

# Attitudes of different stakeholders toward pig husbandry: a study to determine conflicting and matching attitudes toward animals, humans and the environment

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**Abstract** The pig sector is struggling with negative attitudes of citizens. This may be the result of conflicting attitudes toward pig husbandry between citizens and other stakeholders. To obtain knowledge about these attitudes, the objectives of this study were (1) to determine and compare attitudes of various stakeholders toward animals, humans and the environment in the context of pig husbandry and (2) to determine and compare the acceptability of publically discussed issues related to pig husbandry of various stakeholders. A questionnaire was distributed to citizens, conventional pig farmers, organic pig farmers, pig husbandry advisors and pig veterinarians. Respondents could indicate their attitude toward aspects related to animals, humans and the environment in the context of pig husbandry and they could indicate their opinion about the acceptability of issues of pig husbandry, e.g. piglet mortality and inside pig housing. Based on measured attitudes and the acceptability of issues, the studied stakeholders could be divided into three distinctive groups. The group of citizens and organic pig farmers showed negative attitudes toward all aspects of pig husbandry, the group of conventional pig farmers and pig husbandry advisors only showed negative attitudes toward aspects related to economics and

the group of pig veterinarians showed negative attitudes to specific aspects of pig husbandry. This indicates that stakeholders have different interests and different perspectives with regard to pig husbandry. The pig sector should learn to understand citizens' perspectives and take these into account in their line of work, the implementation of animal welfare measures and in their communication.

**Keywords** Attitudes · Pig husbandry · Stakeholders

## Introduction

The animal husbandry sector is struggling with negative public attitudes toward their sector. These public attitudes are, for instance, expressed in public debates with regard to animal husbandry (Barnett et al. 2001; Boogaard et al. 2011a; Brom 2000; De Barcellos et al. 2012; Krystallis et al. 2009; María 2006; Mench 2008; Meuwissen and van der Lans 2005; Miele et al. 2011; Ngapo et al. 2003; Schröder and McEachern 2004). Pig husbandry is one of the animal practices that is trying to anticipate on public attitudes in order to keep their license to produce (Rollin 2004). The license to produce indicates the existence right of a sector, in this case pig husbandry. This license takes into account external factors, e.g., environment and animal welfare, and internal factors, i.e., economic performance and socio-cultural performance (Mureau 2000). For the socio-cultural performance, pig husbandry has a responsibility to implement changes society desires in order to get societal acceptance and have a right to exist (Mureau 2000).

Attitudes toward pig husbandry differ between citizens and other stakeholders (Bergstra et al. 2013; Boogaard et al. 2011b; Bracke et al. 2005; Lassen et al. 2006;

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Meuwissen and van der Lans 2005; Spooner et al. 2014; Te Velde et al. 2002; Tuytens et al. 2010; Vanhonacker et al. 2008). For example, citizens consider the welfare of farm animals being jeopardized, where pig farmers consider the welfare of their animals to be good (Te Velde et al. 2002; Vanhonacker et al. 2008). These different attitudes may be conflicting to a level that stakeholders disagree on steps that are taken within pig husbandry (Bracke et al. 2005; De Greef et al. 2006; Te Velde et al. 2002). This disagreement may result in lack of support from certain stakeholders for decisions that are made by other stakeholders. In order to understand disagreements of different stakeholders of pig husbandry, it is necessary to know which attitudes toward pig husbandry are conflicting. In this context it is important to include attitudes toward different entities related to pig husbandry, i.e., animals, humans and the environment, because all these attitudes play a role in the judgment of pig husbandry (Boogaard et al. 2011b; Kanis et al. 2003; Meuwissen and van der Lans 2005). To our knowledge, no studies have been done that focused on attitudes toward different aspects of pig husbandry of several stakeholders. In order to get insight in these attitudes the first objective of this study is to determine and compare attitudes toward animals, humans and the environment with regard to pig husbandry, of various stakeholders. These attitudes are connected to aspects of pig husbandry that are publically discussed as issues of concern, e.g., piglet mortality, castration and use of antibiotics. Even with negative attitudes related to these issues it is possible that these issues are found acceptable in the current circumstances of pig husbandry. Therefore, our research question is: are there differences between pig husbandry stakeholders in the acceptance of these issues? To this end a second objective of this study is to determine and compare the acceptability of issues related to pig husbandry of various stakeholders.

