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Environmental Enrichment in pig husbandry: Consumer comparative assessment of different housing elements based on a pictorial survey

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Environmental Enrichment in pig husbandry – Consumer comparative assessment of different housing elements based on a pictorial survey

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Abstract

In recent years livestock production became a special focal point in public debate, with animal welfare particularly turning out to be a major concern. Since pig husbandry systems are characterised by intensive production systems, where animals are often kept on slatted floor in an extremely barren environment, consumers' distinctive concern about pigs' welfare is not surprising. Previous researches revealed a clear public demand for a more species-appropriate pig husbandry and in this context identified various enriching housing elements to be important for ensuring animal welfare. However, to our knowledge, research addressing specific and comparative assessment of individual enriching housing elements by consumers, has been lacking so far. For our study we selected 14 housing elements which are commonly known to potentially enrich the pigs' environment, including outdoor runs, straw as bedding and enrichment substrate, different enrichment objects (toys) as well as cooling facilities. In order to give participants an idea of each element and therefore facilitate rating, we used a pictorial-based survey design. Thus German consumers were asked to rate elements regarding their benefit for animal welfare, to indicate their desire for availability in a pigsty and furthermore to evaluate respective costs and practicability. With regard to benefit for animal welfare, wallows seemed to be appreciated most, closely followed by straw as bedding and distraction material in a separate rooting area, but showers, tubs and straw as distraction material in containers were rated positive as well. In contrast, the slatted outdoor run and all four enriching objects performed relatively poor, even though rating was only slightly not positive. Overall, costs associated with the installation/usage of the respective housing elements were evaluated rather low and practicability issues were more or less neglected. Furthermore our cluster analysis revealed several rating-influencing factors such as attitude towards or perception of animal protection and sociodemographic characteristics.

We consider our results to be relevant in the context of future production systems, as for justifying animal husbandry and increasing its acceptance in the public, the integration of social demands, like desire for a more animal friendly production including specific enriching housing elements, is indispensable.

Keywords: Animal welfare, pig husbandry, environmental enrichment, consumer acceptance, public concern

1. Introduction

Modern livestock agriculture is characterised by intensive production systems, where a large number of animals is kept at a confined space in order to reduce production costs. Whilst the improved efficiency of such modern practices results in lower prices for consumers, animal welfare suffers (Akaichi and Revoredo-Giha, 2016; Krystallis et al., 2009; Lassen et al., 2006). As nowadays attitudes towards food production and the societal acceptability of specific production processes are no longer determined only by nutritional, beneficial, risky or economic factors, but also by ethical and moral concerns (Frewer et al., 2005), it is not surprising, that animal husbandry became more and more subject of extensive public criticism during the last decades (Bergstra et al., 2017, 2015; de Barcellos et al., 2013; Frewer et al., 2005; Krystallis et al., 2009). In addition to issues regarding organic production (Hoefkens et al., 2009; Thøgersen, 2010; Zanolli and Naspetti, 2002) and the use of genetically modified organisms (Grunert et al., 2003), animal welfare turned out to be a focal point of consumer interest in many western societies (Boogaard et al., 2011b, 2006; Frewer et al., 2005; Uzea et al., 2011; Verbeke, 2009). Particularly in north-western European countries the debate on environmental protection and animal welfare is quite intense and has already led to the implementation of higher standards in some places (Boehm et al., 2010; Miele et al., 2011; Vanhonacker et al., 2012; Vanhonacker and Verbeke, 2014).

There exist various scientific approaches defining the term “animal welfare”, demonstrating its multidimensional nature (Blokhuys et al., 2013b). However when it comes to the public’s perception of animal welfare as an appropriate simple description the generic term “naturalness”, including housing system, feed, breeding methods, the use of medicines and any farmer-animal contact, can be used (Boogaard et al., 2011b, 2008; Weible et al., 2016). In other words, the public desire for farm animal welfare comprises natural behaviour in a natural environment (Webster, 2001). Nowadays in the EU more than nine out of ten citizens share the view that it is important to protect the welfare of farmed animals and 82 percent of the European population state, that welfare standards should be improved (Eurobarometer, 2016). A study from a Dutch research team provide evidence about consumers’ increased concerns referring to the welfare of mammals (i.e. pigs) compared to non-mammalian farmed species (i.e. fish) (Frewer et al., 2005). Furthermore Europeans are more concerned about the exploitation of animals and animal welfare in industrial or rather conventional housing systems than in organic alternatives (Boogaard et al., 2011b; Miele et

al., 2013) and housing conditions of chickens and pigs are criticised most (Evans and Miele, 2008; Kayser et al., 2012b; Miele et al., 2013). Even though this overall high concern regarding animal welfare obviously lead to an increased willingness to pay for products produced in more animal friendly housing systems (Dransfield et al., 2005; Eurobarometer, 2016; Kehlbacher et al., 2012; Napolitano et al., 2010; Risius and Hamm, 2017), actual market shares of these products are merely small, similar to niche markets (Verbeke, 2009). Nevertheless the public's attitudes towards animal husbandry and concerns about animal welfare can be considered as an potential starting point for marketing and communication activities in order to increase marketability of these products (Verbeke, 2009).

Modern pig production is characterised by intensive production systems, where animals are often kept under extremely barren housing conditions on slatted floors, without any straw as bedding or distraction material or outdoor access (Barnett et al., 2001; van de Weerd and Day, 2009; Zander et al., 2013). Under these conditions pigs are not able to sufficiently express their natural and highly motivated behaviour patterns including for example foraging, exploration or wallowing in the mud, which adversely affects animal welfare (Barnett et al., 2001; European Food Safety Authority (EFSA), 2007; Hsia et al., 1974; van de Weerd and Day, 2009). According to results from previous investigations, serious public concern exists about current pig husbandry, which is often highly associated with the negative loaded term "factory farming" (Kayser et al., 2012b), with an overall striking demand for more species-appropriate production systems (Boogaard et al., 2011b; Zander et al., 2013). Even though criticism referring to space seems predominant (Harper and Henson, 2001; Kayser et al., 2012b; Te Velde et al., 2002; Vanhonacker et al., 2009; Wildraut et al., 2015; Zander et al., 2013), people obviously have further specific ideas of elements contributing to a better animal welfare. For example they argue for outdoor access (Boogaard et al., 2011b; Lusk et al., 2007; Wildraut et al., 2015; Zander et al., 2013) and natural floor conditions (i.e. straw, grass, mud) (Boogaard et al., 2011b; Wildraut et al., 2015), emphasise the importance of providing distraction material or objects (Boogaard et al., 2011b; Busch et al., 2015; Wildraut et al., 2015; Zander et al., 2013) and appreciate the installation of sprinklers or mud wallows for cooling reasons (Boogaard et al., 2011b; Lassen et al., 2006). In a nutshell, consumers definitely call for housing conditions where animals are able to show natural behaviour and to satisfy natural desires (Lassen et al., 2006; Sørensen and Fraser, 2010; Te Velde et al., 2002) and in this context named various housing elements to be important for improving the pigs' welfare. However as to our knowledge, the specific and comparative assessment of individual enriching housing ele-

ments by consumers, has not been investigated yet, our study aimed to close this research gap. We are aware, that not only public demand should be taken into account when discussing and developing more animal friendly production systems, but animals' and farmers' perspectives as well. However, within the scope of the present study we focused on the consumers point of view, as for justifying animal husbandry within society and government the integration of social demands, such as the increasing desire for a more animal friendly production, is indispensable (Boogaard et al., 2011b; Verbeke et al., 2010). Thus it is important to have an idea of consumers appreciations and concerns and direct the development of animal welfare measures or rather changes in animal husbandry, to these specific aspects (Bergstra et al., 2017; Boogaard et al., 2011b; Delezie et al., 2006; Vanhonacker et al., 2008).

The aim of the present study was to find out how consumers rate different enriching housing elements regarding benefit for animal welfare and how they vote for an unconditional availability of the respective elements in a pigsty. Furthermore we wanted to find out how participants estimated costs and practicability and, as several studies proved the influence of sociodemographic characteristics or the attitude towards animal protection on the perception of animal husbandry (Boogaard et al., 2011a; Ermann et al., 2017; Kayser et al., 2012a; María, 2006; McKendree et al., 2014; Schulze et al., 2008; Zander et al., 2013), we additionally included this kind of data in our analysis. Participants were recruited via an online panel by quota sampling and submitted a survey, consisting of a mixture of questionnaire and pictures of several housing elements. As enriching elements outdoor runs, wallows, tubs and sprinklers, straw as bedding and enrichment material and some enrichment objects (toys) were selected. The results could provide a more detailed insight into consumers specific ideas or rather preferences regarding an animal friendly pig production. This knowledge could help with the development of future pig husbandry systems, which are not only adjusted to animals' and farmers' needs, but also receive appreciation and acceptance through the public.

