfree-organic agriculture had to be explained to respondents (Appendix A). The study therefore measures spontaneous perceptions and evaluations rather than stable attitudes. Stockfree-organic agriculture, if widespread, would have the potential to profoundly change agriculture, including organic farming, and to render it more sustainable. Therefore, this trend study is important.

Overall, it can be seen that stockfree-organic agriculture is supported by considerably more citizens (23.9%) than only vegans (1.1%). It can be concluded that potentially up to 24% of society evaluates vegan food products from stockfree-organic agriculture very positively. Vegans reject the use of animals because of their attitudes, and therefore stockfree-organic agriculture is a logical continuation of their dietary style. However, these days, it is not possible to follow a diet without animal by-products

used in food production, but foods without animal by-products are important for consumers who follow a vegan lifestyle. Therefore, it is important to communicate that stockfree-organic products exclude all use of animals. Since many consumers who purchase and eat a lot of organic food often opt for organic food for ethical reasons, it is important to make them aware of the advantages of stockfree-organic agriculture, which excludes all animal usage. If consumers were aware of this, it would probably lead to increased demand, from which farmers of stockfree-organic products would benefit. Since 24% of the population rate products of stockfree-organic agriculture positively, it can be cautiously concluded that consumers might also be willing to consume them. Assuming that the products are readily available and recognisable at the points-of-sale, it can be assumed that they will be in demand by consumers. Farmers who already operate an organic farm could consider whether it would be more economical to switch to stockfree-organic agriculture.

The results and assessments of the respondents should be interpreted with caution and might be biased by the given information. Furthermore, the estimate of consumed food in the past seven days was a self-estimation in this study and therefore might deviate from true values. Additionally, the sample is based on German consumers, and the results might therefore deviate for other countries due to social and cultural aspects. Since stockfree-organic agriculture is not yet widespread in Germany, it is not possible to exclusively eat such products. For this reason, we could only measure attitudes and intentions, not actual buying behaviour. It would be interesting to conduct a further study on the evaluation of the acceptance, advantages, and disadvantages if this were a more established cultivation method.

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Appendix A

Original German Text of the Stockfree-Organic Agriculture Explanation

In Deutschland entwickelt sich gerade eine neue Anbaumethode. Diese erweitert die ökologische Landwirtschaft um Prinzipien aus der veganen Ernährungsweise. Dabei werden Lebensmittel nach ökologischen Standards angebaut und kommen nur mit veganen Produkten in Berührung. Sie wird bio-vegane Landwirtschaft genannt. Julia und Johannes ernähren sich biovegan, d.h. sie essen keine Lebensmittel, die vom Tier stammen und zusätzlich bevorzugen sie Lebensmittel, die während der Produktion nicht mit tierischen Produkten in Berührung kamen. Sie essen kein Fleisch, Fisch, Eier, Milchprodukte und Honig. Des Weiteren wurden die Lebensmittel nach ökologischen Standards angebaut. Beim Abendessen trinken sie gerne mal ein Glas Wein. Sie rauchen nicht und gehen einmal wöchentlich zum Sport. Julia ist nicht schwanger. Es werden keine tierischen Produkte verwendet, z.B. Gülle, Hornspäne oder Blutmehl zur Düngung der Felder. Die bio-vegane Landwirtschaft strebt eine vollständige Entkopplung von tierischen Produkten aus der Nutztierhaltung an. Außerdem werden alle Bedingungen, die in der ökologischen Landwirtschaft gelten, eingehalten wie z.B. der Verzicht von synthetischen Dünge- und Pflanzenschutzmitteln.

Translation to English of the Original German Text of the Stockfree-Organic Agriculture Explanation

A new cultivation method is currently developing in Germany. This extends the organic agriculture based on principles from the vegan diet. Food is cultivated according to organic standards and only comes into contact with vegan products. This is called stockfree-organic agriculture. Julia and Johannes

eat stockfree-organic, i.e., they do not eat food that comes from animals and, additionally, they prefer food that did not come into contact with animal products during production. They do not eat meat, fish, eggs, dairy products, and honey. Furthermore, the food was produced according to ecological standards. At dinner they like to have a glass of wine. They do not smoke and practice sports once a week. Julia is not pregnant. No animal products are used, e.g. manure, horn meal, or blood meal to fertilise the fields. Stockfree-organic agriculture aims at a complete decoupling of animal products from livestock farming. In addition, all conditions that apply to organic farming, such as the renunciation of synthetic fertilisers and pesticides, are applied.

Appendix B

Table A1. Cluster differences according to sociodemographic variables and knowledge about stockfree-organic agriculture.

		Contesting the Use of Animals (1)	Slight Supporter (2)	Slight Rejecter (3)	Not Interested (4)	Sample
	n (%)	108 (23.9)	227 (50.3)	60 (13.3)	56 (12.4)	N = 451 (100)
Gender	Male	38.0^{a}	52.0^{b}	53.3^{ab}	60.7^{b}	49.9
	Female	62.0^{a}	47.6^{b}	46.7^{ab}	39.3^{b}	49.9
	Divers	-	0.4	-	-	0.2
Age		43.8^{a}	52.6^{b}	53.5^{b}	49.5^{ab}	50.3
Education	No graduation (yet)	1.9^{a}	1.8^{a}	1.7^{a}	3.6^{a}	2.0
	Certificate of Secondary Education	25.0^{a}	37.4^{a}	36.7^{a}	42.9^{a}	35.0
	General Certificate of Secondary Education	26.9^{a}	31.3^{a}	31.7^{a}	33.9^{a}	30.6
	General qualification for university entrance	26.9^{a}	11.5^{b}	6.7^{b}	10.7^{b}	14.4
	University degree	19.4^{ab}	18.1^{ab}	23.2^{a}	8.9^{b}	18.0
Income	Below €1,300	27.8^{a}	27.3^{a}	18.3^{a}	19.6^{a}	25.3
	€1,300 - €2,599	47.2^{a}	37.9^{a}	40.0^{a}	39.3^{a}	40.6
	€2,600 - €4,999	19.4^{a}	27.3^{ab}	30.0^{ab}	35.7^{b}	26.8
	Above €5,000	5.6^{a}	7.5^{a}	11.7^{a}	5.4^{a}	7.3
*Knowledge of stockfree-organic agriculture	Yes	0.31^{a} (0.47)	0.05^{b} (0.23)	0.13^{c} (0.34)	0.07^{b} (0.25)	0.16 (0.37)

Note: Data in percent; * question: Do you know about stockfree-organic agriculture? yes (1)/no (0); mean (standard deviation); differences between clusters were tested using ANOVA or Chi-square test and cross tabulation z-test ($p = 0.05$); letters a and b indicate a significant ($p < 0.05$) difference between groups.

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