## Literature review

An attitude is defined as “a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor (Eagly and Chaiken 1993). Conflicting attitudes between stakeholders can be caused by different interests (Boogaard et al. 2006). Pig farmers have a financial interest in pig husbandry while consumers have an interest in a tasty and healthy piece of meat that is cheap and derived from animals with good welfare (Te Velde et al. 2002). Organic pig farmers have a high interest in the opportunity for animals to express their natural behavior (Bock and van Huik 2007; Lund et al. 2004), while conventional pig farmers mainly have an interest in good physical welfare of the animals they keep (Bock and van Huik 2007). Because of the different interests and different attitudes toward pig

husbandry, citizens do not always agree on the choices that are made within pig husbandry. A Canadian study showed that citizens have an interest in natural living conditions for animals and that they showed positive attitudes toward small family farms in which animals are not confined (Spooner et al. 2014). As Dutch citizens are also interested in natural living conditions for pigs (Anonymous 2016) it could be assumed that Dutch citizens also have a preference for small farms. However, because of their financial interest it is inevitable for conventional pig farmers to increase production efficiency and scale of production in order to reduce costs and meet market demands (De Greef and Casabianca 2009).

In order to decrease conflicting attitudes between the pig sector and citizens, measures for pig husbandry have to be economically viable for pig farmers and at the same time acceptable for society (De Greef and Casabianca 2009). Meeting both these demands is a challenge, as society wants an improvement of animal welfare while pig farmers are not willing to implement animal welfare measures if they have strong negative economic effects (De Greef and Casabianca 2009). Another challenge is to take into account the effect of measures on animals, humans and the environment to get citizens' support. Citizens' attitudes toward these entities can sometimes be conflicting (Boogaard et al. 2011a), which should be considered in the development of measures for pig husbandry. For example, with piglet castration, citizens reject the intervention without anesthetics because of the effect on animal welfare (Frederiksen et al. 2010; Heid and Hamm 2012, 2013; Lagerkvist et al. 2006) but, at the same time, citizens reject putting castration to an end because of the risk of boar taint in meat (Frederiksen et al. 2010; Lagerkvist et al. 2006). Immunocastration as an alternative for surgical castration seems to be a solution to this problem (Heid and Hamm 2013; Lagerkvist et al. 2006). However, immunocastration may provoke negative citizens' attitudes because of uncertainty about the effect of residuals in meat on human health (Frederiksen et al. 2010; Heid and Hamm 2013).

Animal welfare measures in pig husbandry do not seem to have a positive effect on citizens' attitudes toward pig husbandry because citizens' attitudes toward this animal practice stay negative (Anonymous 2016; Boogaard et al. 2011b; Meuwissen and van der Lans 2005; Verbeke and Viaene 2000). A reason for this may be that in the development of animal welfare measures, the pig sector focuses primarily on technical solutions that meet their own interests, such as low costs and labor efficiency. As these interests differ from the interests of citizens (Te Velde et al. 2002), the interests of citizens will not be met with measures developed by the pig sector. As long as the pig sector does not include citizens' interests in the measures they develop, there will be no change in conflicting attitudes between these groups. The organic pig sector seems to have

found a way to reduce conflicting attitudes between them and citizens as citizens have more positive attitudes toward organic pig farming (Magnusson et al. 2003; Heid and Hamm 2012). A reason may be that legislation for organic pig farming is more in line with citizens' attitudes toward pig husbandry. For example, in the Dutch organic pig sector it is only allowed to castrate boars under anesthesia (Skal bio controle 2014). Studies showed that surgical castration without the use of anesthetics was found to be unacceptable by citizens (Lagerkvist et al. 2006; Heid and Hamm 2012). So when anesthetics are used, this intervention is more likely to be supported by citizens.