2. Material and methods

2.1 Definition of animal welfare and selection of welfare criteria for the survey

There have been various definitions of the term animal welfare elaborated during the last decades, with researchers either focusing on the animal's functioning in its environment, on animal feelings or on natural living conditions (Blokhuys et al., 2013b; Dawkins, 1980; Duncan, 1993; Hewson, 2003; Rollin, 1981). Therefore animal welfare cannot be considered as a unitary concept consisting of one individual psychological or physiological mechanism, but rather contains many different characteristics (Blokhuys et al., 2013b). According to Fraser (1995, 1993) animal welfare can be described as a multidimensional concept comprising three main dimensions, including a high level of biological functioning, freedom from suffering and last, the presence of positive experience. This multidisciplinary approach can also be found in the general scientific consensus of the main requirements contributing to good animal welfare in form of the "Five Freedoms", which have been developed and formulated by the UK's Farm Animal Welfare Council (Blokhuys et al., 2013a; FAWC, 1992; Welfare Quality®, 2007). In this context another concept should be mentioned - the Welfare Quality® Project. With the "Five Freedoms" as initial point, it aims to develop European standards for the assessment of animal welfare by evaluating more practical and better measurable criteria (Keeling et al., 2013; Manteca et al., 2012). As a balanced welfare assessment system has to meet acceptance by a broad stakeholder group, consumers, farmers, industry, legislators as well as scientists were involved in the Welfare Quality® project. In order to ensure and improve farm animal welfare, together they evaluated four principles (i.e. good feeding, good housing, good health and appropriate behaviour) with twelve assignable criteria (Blokhuys et al., 2013a).

We decided to incorporate these extensively developed criteria into our questionnaire because of their practical feasibility and as the classification seemed most suitable for the rating of the selected housing elements. Since using each single subcategory as an extra rating-point would have protracted our questionnaire, we focused on the main principles and indicated the respective subcategories as examples in parentheses. However, as suffering from hunger and thirst should not be a predominant problem in modern pig husbandry, where weight gain is one of the most important production targets, the principle "good feeding" was deleted completely. Furthermore we omitted the two subcategories "absence of pain induced by management procedures" and "good human-animal relationship" which probably would not be associated with any of the housing elements at first glance and thus

would not be adequate. To cover the two subcategories “absence of injuries” and “absence of disease” we found the generic term “good health” to be sufficient. Additionally we decided to integrate “positive emotional state” as an extra point, since the emotional state is gaining increasing scientific acknowledgement when it comes to the assessment of animal welfare and apart from that seems to be an important aspect for the public’s perception of animal welfare (Duncan, 2005, 2002).

2.2 Definition of environmental enrichment and selection of enriching housing elements for the survey

The use of the term environmental enrichment is quite inconsistent in the literature, but generally implies a benefit for the animals (Newberry, 1995). It can be described as a possibility to beneficially modify the environment of captive animals (Shepherdson, 1994) with specific goals ranging from increasing behavioural diversity, reducing the occurrence of abnormal behaviour or to enhancing normal (i.e. wild) behaviour patterns (Young, 2003) which finally leads to improved animal welfare (Hare and Sevenich, 2001). There are various possibilities to enrich the environment (Young, 2003), with five major categories identified by Bloomsmith et al. (1991), including social companionship, psychological occupation and exercise, the physical environment, sensory stimuli and nutritional delivery and type.

However, in intensive pig husbandry environmental enrichment is widely lacking. The environment in which pigs are often kept on concrete (slatted) floors is very barren, without any substrate for the animals to root in or to lay on (Barnett et al., 2001; van de Weerd and Day, 2009). Usually these kinds of housing systems are not equipped with outdoor runs, where the pigs would have the possibility to use different climate zones and functional areas with daylight and fresh air or even to wallow in the mud (Fritzsche et al., 2007; Wiedmann, 2005). In Germany for example approximately only one percent of pigs have outdoor access (Zander et al., 2013), where the installation of cooling or respective body care facilities such as showers or wallows would be most practicable (Brade and Flachowsky, 2006; Wiedmann, 2005). Living under these conditions makes it impossible for the pigs to express various natural and highly motivated behaviour patterns including, for example, exploration and foraging (van de Weerd and Day, 2009), or the inclination to cool themselves by seeking appropriate wet places in case of heat (Hsia et al., 1974). As a result they often redirect their explorative behaviour on pen mates or wallow in their own

dung for cooling reasons which both can cause health problems (Barnett et al., 2001; European Food Safety Authority (EFSA), 2007).

Within the framework of the present study we chose enriching elements with focus on the physical environment (Bloomsmith et al., 1991), as in pig husbandry the design of the physical environment plays a major role when it comes to the improvement of animal welfare. Thus there exist numerous researches dealing with environmental enrichment of pig housing systems, with a large proportion focusing on the usage of enriching substrates or objects (see van de Weerd and Day, 2009). However, there is clear evidence that not only distraction materials like straw or several objects have the potential to improve animal welfare. In organic pig husbandry systems for example, which are standing for more animal welfare, besides organic substrates, the use of outdoor runs, or even wallows or sprinklers as cooling facilities, are key elements (Kijlstra and Eijck, 2006; Spooler, 2007; Sundrum, 2001). Additionally there is a striking public demand for more animal friendly pig husbandry, with consumers particularly referring to natural housing conditions, including elements such as outdoor access, wallows or sprinklers, straw or enriching objects (Boogaard et al., 2011b; Busch et al., 2015; Lassen et al., 2006; Wildraut et al., 2015; Zander et al., 2013). Finally we decided to include 14 enriching housing elements into our pictorial-based survey. Besides outdoor runs (with straw as bedding or slatted floor), wallows, tubs or sprinklers (inside the stable and in the outside run), we selected the enriching substrate straw (as bedding in the stable, in form of a separate rooting area, and as distraction material in two different containers) as well as four enriching objects (toys).

2.3 Study design and sample

The present study was conducted via a standardised online questionnaire in a cross-sectional design with 414 German citizens in March 2018. To achieve approximate representativeness for the German population, participants were recruited through an online panel. Subjects were selected by using quota sampling with gender, age, place of residence (North, South, East, and West Germany) and school education as quota control criteria (Table 1). Prior to the field phase a pretest with 20 participants was carried out to ensure validation of the survey.

2.4 Questionnaire

2.4.1 Structure

Basically the questionnaire consists of two main parts with an estimated overall editing time of around 20 minutes. One part consists of questions regarding sociodemographic characteristics and further personal data such as self-perceived knowledge of animal husbandry and natural behaviour patterns of pigs or interest in agriculture and pig husbandry, whereby some of these questions were put at the beginning and some at the end of the questionnaire. Furthermore it comprises questions concerning the participants attitude towards animal protection/welfare. The second part contains the pictorial-based section of the questionnaire. Participants were confronted with pictures of the respective housing elements, with a very brief and neutral description above each picture and subsequently were asked to answer eight questions, identical for each housing element. First, participants had to assess the potential benefit for animal welfare due to the usage of the housing element. For this purpose they had to specify how far the four selected animal welfare criteria (i.e. general housing conditions, health, realisation of appropriate behaviour and positive emotional state) were fulfilled. Additionally we asked for the overall potential of the housing elements to beneficially influence animal welfare and if the element should definitely be available in a pigsty. Two more questions refer to the amount of costs associated with the installation/usage and to practicability of the housing elements as well. Moreover participants were asked to estimate the fulfillment of the animal welfare criteria (same animal welfare criteria as above) under conventional housing conditions and to indicate how important the fulfillment of the animal welfare criteria is to them.

Question types ranged from dichotomous questions to multiple choice and multiple response questions for requesting sociodemographic characteristics. For the questions concerning self-perceived knowledge, interest, attitude towards animal protection/welfare as well as for the pictorial part, a five-point Likert scale was applied.

2.4.2 Selection of the pictures

We opted for a pictorial-based presentation of the housing elements, as many participants might not have a concrete idea of the specific housing elements by only naming it. In order to prevent potential influence of picture selection on the perception and therewith on the evaluation of the presented content, we strove to select neutral examples of the housing. We thus tried to choose picture sections with focus on the respective housing element to reduce visible environment as far as possible and to pay attention to a comparable appear-

ance of the animals (for example degree of dirt smudges, animal size, facial expression, number of animals in the pictures). Additionally we preped the advice to primarily concentrate on the housing element rather than on the environment or the animals themselves. To ensure objectivity, we gave the selected pictures to the animal welfare organisation *Vier Pfoten* and the farmer's federation *Landvolk Göttingen* and they confirmed, that our selection was in accordance with reality and not glossed over. The pictures were presented randomised in the course of the survey, except for the last subcategories appearing in the same order within one page (for example this was the case for the organic enriching objects "rope" and "wooden block", or the cooling facilities "shower indoor" and "shower outdoor").

2.5 Statistical analysis

Data analysis was done using the statistical analysis software IBM SPSS Statistics 24. For simple descriptive purposes, mean scores, standard deviations and relative frequencies were used. For bivariate analyses we used t-test for dependent data to compare mean scores within the sample and one-way analysis of variance (ANOVA) and cross-tabulation with χ^2 -tests, to detect differences between groups. In order to reduce the sets of variables in the dataset, we extracted a lower number of latent variables (factors) by applying multivariate analysis in the form of principal component analysis. Hierarchical cluster analysis was subsequently conducted to detect different groups (clusters), which are characterised by homogeneity within and heterogeneity between clusters regarding certain response behaviour. All tests were two-tailed, and the significance level was set at 0.05.

3. Results

3.1 Description of the sample

The overall sample size was 414 participants. According to the four quotas set for the data collection there was only little deviation from the target quotas which means, that for gender, age, place of residence and education, an approximate representativeness for the German population can be guaranteed by the sample (Table 1).

Table 1: Sociodemographic characteristics of the sample and the German population

	Specification	Sample (%)	German population (%)
Gender	Female	51.9	50.7
	Male	48.1	49.3
Age in years	18-29	17.1	16.9
	30-39	14.0	14.9
	40-49	15.2	16.0
	50-59	19.6	19.1
	60 and older	33.8	33.0
Place of residence	South ¹	29.0	28.9
	North ²	16.2	16.1
	East ³	20.5	19.6
	West ⁴	34.3	35.4
Education	No educational qualifications	3.9	4.0
	Secondary school (low)	32.1	31.4
	Secondary school (high)	29.2	29.4
	Higher education entrance qualification	30.9	30.8
	Still in education	3.9	3.6

n = 414; source: own calculations; Statistisches Bundesamt Germany 2015; 2016; 2017; Bundesamt für Bauwesen und Raumordnung 2015; ¹Bavaria, Baden-Wuerttemberg; ²Bremen, Hamburg, Lower-Saxony, Schleswig-Holstein; ³Brandenburg, Berlin, Saxony, Saxony-Anhalt, Thuringa, Mecklenburg-Western Pomerania; ⁴Hessia, North Rhine-Westphalia, Rhineland-Palatinate, Saarland.

Referring to available household income per month (after paying taxes and social security contributions), 20.8% of the participants indicate to have less than 1300€, 38.9% to have 1300€- under 2600€, 30% to have 2600€- under 4500€ and 10.4% to have 4500€ and more available. Concerning urbanity of residence, 24.9% were from rural (under 5.000 habitants), 17.9% from urban (5.000- under 20.000 habitants), 25.6% from highly urban (20.000- under 100.000 habitants) and 31.6% from extremely urban regions (more than

100.000 habitants). Relating to meat and sausage consumption, 39.9% replied to eat an average amount of it, 22% indicated to rather eat few, 14% stated to eat few and 13.3% indicated to rather eat much meat and sausage. Only 4.6% of the participants stated to consume a lot of meat and sausage whereas 3.8% were vegetarians or vegans and 2.4% indicated to eat no meat or sausage, but fish. When it came to the relationship with agriculture, 40.8% stated to are not related to agriculture at all, 38.6% indicated to have/had contact with farmers, 20.3% of the participants were living in immediate vicinity of a farm and 13.2% had farmers as relatives or friends. 5.8% grew up on a farm and 1.8% were farmers (main source of income or sideline activity) or were about to undergo/underwent an agricultural vocational training (apprenticeship or study).

3.2 Rating of the housing elements

In the pictorial based section of the survey, participants were encouraged to give their opinion about eight statements per housing element, on a 5-point Likert scale with 1 = completely disagree, 2 = rather disagree, 3 = partly/partly, 4 = rather agree, 5 = totally agree. Five of them directly referred to the potential benefit of animal welfare through the usage of the respective housing element and one asked for the desire regarding availability in a pigsty. The remaining two statements referred to costs and practicability of the housing elements.

3.2.1 Rating regarding benefit for animal welfare and desire for availability

In order to reduce the set of variables in the dataset and thereby to improve overview, we examined the internal consistency of the first six items mentioned above. As the Cronbach's alpha (CRA) with ≥ 0.9 for all housing elements was excellent (Hair et al., 1998), we calculated new variables or rather mean scores, which will be called "benefit for animal welfare and desire for availability" hereinafter. The calculated mean scores revealed an average agreement for nine of the 14 elements (Fig.1). Agreement was highest and therewith rating was best for "wallow" (SD = 0.83; mean = 4.34), closely followed by "straw as bedding" (SD = 0.76; mean = 4.25), "rooting area" (SD = 0.75; mean = 4.16) and "outdoor run with straw" (SD = 0.77; mean = 4.06). With regard to the elements "shower outdoor" (SD = 0.85; mean = 3.70), "shower indoor" (SD = 0.85; mean = 3.66), "rooting tower" (SD = 3.46; mean = 0.91), "tub" (SD = 0.99; mean = 3.18) and "straw basket" (SD = 0.98; mean = 3.16), on average, participants also answered affirmatively, even though to a lesser extent. No agreement, or in other words, no positive rating, arose from the results

for the remaining five housing elements, with “outdoor run slatted floor” showing the lowest agreement (SD = 1.03; mean = 2.70), followed by “plastic block” (SD = 1.01; mean = 2.76), “rubber hose” (SD = 0.99; mean = 2.80), “rope” (SD = 1.05; mean = 2.96) and “wooden block” (SD = 1.05; mean = 2.97). Differences between mean scores were significant ($p < 0.05$) for the majority of potential pairing combinations. No significant difference ($p > 0.05$) was only found between “outdoor run slatted floor” and “rubber hose”, “outdoor run slatted floor” and plastic block”, “rubber hose” and “plastic block”, “straw basket” and “tub”, “wooden block” and “rope” and between “shower outdoor” and “shower indoor” (Fig. 1).

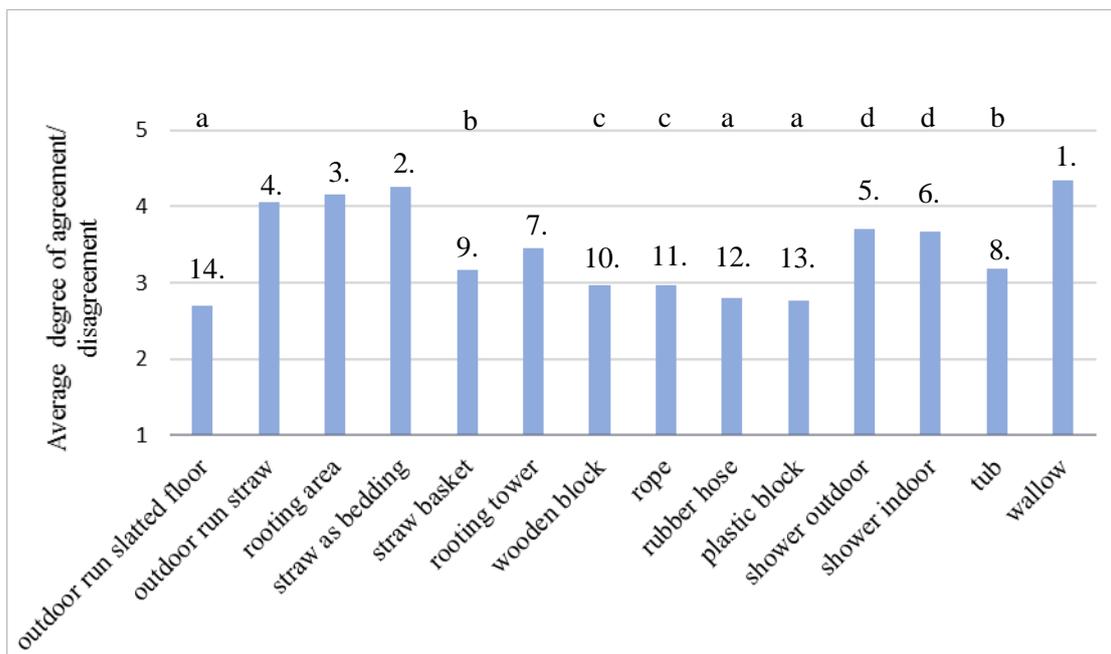


Fig. 1: Average rating of the housing elements regarding benefit for animal welfare and desire for availability

Rating on a 5-point Likert scale with 1 = completely disagree, 2 = rather disagree, 3 = partly/partly, 4 = rather agree, 5 = totally agree. SD = standard deviation. Numbers from 1-14 marking ranking position of the rating, with 1 standing for best and 14 for worse rating. Comparison of mean scores using t-test for dependent samples. No significant differences ($p > 0.05$) between individual pairing combinations are marked with same letters. Accordingly, differences between elements without markings and elements marked with letters, differences between elements not marked with letters, as well as between elements with different letters are significant ($p < 0.05$).