To understand why citizens do not support certain animal welfare measures it is important to understand their attitudes and how these attitudes differ from attitudes of other pig husbandry stakeholder groups.

## Methods

### Participants

A questionnaire was distributed via internet to stakeholders of pig husbandry, i.e., citizens, conventional pig farmers, organic pig farmers, pig husbandry advisors, such as food advisors and business advisors, and pig veterinarians. These stakeholders were selected because they all are important when it comes to pig husbandry measures. The attitudes of citizens are a reason why animal welfare measures are developed. Pig farmers are important, because they implement new animal welfare measures. We made a distinction between organic and conventional pig farmers. These two types of farmers choose a different approach for animal keeping by participating in a conventional system or in an organic system. Based on this it is assumed that the two types of farmers have different attitudes toward pig husbandry. Pig farmers have close contact with pig husbandry advisors, such as feed advisors and business advisors, and pig veterinarians. These advisors are expected to influence the development of measures for pig husbandry.

A randomly selected panel of 2572 Dutch citizens, representative for the Netherlands and willing to participate in surveys, was invited to fill in the questionnaire in October 2011 (CentERdata, Tilburg, the Netherlands). A week after the invitation, the panel received a reminder. In total the panel had 2 weeks the time to fill in the questionnaire. The questionnaire was open from October until December 2011 for all other stakeholders. These stakeholders were approached in different ways. TOPIGS (a global leader in pig breeding and artificial insemination) provided a list of 2399 addresses of conventional pig farmers (TOPIGS, Helvoirt, the Netherlands). From this list the addresses of pig farmers with less than 50 sows

were excluded. From the remaining list 1000 randomly selected addresses received an invitation. Two weeks after the first letter a reminder letter was sent. The 60 organic pig farmers affiliated with the association of organic pig keepers (VBV, Uden, the Netherlands) received an invitation as part of the general electronic newsletter. To the 320 pig veterinarians affiliated with the royal Dutch Society for Veterinary Medicine (KNMvD, Houten, the Netherlands) an invitation for the questionnaire was sent by electronic mail. A reminder was sent by electronic mail 3 weeks after the initial invitation. The 370 pig husbandry advisors who were member of Agrivaknet (an independent trade union of agricultural specialists, Lettele, the Netherlands) also received an invitation by electronic mail and a reminder after 3 weeks.

The response rate per stakeholder was as follows:

- Citizens: 1607 of 2572 (62.5 %), of which 5 were pig veterinarians and 2 were pig husbandry advisors;
- Conventional pig farmers: 181 of 1000 (18.1 %);
- Organic pig farmers: 11 of 60 (18.3 %);
- Pig husbandry advisors: 70 of 370 (18.9 %);
- Pig veterinarians 66 of 320 (20.6 %).

For most socio-demographic features (Table 1) the groups of stakeholders were representative of the Netherlands, except for the age of citizens. Citizens in our study were on average older than in the Dutch population (Central Bureau for Statistics 2010).

### Framework

The first step in this study was the development of a framework that includes aspects of pig husbandry that play a role in stakeholder attitudes (Fig. 1). The aspects of importance were defined with the focus on aspects that were presented in the media by animal welfare organizations (Society for the protection of animals, Stichting varkens in nood and Wakker dier) from 2009 until 2011. As these aspects were a matter of public discussion they can also be defined as issues (see, inter alia, Oxford Dictionaries and Cambridge Dictionaries). Presented issues were: piglet mortality, pig housing (space, social contact, outdoor access), scale increase, interventions (castration, tail docking) in piglets, pig euthanasia, sow lifespan, piglet litter size, weaning age of piglets, motherless care of piglets, use of antibiotics in pigs, pig transport and anesthetics used to sedate pigs. Because most of these issues refer to multiplier pig husbandry the framework focuses on this type of pig husbandry. Consequently, in the remainder of the present study, 'pig husbandry' stands for 'multiplier pig husbandry'. The issue 'pig transport' was excluded because transport hardly occurs between multiplier pig farms. The issue 'use of anesthetics' was excluded because the issue