Source: own calculations

3.2.2 Rating regarding costs and practicability

With regard to the statement “costs associated with the installation/use of the housing elements are high”, the average agreement was low for all elements which means, that the level of costs was rated relative low (Fig. 2). There was a slight agreement only for “shower outdoor” (SD = 1.00; mean = 3.16), and a very slight one for “shower indoor” (SD =

1.04; mean= 3.03), for all other elements no agreement was found. Costs were rated low particularly for the elements “plastic block” (SD = 0.83; mean = 1.59), “rope” (SD = 0.94; mean = 1.62), “rubber hose” (SD = 0.85; mean = 1.64) and “wooden block” (SD = 0.97; mean = 1.75). Comparison of mean scores showed significant differences ($p < 0.05$) for the majority of potential pairing combinations (Appendix, Table 3).

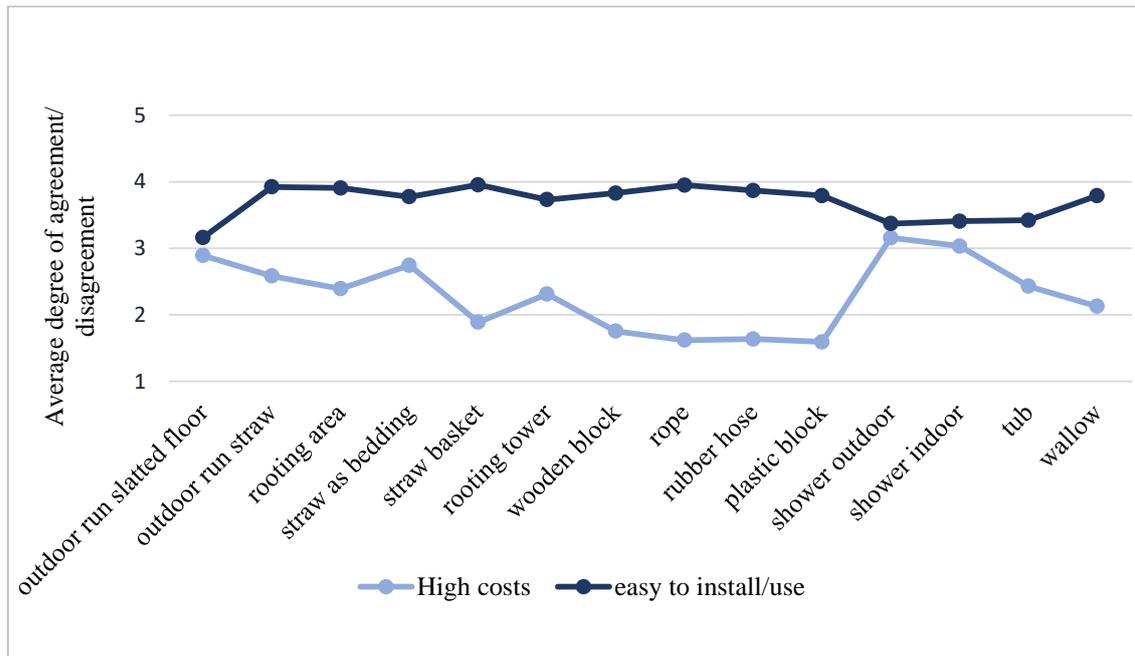


Fig. 2: Average rating of the housing elements regarding costs and practicability
 Rating on a 5-point Likert scale with 1 = completely disagree, 2 = rather disagree, 3 = partly disagree/partly agree, 4 = rather agree, 5 = totally agree.

Source: own calculations

Regarding the statement “this housing element can be easily installed/used in any production system” on average, participants answered affirmatively for all elements (Fig. 2). Compared to the cost-rating, mean scores showed lesser variety. However the lowest agreement existed for “outdoor run slatted floor” (SD = 1.07; mean = 3.16). Since comparison of mean scores for all potential pairing combinations revealed a lot of significant and not significant differences as well, only few of them will be mentioned hereinafter. For example we found significant differences ($p < 0.05$) between “outdoor run slatted floor” and all other housing elements. No significant differences were found between “shower outdoor”, “shower indoor” and “tub”, whereas the mean scores of these three elements were significantly different ($p < 0.05$) from those of the remaining elements, without exception (Appendix, Table 4)

3.3 Multivariate analysis in order to detect rating influencing factors

3.3.1 Factor analysis including items assessing attitude towards animal protection

As we decided to use the participants attitude towards animal protection/welfare amongst others as basis for our cluster analysis, first of all, we carried out factor analysis. The aim was to reduce the number of variables in the dataset (the original number of variables was 17.) by summarising strong correlating variables to higher-ranking factors (Bühl, 2010). By means of the principal component analysis we finally extracted three factors (Appendix, Table 5), whereby low factor loadings (< 0.5) or rather low correlations between the underlying factor and the respective item were neglected (Backhaus et al., 2008). The KMO-value (Kaiser-Meyer-Olkin test for sampling adequacy) with 0.913 was marvelous (Kaiser and Rice, 1974), the Bartlett test for sphericity was significant with a p-value < 0.001 and the explained total variance was 57.5%. Furthermore we examined internal consistency and as the Cronbach's alpha (CRA) of the item "many consumers think, that they don't have the power to change the animal protection situation anyway" was poor (0.405) (Hair et al., 1998), it was deleted. The CRAs for all 3 factors were then > 0.7 (CRA: factor 1 = 0.843; factor 2 = 0.818; factor 3: 0.780). In order to interpret the meaning of the resulting dimensions and nominate them accordingly, we studied factor loadings. Thus the first factor we named "indifferent towards animal protection/welfare", the second "happy with the animal protection situation" and the third we designated as "distrust towards the current animal protection situation" (Appendix, Table 5).

3.3.2 Cluster analysis and description of the clusters

The hierarchical cluster analysis was not only based on the evaluated factors, but also on the rating concerning the degree of fulfillment of animal welfare criteria under conventional housing conditions and the importance of the fulfillment of animal welfare criteria. As both ratings consisted of five animal welfare-related statements, we again examined internal consistency and since the CRA was > 0.9 , we summarised items and calculated a new variable or rather mean score respectively.

Hereafter, in order to identify outliers, we initially used nearest neighbour method and consequently excluded three participants from the cluster analysis. In a next step we chose a two-cluster solution using Ward's method. The first cluster represented 42.6% ($n = 175$) of the sample and was named "the unhappy animal protectionists", whereas the second cluster represented 57.4% of the sample ($n = 236$) and was described as "those being aware of and virtually satisfied with animal protection". Comparison of mean scores revealed

highly significant differences ($p < 0.001$) for all five cluster-building variables between the two clusters (Table 2). Participants belonging to cluster 1 were less indifferent towards animal protection/welfare than those belonging to cluster 2, whereby on average neither cluster agreed to be indifferent. With regard to the factor “distrust towards the current animal protection situation” both clusters showed distinctive distrust, nevertheless distrust was higher in case of the first cluster. Moreover cluster 1 indicated to be less happy with the animal protection situation and rated the degree of fulfillment of animal welfare criteria in conventional pig husbandry systems worse, compared to cluster 2. Furthermore, for cluster 1 fulfillment of animal welfare criteria was more important as it was for participants of the second cluster (Table 2).

Table 2: Two-cluster solution based on the mean scores of the three evaluated factors and the rating regarding the importance and the degree of fulfillment of animal welfare criteria

Cluster-building variables	Cluster 1	Cluster 2
	"The unhappy animal protectionists"	"Those being aware of and virtually satisfied with animal protection"
	Mean (SD)	Mean (SD)
Indifferent towards animal protection/welfare***	1.49 (0.36)	2.34 (0.62)
Happy with the animal protection situation***	2.26 (0.67)	2.95 (0.67)
Distrust towards the current animal protection situation***	4.69 (0.42)	3.98 (0.65)
High importance of animal welfare criteria***	4.90 (0.21)	4.22 (0.55)
High degree of fulfillment of animal welfare criteria***	2.19 (0.70)	3.38 (0.84)

Cluster 1: $n = 175$ (42.6%); cluster 2: $n = 236$ (57.4%); SD = Standard deviation; 5-point Likert scale from 1 = completely disagree, 2 = rather disagree, 3 = partly/partly, 4 = rather agree, 5 = totally agree; comparison of mean scores of all five cluster-building variables between the two clusters by using ANOVA; *** = $p < 0.001$.

Source: own calculations

Mean scores of the rating regarding benefit for animal welfare and desire for availability showed, that cluster 1 rated those housing elements, which were already not rated positive within the total sample, even worse, and those, which were rated positive, even better (except for the straw basket) than cluster 2 (Appendix, Table 6). This was significant ($p < 0.05$) for most of the housing elements (Appendix, Table 6). Additionally, participants belonging to cluster 1 consistently rated costs lower and practicability easier compared to cluster 2, which was also significant ($p < 0.05$) for the majority of housing elements (Appendix, Table 6).

In order to further characterise the two clusters, we studied sociodemographic and other personal data. Compared to the second cluster, the first cluster contained a significantly higher proportion of women ($p < 0.001$) and more of the non-pet owners expressed the desire for having a pet ($p < 0.05$) (Appendix, Table 7). Moreover there were striking differences between the clusters with regard to meat and sausage consumption, with participants belonging to the first cluster showing lower meat and sausage consumption and representing the major proportion of vegetarians and vegans of the total sample ($p < 0.001$) (Appendix, Table 7). Furthermore on average they indicated to be more interested in agriculture and pig husbandry and rated their knowledge of animal husbandry, as well as of natural behaviour patterns of pigs, significantly higher than those of cluster 2 ($p < 0.01$) (Appendix, Table 8). Concerning other characteristics such as age, household income, school education, place of residence and urbanity of residence, we found no significant differences between the two clusters (Appendix, Table 7).

4. Discussion

Several studies revealed distinctive public demand for more species-appropriate pig housing systems and thereby identified various housing elements to be important for ensuring animal welfare. However, to our knowledge the present study was the first investigating the specific and comparative assessment of individual housing elements by consumers. We selected 14 housing elements which are commonly known to potentially enrich the pigs' environment, including outdoor runs, straw as bedding and enrichment substrate, different enrichment objects (toys) and cooling facilities. In order to give participants an idea of each element, we used a pictorial-based survey design. Since participants were recruited via quota sampling by using gender, age, place of residence and school education as quota control criteria, an approximate representativeness for the German population can be ensured. In addition to the general rating of the housing elements we conducted cluster analysis to check for rating influencing factors such as sociodemographic characteristics or attitude towards animal protection.

4.1 Rating of the housing elements

4.1.1 Rating regarding benefit for animal welfare and desire for availability

With regard to the benefit for animal welfare and the desire for availability in a pigsty, on average nine of the 14 housing elements were rated positive. This means, in participants' opinion these elements have the potential to positively influence animal welfare and they voted for an unconditional usage of these elements, whereas the remaining five elements were not appreciated much. The "wallow" was rated best, followed by "straw as bedding", "rooting area", "outdoor run with straw", "shower outdoor", "shower indoor", "rooting tower", "tub", and "straw basket". In contrast, poor assessment was made for "outdoor run slatted floor" and for all four enriching objects.

Apart from lacking space in modern pig husbandry systems (Harper and Henson, 2001; Kayser et al., 2012b; Te Velde et al., 2002; Vanhonacker et al., 2009; Wildraut et al., 2015; Zander et al., 2013), according to previous studies, people seem to have further detailed ideas of the pigs' ideal housing conditions. This includes for example the possibility to wallow in the mud or the installation of sprinklers for cooling reasons (Boogaard et al., 2011b; Lassen et al., 2006; Wildraut et al., 2015). For laypersons a dirty pig seems to be an obvious indication for having the opportunity to express natural behaviour and thus living a good pig-life (Lassen et al., 2006; Wildraut et al., 2015). Against this background it is not

surprising, that in the present study “wallow” was rated exceptionally good whereas “shower outdoor”, “shower indoor” and “tub” obtained a significantly less positive rating. Even though participants seem to appreciate the provision of cooling facilities in general, there is a clear preference for the most natural version, a mud wallow.

With regard to floor conditions in a study from Wildraut et al. (2015) the sight of straw as bedding released positive emotions and people strongly expressed the desire for straw instead of the often used concrete (slatted) floor in modern pig production. Furthermore in a pictorial-based study of Busch et al. (2015) slatted floors were rated worse by consumers (i.e. fully slatted as well as partly slatted floor) in comparison with straw as bedding. This is similar to our results, since straw as bedding (in the stable as well as in the outdoor run) was rated good, in contrast to the slatted outdoor run, which was rated worst amongst all elements. Given the fact, that there is a striking public demand for outdoor access, fresh air and daylight (Boogaard et al., 2011b; Lusk et al., 2007; Wildraut et al., 2015; Zander et al., 2013), it could have been assumed, that outdoor access per se would be rated positive, but this was not the case. In this context peoples’ apparently specific idea of the characteristics of outdoor areas could explain the poor performance to some extent, since apart from limited space and temporary access, they criticise the unnatural ground (e.g. concrete floor) and argue for a natural surface instead (i.e. mud, grass) (Boogaard et al., 2011b). Therefore slatted floor as unnatural ground seems to be negatively established in consumers mind to such an extent, as not even the fact “outdoor access” is able to increase its appreciation. Nevertheless it is interesting, that “rooting area” was rated extremely positive, although the surrounding ground consisted of slatted floor. In this case, an available separate straw area seems to compensate the simultaneous use of slatted floor somehow, thus a combination of both might be considered as an acceptable compromise for consumers. The consumers’ preference for outdoor access and aversion against unnatural floor conditions (i.e. slatted floor) can finally also be used as an explanation for the better rating of the outdoor shower compared to the indoor shower (even though this was not significant) and the concrete tub on slatted floor, with the latter performing worst amongst the three.

In the present study straw was not only rated positive by offering as bedding but also as distraction material in containers (i.e. straw basket and rooting tower) similar to other studies. Accordingly the provision of straw was not merely appreciated as comfortable surface to lie or to walk on, but also as additional distraction in order to prevent boredom in the bare pens and enabling the satisfaction of natural needs (Boogaard et al., 2011b; Busch et al., 2015; Wildraut et al., 2015; Zander et al., 2013). The fact that the rooting

tower was appreciated more than the straw basket could be ascribed to the different locations of straw releasing. Whereas the rooting tower enables rooting and eating on ground level, using straw baskets, pigs only can pick up straw from above, which might be perceived as unnatural.

The fact that none of the enriching objects was rated positive is partially consistent with results from other studies. Even though ropes, chains and jerry cans were mentioned to be good enrichment elements (Boogaard et al., 2011b), some people were skeptical regarding the benefit of some distraction objects or even did not recognize it as such (Busch et al., 2015; Wildraut et al., 2015; Zander et al., 2013) and there was no consensus how much distraction objects would be sufficient for the pigs (Boogaard et al., 2011b). Thus, it can be assumed, that participants in the present study were equally not sure about the function or benefit of the four distraction objects for the pigs and accordingly doubted that the application would sufficiently enrich the environment with regard to animal welfare. However, as rating of the distraction objects was only slightly not positive, or rather participants were undecided, they would supposedly prefer the offering of enriching objects over no distraction at all. Finally differences in rating between objects could be traced to material characteristics, with rubber and plastic probably considered as less natural than wood and sisal and consequently led to worse performance of “plastic block” and “rubber hose” in comparison with “wooden block” and “rope”.