**Table 1** Percentage of respondents per category of the socio-demographic features for each stakeholder

Socio-demographic feature	Category	Cit*	Con	Org	Adv	Vet
Gender	Male	54.8	95.0	72.7	87.1	86.4
	Female	45.2	5.0	27.3	12.9	13.6
Age	15–24	3.5	1.1	0.0	7.1	0.0
	25–34	4.6	14.5	18.2	15.7	12.1
	35–44	14.1	32.4	0.0	25.7	18.2
	45–54	19.7	39.1	63.6	40.0	42.4
	55–64	26.6	12.8	18.2	8.6	25.8
	65–older	31.5	0.0	0.0	2.9	1.5
Education	Primary school	4.8	0.0	0.0	0.0	0.0
	Secondary school (low)	27.3	4.5	9.1	2.9	0.0
	Secondary school (high)	12.3	6.1	0.0	2.9	0.0
	Vocational	15.9	58.7	63.6	15.7	0.0
	BSc	26.8	28.5	27.3	55.7	0.0
Religious	MSc	12.8	2.2	0.0	22.9	100.0
	Yes	28.1	36.5	9.1	32.9	25.8
	No	50.6	32.0	72.7	32.9	56.1
Pets	Little	21.3	31.5	18.2	34.3	18.2
	Yes	41.7	84.4	90.9	71.4	90.6
Childhood residence	No	58.3	15.6	9.1	28.6	9.4
	Randstad	25.6	3.9	0.0	8.6	13.6
Urban character residence	Big city	13.1	1.1	10.0	4.3	13.6
	Small city	16.8	2.2	10.0	5.7	6.1
	Big village	16.4	18.3	10.0	24.3	25.8
	Small village	28.1	74.4	70.0	57.1	40.9
	Extremely urban (>2500*)	14.0	1.1	0.0	8.7	7.8
Urban character residence	Highly urban (1500–2500*)	24.8	2.9	9.1	8.7	6.3
	Urban (1000–1500*)	21.4	10.3	9.1	21.7	17.2
	Moderately urban (500–1000*)	22.0	21.7	9.1	24.6	14.1
	Not urban (<500*)	17.8	64.0	72.7	36.2	54.7