Altogether results show, that consumers’ assessment regarding benefit for animal welfare is widely corresponding with the scientifically evaluated value the individual housing elements have for the pigs’ welfare. For example straw is known to be of particular value as enrichment substrate for many years by having positive effects on activity level and pen-mate directed behaviour such as tail-biting, both when used as bedding and provided in limited quantity (i.e. in racks or hanging baskets) (Beattie et al., 2000; Buré et al., 1983; Fraser et al., 1991; Scott et al., 2006; van de Weerd et al., 2005; van de Weerd and Day, 2009; Zonderland et al., 2008), whereas the benefit of several enriching objects is quite controversial (Bracke et al., 2006; van de Weerd et al., 2005; van de Weerd and Day, 2009). With regard to cooling facilities, wallows were not only rated exceptionally good by consumers in the present survey, but also from a scientific point of view wallows indeed provide higher benefit with regard to animal welfare compared to sprinklers, due to the extending effect of evaporative cooling through the mud layer and an additional protection from parasites (Huynh et al., 2006; Sambraus, 1991). However, as the aim of the present

study was not to compare to scientifically proved real value of the several housing elements for pig welfare, this will not be further examined at this point.

4.1.2 Rating regarding costs and practicability

Overall, potential costs associated with the usage of the housing elements were not rated very high. Only for the elements “shower outdoor” and “shower indoor” there was a slight agreement, that the application would cause high costs. This could be ascribed to participants associating high water consumption with the usage of showers, particularly if unlimited water activation is permitted, which possibly derives from personal experience. In contrast, cost-rating was lowest for the four enriching objects, which seems quite realistic, as according to some producer webpages investment costs for several enriching objects amount to a few euros, whereas for example the usage of straw as bedding and rooting substrate ad libitum, causes 4-8% extra costs in comparison to conventional housing systems with fully slatted floor (Bornett et al., 2003). However, as we did not offer the option for direct ranking, the present survey was not designed for a more precise and comparative assessment of costs and thus data are neither suitable for further comparison with actual costs. Nevertheless, since participants rated costs rather low, they seem to have only little idea of extra costs coming along with environmental enrichment. It is certainly conceivable that a better idea of costs mediated through appropriate marketing activities for example, could help to justify consumer price and finally lead to a change in actual buying behaviour, resulting in increased sales of products from enriched housing conditions.

With regard to practicability, on average, participants agreed to the statement “this housing element is relatively easy to install/use” on a more or less similar level for all housing elements. Thus, consumers obviously not only have little idea of costs, but also of the requirements for the installation/usage of several housing elements, with the latter explaining rating of the former. Participants’ opinion for example, that a wallow could be installed/used as easy as a plastic block or a rooting tower seems quite unrealistic. The installation of a mud wallow is actually only possible in free-range systems (Brade and Flachowsky, 2006), whereas a plastic block or a rooting tower can be implemented more easily in various housing systems.

4.2 Rating influencing factors – characterisation of the clusters

Although there were differences between the two clusters, both indicated no indifference towards animal protection/welfare and had the opinion, that fulfillment of animal welfare

criteria is important. This is consistent with the overall increasing general public concern about farm animal protection during the last decades (Bornett et al., 2003; Eurobarometer, 2016; Kendall et al., 2006; Miele et al., 2013; Verbeke, 2009). Additionally both clusters showed distinctive distrust towards the current animal protection situation, including a high demand for a stricter control system of compliance with regulations regarding animal protection and participants calling farmers as well as political parties to do much more for the improvement of animal protection, similar to previous studies (Rovers et al., 2017; Weible et al., 2016).

Regarding the benefit for animal welfare and desire for availability, participants belonging to cluster 1 (“the unhappy animal protectionists”) rated elements which were not rated positive within the total sample even worse than cluster 2. This higher critical perception could be linked to several cluster characteristics, similar to other studies. First, cluster 1 was characterised by an overall higher concern about animal protection/welfare, a higher proportion of female participants, a lower meat and sausage consumption, included more non-pet owners with the desire for having a pet, and more pet-owners (even though this was not significant closely), compared to cluster 2. According to previous researches, women were found to be more concerned about farm animal welfare (Harper and Henson, 2001; María, 2006; McKendree et al., 2014), more critical regarding animal husbandry (Kayser et al., 2012b; María, 2006; McKendree et al., 2014) and rather classified as opponents of pig husbandry compared to men (Zander et al., 2013). In addition women are known to have lower meat and sausage consumption (Cordts et al., 2013; MRI, 2008) and more generally spoken, people being highly concerned about animal welfare consume less meat and sausage (Cordts et al., 2013). Furthermore, pet owners were found to be more concerned about animal welfare (McKendree et al., 2014) and perceived life quality of farm animals less positive (Boogaard et al., 2006) than non-pet owners. Secondly, participants from the first cluster had higher self-perceived knowledge of animal husbandry and were more interested in agricultural issues which is again in line with other studies. Accordingly a higher interest in agriculture (Zander et al., 2013) as well as higher objective or subjective knowledge (Kayser et al., 2012a; Weible et al., 2016; Zander et al., 2013) led to a more critical perception of animal husbandry. Thus it can be assumed, that due to their higher interest, participants belonging to cluster 1, enquired a better knowledge of animal husbandry and consequently developed a firmer position. In this context they might have tried to strengthen their position in order to reduce cognitive dissonance by rating elements even worse, which were already not rated positive within the total sample. Obviously ele-

ments, which were rated positive within the sample, were rated even better by cluster 1 for the same reason. With regard to costs and practicability the first cluster estimated costs consistently lower and additionally had the opinion, that elements could be easier installed/used, compared to cluster 2. Might be, “the unhappy animal protectionists” (cluster1) focus or prioritise the benefit for animal welfare rather than cost or practicability and thus rating it more optimistic.

5. Conclusion

In a pictorial-based survey German participants had to rate 14 housing elements regarding benefit for animal welfare. They were asked to indicate their desire for availability and furthermore to evaluate costs and practicability. Even though previous researches revealed a striking demand for a more species appropriate pig production and thereby named various housing elements to be important for, results from the present study provide a more differentiated idea of the consumers’ preferences. Thus, consumers not only seem to appreciate various housing elements in order to enrich the pig’s environment, but even differentiate between elements by rating some better than others. Even though natural-near enrichment elements (i.e. wallow, straw as bedding) were rated exceptional positive, our results provide evidence, that even smaller enrichment arrangements have the potential to meet consumer acceptance (i.e. rooting area, showers, straw in containers). Furthermore consumers apparently have only quite few ideas of cost and practicability of individual housing elements. Obviously some rating-influencing factors exist like attitude towards or perception of animal protection/welfare or sociodemographic characteristics.

However, since our findings show a lack of consumers’ knowledge respective ideas to some extent, results should be considered as a basis for further studies rather than as subject for direct implementation. In our survey ranking of the various elements was not intended, but it would be quite interesting to know how preferences would look like, if consumers would be asked for an overall ranking instead of a separate rating of elements. Consumers probably would weigh up their sight of advantages and disadvantages of the respective housing elements and consequently adjust ranking by making compromises. In this context it would be of particular interest to know not only about consumers’ rating as a “layperson”, but also after being provided with information about actual trade-offs. Thus, in order to investigate potential changes in decision making, subsequent studies could include a before- and after-ranking by providing pros and cons regarding animal welfare as well as cost and practicability. Finally, knowledge, gained about the influence of infor-

mation supply on consumers preferences, could be incorporated into marketing activities in order to improve marketability of products out of more animal friendly pig husbandry systems. Subsequent research should additionally address the comparison of different interests and needs taking into account not only consumers' but also farmers' and animals' perspectives. Future production systems are conceivable that comprise public acceptance, farmers' needs and adequate level of animal welfare as well.

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7. Appendix

Appendix 1

Table 3: Average rating of the housing elements regarding costs; comparison of mean scores for any possible pairing combination

Mean (SD)	Outdoor run slatted floor	Outdoor run straw	Roofing area	Straw as bedding	Straw basket	Roofing tower	Wooden block	Rope	Rubber hose	Plastic block	Shower outdoor	Shower indoor	Tub	Wallow
Outdoor run slatted floor	2.89 (1.04)	***	***	*	***	***	***	***	***	***	***	*	***	***
Outdoor run straw		2.58 (1.14)	**	**	***	***	***	***	***	***	***	***	*	***
Roofing area			2.39 (1.10)	***	***	n.s.	***	***	***	***	***	***	n.s.	***
Straw as bedding				2.74 (1.25)	***	***	***	***	***	***	***	***	***	***
Straw basket					1.89 (0.88)	***	**	***	***	***	***	***	***	***
Roofing tower						2.31 (1.01)	***	***	***	***	***	***	n.s.	**
Wooden block							1.75 (0.97)	**	**	***	***	***	***	***
Rope								1.62 (0.94)	n.s.	n.s.	***	***	***	***
Rubber hose									1.64 (0.84)	n.s.	***	***	***	***
Plastic block										1.59 (0.83)	***	***	***	***
Shower outdoor											3.16 (1.00)	**	***	***
Shower indoor												3.03 (1.04)	***	***
Tub													2.43 (1.01)	***
Wallow														2.13 (1.21)

n = 414; mean = average rating regarding the statement “costs associated with the installation/use of the housing elements are high”; SD = standard deviation; rating on a 5-point Likert scale with 1 = completely disagree, 2 = rather disagree, 3 = partly disagree/partly agree, 4 = rather agree, 5 = totally agree; comparison of mean scores using t-test for dependent samples; significant differences between housing elements with * = p < 0.05, ** = p < 0.01, *** = p < 0.001; n.s. = not significant.

Source: own calculations

Appendix 2

Table 4: Average rating of the housing elements regarding practicability; comparison of mean scores for any possible pairing combination

Mean (SD)	Outdoor run slatted floor	Outdoor run straw	Rooting area	Straw as bedding	Straw basket	Rooting tower	Wooden block	Rope	Rubber hose	Plastic block	Shower outdoor	Shower indoor	Tub	Wallow
Outdoor run slatted floor	3.16 (1.07)	***	***	***	***	***	***	***	***	***	**	***	***	***
Outdoor run straw		3.92 (0.95)	n.s.	**	n.s.	**	n.s.	n.s.	n.s.	n.s.	***	***	***	*
Rooting area			3.91 (0.94)	**	n.s.	**	n.s.	n.s.	n.s.	n.s.	***	***	***	*
Straw as bedding				3.77 (1.06)	**	n.s.	n.s.	*	n.s.	n.s.	***	***	***	n.s.
Straw basket					3.95 (0.99)	***	*	n.s.	n.s.	**	***	***	***	*
Rooting tower						3.73 (0.97)	n.s.	***	*	n.s.	***	***	***	n.s.
Wooden block							3.83 (1.13)	**	n.s.	n.s.	***	***	***	n.s.
Rope								3.95 (1.11)	n.s.	**	***	***	***	*
Rubber hose									3.87 (1.16)	n.s.	***	***	***	n.s.
Plastic block										3.79 (1.18)	***	***	***	n.s.
Shower outdoor											3.37 (1.00)	n.s.	n.s.	***
Shower indoor												3.41 (1.01)	n.s.	***
Tub													3.42 (1.03)	***
Wallow														3.79 (1.14)

n = 414; mean = average rating of the housing elements regarding the statement “this housing element can be easily installed/used in any production system”; SD = standard deviation; rating on a 5-point Likert scale with 1 = completely disagree, 2 = rather disagree, 3 = partly/partly, 4 = rather agree, 5 = totally agree; comparison of mean scores using t-test for dependent samples; significant differences between housing elements with * = p <0.05, ** = p <0.01, *** = p <0.001; n.s. = no significant difference.

Source: own calculations

Appendix 3

Table 5: Principal component analysis: items assessing attitude towards animal protection/welfare. Rotated component matrix

Items	Loadings		
	Factor 1	Factor 2	Factor 3
This idle talk about animal protection is getting on my nerves.	0.797		
There are much more issues in the world than animal protection to think about.	0.737		
To be honest, I don't think too much about animal protection.	0.695		
I don't care about housing conditions of farm animals – they will die anyway	0.670		
The subject Animal Protection/Animal Welfare in agriculture is important to me	-0.593		
If animals need to die for our food production, they should at least have had a good life.	-0.530		
Consumers should care more about animal protection, and buy products provided by more species-appropriate animal husbandry systems.	-0.528		
In modern agriculture, animals are allowed to live according to their species-appropriate behaviour patterns.		0.797	
Altogether, modern animal husbandry is good - there are always black sheep.		0.713	
In Germany animals are sufficiently protected by legal regulations.		0.691	
In modern animal husbandry animals are not treated well.		-0.678	
Nowadays farm animals are treated better than in the past.		0.675	
In modern agriculture animals do not suffer unnecessarily.		0.650	
Compliance with regulations regarding animal protection should be controlled more strictly.			0.781
Farmers should do much more for animal protection by improving housing conditions.			0.771
Political parties should do much more for animal protection by introducing stricter regulations.			0.672
Variance explained (57.5 % total)	22%	20%	15.5%

The higher the factor loading, the greater the correlation between the underlying factor and the respective item; accordingly named factors: factor 1: “indifferent towards animal protection/welfare”, factor 2: “happy with the animal protection situation”, factor 3: “distrust towards the current animal protection situation”.

Appendix 4

Table 6: Comparison of rating of the housing elements between the two clusters

	Benefit for animal welfare and desire for availability			High costs			Easy to install/use		
	Mean (SD)			Mean (SD)			Mean (SD)		
	Cluster 1		Cluster 2	Cluster 1		Cluster 2	Cluster 1		Cluster 2
Outdoor run slatted floor	2.50 (1.07)	***	2.84 (0.97)	2.75 (1.10)	**	3.00 (0.99)	3.25 (1.13)		3.10 (1.02)
Outdoor run straw	4.19 (0.78)	**	3.96 (0.72)	2.26 (1.08)	***	2.82 (1.12)	4.05 (0.94)	*	3.83 (0.93)
Roofing area	4.27 (0.82)	*	4.09 (0.65)	2.08 (1.07)	***	2.62 (1.06)	4.06 (0.94)	**	3.80 (0.91)
Straw as bedding	4.41 (0.78)	***	4.15 (0.70)	2.53 (1.30)	**	2.90 (1.18)	3.87 (1.10)		3.70 (1.00)
Straw basket	3.13 (1.09)		3.19 (0.88)	1.66 (0.73)	***	2.06 (0.94)	4.06 (1.03)		3.89 (0.93)
Roofing tower	3.49 (0.98)		3.44 (0.85)	2.14 (0.92)	**	2.45 (1.05)	3.88 (0.95)	**	3.64 (0.95)
Wooden block	2.91 (1.17)		3.03 (0.93)	1.51 (0.88)	***	1.94 (0.99)	3.99 (1.16)	*	3.74 (1.06)
Rope	2.88 (1.10)		3.04 (0.95)	1.39 (0.78)	***	1.80 (1.02)	4.15 (1.12)	**	3.83 (1.06)
Rubber hose	2.66 (1.10)	*	2.90 (0.88)	1.35 (0.59)	***	1.85 (0.95)	3.99 (1.23)		3.78 (1.08)
Plastic block	2.63 (1.10)	*	2.86 (0.93)	1.34 (0.59)	***	1.79 (0.92)	3.87 (1.26)		3.75 (1.10)
Shower outdoor	3.84 (0.88)	**	3.61 (0.79)	3.04 (1.02)	*	3.26 (0.97)	3.47 (1.04)		3.30 (0.95)
Shower indoor	3.80 (0.89)	**	3.56 (0.78)	2.89 (1.04)	**	3.16 (1.02)	3.55 (1.02)	**	3.30 (0.97)
Tub	3.25 (1.10)		3.14 (0.89)	2.16 (0.97)	***	2.64 (0.99)	3.55 (1.09)	*	3.34 (0.96)
Wallow	4.55 (0.75)	***	4.19 (0.82)	2.01 (1.28)		2.22 (1.14)	3.95 (1.17)	**	3.67 (1.08)

Cluster 1: n = 175; Cluster 2: n = 236; SD = standard deviation; 5-point Likert scale from 1 = completely disagree, 2 = rather disagree, 3 = partly disagree/partly agree, 4 = rather agree, 5 = totally agree; comparison of mean scores using ANOVA; asteriks marking significant differences between the two clusters with * = p <0.05, ** = p <0.01, *** = p <0.001.