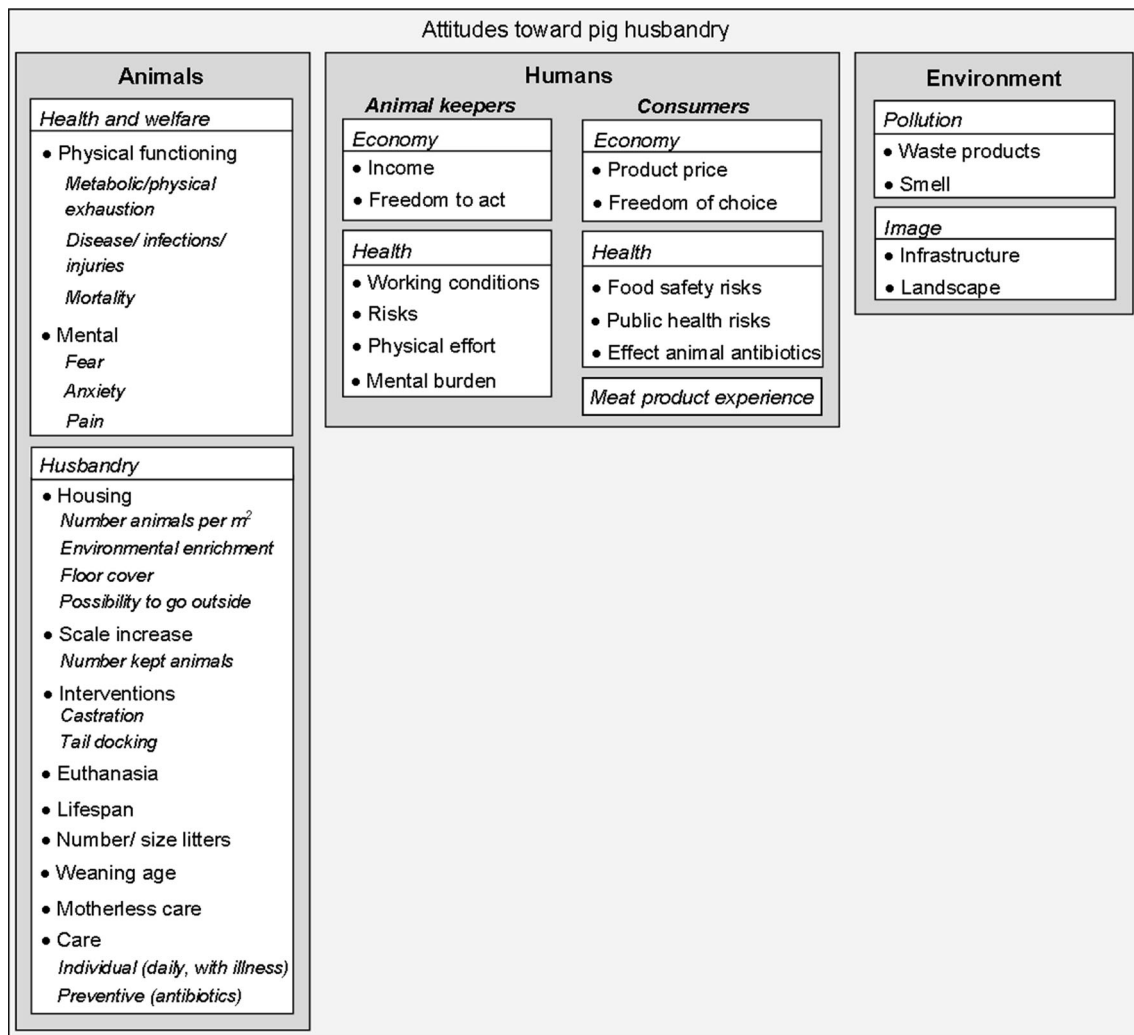
\* *Cit* citizens, *Con* conventional pig farmers, *Org* organic pig farmers, *Adv* pig husbandry advisors, *Vet* pig veterinarians

‘castration’ covered this, as public debates about this issue predominately focused on the use of anesthetics during the castration process. With the remaining issues in mind, aspects of importance were defined based on literature (Fig. 1), information from the sector and expert knowledge. These aspects are related to the three entities; animals, humans (both animal keepers and consumers) and the environment. Per entity, the aspects of relevance were divided into different categories. For example, the aspects ‘income’ and ‘freedom to act’ were listed in the category ‘economy’ for the entity ‘animal keeper’ (Fig. 1). The issues of focus were also included in the framework.

### Data collection

Based on the framework (Fig. 1), we developed a questionnaire. In the questionnaire as little information as possible was given about pig husbandry to minimize the

influence of the given information on respondent’s attitudes. Because attitudes cannot be measured directly, in the first part of the questionnaire respondents could give additional care (AC) levels to each aspect mentioned in Fig. 1. With AC levels respondents could indicate how much more attention they thought should be given to an aspect of pig husbandry than the attention this aspect was currently receiving. For example, when someone believes that the attention that the pig sector is currently been given to piglet mortality is not enough, he or she can give a high AC level to this aspect. It was assumed that AC levels could be representative for the attitude of the respondent, where a higher indicated AC level is considered indicative for a more negative attitude. AC levels could be indicated on a Likert scale of 1 (no AC necessary) to 10 (maximal AC necessary). It is possible that people show negative attitudes toward aspects of pig husbandry but do find aspects that have been discussed in the media, i.e., issues,



**Fig. 1** Framework for the assessment of attitudes toward pig husbandry. Per entity, i.e., animals, humans (animal keepers and consumers) and environment, categories with aspects relevant for attitudes toward pig husbandry are presented. Sources Barnett et al. 2001; Beekman et al. 2002; Boogaard et al. 2011a, b; Cohen et al. 2009, 2012; Driessen 2012; Fraser 1999; Frederiksen et al. 2010; Harper and Henson 2001; Huber-Eicher and Spring 2008; Kanis et al.