Source: Own calculations

Appendix 5

Table 7: Sociodemographic characteristics of the participants in the two clusters

		Cluster 1	Cluster 2
Gender	***		
	Female	62.9%	44.1%
	Male	37.1%	55.9%
Age groups	n.s.		
	18-29	17.8%	16.9%
	30-39	13.8%	14.0%
	40-49	11.5%	18.2%
	50-59	21.8%	17.4%
	60+	35.1%	33.5%
Place of residence	n.s.		
	South ¹	30.9%	27.5%
	North ²	12.6%	19.1%
	East ³	18.3%	22.5%
	West ⁴	38.3%	30.9%
Education	n.s.		
	No educational qualifications	3.4%	3.8%
	Secondary school (low)	33.1%	30.9%
	Secondary school (high)	26.3%	31.8%
	Higher education entrance qualification	33.1%	29.7%
	Still in education	4.0%	3.8%
Household income	n.s.		
	under 1,300 €	21.1%	19.9%
	1.300-2.600 €	42.3%	36.9%
	2.600- under 4.500	25.1%	33.5%
	4.500 and more	11.4%	9.7%
Urbanity of residence	n.s.		
	rural (under 5.000 habitants)	24.0%	25.4%
	urban (5.000- under 20.000 habitants)	18.3%	17.4%
	highly urban (20.000- under 100.000 habitants)	26.9%	25.0%
	extremely urban regions (more than 100.000 habitants)	30.9%	32.2%
Pets			
	Grown up with pets	Yes	73.1%
		No	26.9%
	Pet owner	Yes	56.0%
		No	44.0%
	Desire for a pet*	Yes	58.4%
		No	41.6%

Meat and sausage consumption ***

Much and rather much	10.3% ^a	23.7% ^b
Average amount	32.6% ^a	45.8% ^b
Rather few and few	44.6% ^a	29.2% ^b
No meat or sausage but fish	4.6% ^a	0.8% ^b
Vegans or vegeterians	8.0% ^a	0.4% ^b

Cluster 1: n = 175; cluster 2: n = 236; Chi-square test with * = p < 0.05, ** = p < 0.01, *** = p < 0.001; n.s. = no significant differences; ^{a,b} = significant differences (p < 0.05) between clusters according to z-test in the cross-tabulation. ¹Bavaria, Baden-Wuerttemberg; ²Bremen, Hamburg, Lower-Saxony, Schleswig-Holstein; ³Brandenburg, Berlin, Saxony, Saxony-Anhalt, Thuringa, Mecklenburg-Western Pomerania; ⁴Hessia, North Rhine-Westphalia, Rhineland-Palatinate, Saarland.

Source: own calculations

Appendix 6

Table 8: Comparison of mean scores regarding interest and self-perceived-knowledge between the two clusters

	Mean (SD)	Mean (SD)
Interested in		
Agriculture***	3.70 (0.94)	3.17 (0.93)
Pig husbandry***	3.63 (1.02)	2.96 (0.93)
Self-perceived-knowledge of		
Pig husbandry***	2.97 (0.89)	2.58 (0.97)
Cattle husbandry**	2.86 (0.87)	2.56 (0.92)
Poultry husbandry***	3.03 (0.88)	2.67 (0.96)
Natural behaviour needs/ patterns of pigs***	2.85 (0.86)	2.49 (0.85)

Cluster 1: n = 175; cluster 2: n = 236; SD = standard deviation; 5-point Likert scale for the rating of knowledge from 1 = extremely low, 2 = rather low, 3 = middle, 4 = rather high and 5 = extremely high and for interest from 1 = not at all, 2 = rather not, 3 = partly/partly, 4 = little, 5 = much; comparing of mean scores using ANOVA; significant differences between the two clusters with * = p < 0.05, ** = p < 0.01, *** = p < 0.001.

Source: own calculations



Diskussionspapiere

2000 bis 31. Mai 2006

Institut für Agrarökonomie

Georg-August-Universität, Göttingen

<u>2000</u>		
0001	Brandes, W.	Über Selbstorganisation in Planspielen: ein Erfahrungsbericht, 2000
0002	von Cramon-Taubadel, S. u. J. Meyer	Asymmetric Price Transmission: Factor Artefact?, 2000
<u>2001</u>		
0101	Leserer, M.	Zur Stochastik sequentieller Entscheidungen, 2001
0102	Molua, E.	The Economic Impacts of Global Climate Change on African Agriculture, 2001
0103	Birner, R. et al.	„Ich kaufe, also will ich?": eine interdisziplinäre Analyse der Entscheidung für oder gegen den Kauf besonders tier- u. umweltfreundlich erzeugter Lebensmittel, 2001
0104	Wilkens, I.	Wertschöpfung von Großschutzgebieten: Befragung von Besuchern des Nationalparks Unteres Odertal als Baustein einer Kosten-Nutzen-Analyse, 2001
<u>2002</u>		
0201	Grethe, H.	Optionen für die Verlagerung von Haushaltsmitteln aus der ersten in die zweite Säule der EU-Agrarpolitik, 2002
0202	Spiller, A. u. M. Schramm	Farm Audit als Element des Midterm-Review : zugleich ein Beitrag zur Ökonomie von Qualitätssicherungssystemen, 2002
<u>2003</u>		
0301	Lüth, M. et al.	Qualitätssignaling in der Gastronomie, 2003
0302	Jahn, G., M. Peupert u. A. Spiller	Einstellungen deutscher Landwirte zum QS-System: Ergebnisse einer ersten Sondierungsstudie, 2003
0303	Theuvsen, L.	Kooperationen in der Landwirtschaft: Formen, Wirkungen und aktuelle Bedeutung, 2003

0304	Jahn, G.	Zur Glaubwürdigkeit von Zertifizierungssystemen: eine ökonomische Analyse der Kontrollvalidität, 2003
2004		
0401	Meyer, J. u. S. von Cramon-Taubadel	Asymmetric Price Transmission: a Survey, 2004
0402	Barkmann, J. u. R. Marggraf	The Long-Term Protection of Biological Diversity: Lessons from Market Ethics, 2004
0403	Bahrs, E.	VAT as an Impediment to Implementing Efficient Agricultural Marketing Structures in Transition Countries, 2004
0404	Spiller, A., T. Staack u. A. Zühlsdorf	Absatzwege für landwirtschaftliche Spezialitäten: Potenziale des Mehrkanalvertriebs, 2004
0405	Spiller, A. u. T. Staack	Brand Orientation in der deutschen Ernährungswirtschaft: Ergebnisse einer explorativen Online-Befragung, 2004
0406	Gerlach, S. u. B. Köhler	Supplier Relationship Management im Agribusiness: ein Konzept zur Messung der Geschäftsbeziehungsqualität, 2004
0407	Inderhees, P. et al.	Determinanten der Kundenzufriedenheit im Fleischerfachhandel
0408	Lüth, M. et al.	Köche als Kunden: Direktvermarktung landwirtschaftlicher Spezialitäten an die Gastronomie, 2004
2005		
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44	Feulefack, Joseph Florent, Manfred Zeller u. Stefan Schwarze	Accuracy Analysis of Participatory Wealth Ranking (PWR) in Socio-economic Poverty Comparisons, 2006



Die Wurzeln der **Fakultät für Agrarwissenschaften** reichen in das 19. Jahrhundert zurück. Mit Ausgang des Wintersemesters 1951/52 wurde sie als siebente Fakultät an der Georg-Augusta-Universität durch Ausgliederung bereits existierender landwirtschaftlicher Disziplinen aus der Mathematisch-Naturwissenschaftlichen Fakultät etabliert.

1969/70 wurde durch Zusammenschluss mehrerer bis dahin selbständiger Institute das **Institut für Agrarökonomie** gegründet. Im Jahr 2006 wurden das Institut für Agrarökonomie und das Institut für RURALE Entwicklung zum heutigen **Department für Agrarökonomie und RURALE Entwicklung** zusammengeführt.

Das Department für Agrarökonomie und RURALE Entwicklung besteht aus insgesamt neun Lehrstühlen zu den folgenden Themenschwerpunkten:

- Agrarpolitik
- Betriebswirtschaftslehre des Agribusiness
- Internationale Agrarökonomie
- Landwirtschaftliche Betriebslehre
- Landwirtschaftliche Marktlehre
- Marketing für Lebensmittel und Agrarprodukte
- Soziologie Ländlicher Räume
- Umwelt- und Ressourcenökonomik
- Welternährung und rurale Entwicklung

In der Lehre ist das Department für Agrarökonomie und RURALE Entwicklung führend für die Studienrichtung Wirtschafts- und Sozialwissenschaften des Landbaus sowie maßgeblich eingebunden in die Studienrichtungen Agribusiness und Ressourcenmanagement. Das Forschungsspektrum des Departments ist breit gefächert. Schwerpunkte liegen sowohl in der Grundlagenforschung als auch in angewandten Forschungsbereichen. Das Department bildet heute eine schlagkräftige Einheit mit international beachteten Forschungsleistungen.

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