2003; Krystallis et al. 2009; Lagerkvist et al. 2006; Marchant-Forde 2009; McGlone 2001; Mephram 2000; Meuwissen and van der Lans 2005; Michalopoulos et al. 2008; Millman 2011; Ngapo et al. 2003; Petit and van der Werf 2003; Te Velde et al. 2002; Tuytens et al. 2010; Vanhonacker et al. 2010, 2008; Verdoes and Swinkels 2003; Von Essen and McCurdy 1998; Webster 2001

acceptable in the current situation. This means that these people are of the opinion that more attention should be given to these aspects but that under the current circumstances in pig husbandry these aspects are acceptable. The second part of the questionnaire included a question about the acceptability of issues related to pig husbandry, i.e., piglet mortality, weaning age of piglets, castration of piglets, tail docking of piglets, interventions (castration/tail docking) without sedation, interventions (castration/tail docking) with sedation, housing of pigs inside, the use of farrowing pens, euthanize sick pigs, allow the farmer to decide when a pig should be euthanized, lifespan of sows, and the effect of the use of antibiotics on public health. Respondents could indicate whether they found these

issues in the current conventional pig husbandry system acceptable, not acceptable or that they had no judgment. In the last part of the questionnaire, respondents were asked for their socio-demographic features, i.e., gender, age, level of education, religious (yes, no or a little), pets (yes or no), urban character of residence, and size of childhood residence.

### Data analysis

Before the statistical analyses were performed, the AC levels were decreased from a ten-point Likert scale to a five-point Likert scale (1: no AC necessary, 2: little AC necessary, 3: temperate AC necessary, 4: strong AC

necessary and 5: maximal AC necessary); levels 1 and 2 became level 1, levels 3 and 4 became level 2, levels 5 and 6 became level 3, levels 7 and 8 became level 4 and levels 9 and 10 became level 5). The scale decrease was done to maximize scale variation.

Descriptive statistical analyses were carried out to identify assigned AC levels of citizens, conventional pig farmers, organic pig farmers, pig husbandry advisors and pig veterinarians to aspects of pig husbandry. The probability that respondents belonging to a certain stakeholder group gave higher or lower AC levels than respondents in the other stakeholder groups was calculated with ordered multinomial logistic regression. In this regression, corrections were made for socio-demographic features to ensure that these features did not affect probabilities. Descriptive statistical analyses were carried out to identify acceptability of issues with regard to pig husbandry in the stakeholder groups 'citizens', 'conventional pig farmers', 'organic pig farmers', 'pig husbandry advisors' and 'pig veterinarians'. To analyze whether respondents in the one stakeholder group had a higher or lower probability to choose 'no' for the acceptability of issues than respondents in the other stakeholder groups, binary logistic regression was performed.

For statistical analyses IBM SPSS Statistics 19 (IBM Corporation, New York, United States) and EViews6 (IHS EViews, Irvine, United States) were used. In SPSS descriptive statistical analysis was performed, and in EViews all other analyses were carried out.

## Results

The different stakeholders assigned different additional care (AC) levels to aspects of pig husbandry (Table 2). Citizens and organic pig farmers gave the highest AC levels ( $\geq 3.3$  on a five-point scale). Although both stakeholder groups gave AC levels above average, there was a probability that organic pig farmers gave higher AC levels than citizens for ten of the aspects, e.g., tail docking, litter size and weaning age. Citizens gave the highest AC levels ( $\geq 4.0$ ) to the possibility for animals to go outside, the effect of the use of antibiotics on both animals and humans, food safety risks, public health risks and environmental waste. Compared to citizens, conventional pig farmers gave to most aspects lower AC levels but gave higher AC levels ( $\geq 3.7$ ) to enough income, freedom to act and mental burden for the animal keeper, and price of the product and the experience of meat products for consumers. The probability that pig husbandry advisors gave lower AC levels than conventional pig farmers was only significant for four aspects, i.e., metabolic/physical exhaustion, number of kept animals, motherless care and

image landscape. The probability that pig veterinarians gave different AC levels than the other stakeholders was significant for most aspects related to animals. These AC levels were the most different in comparison with conventional pig farmers and pig husbandry advisors, in which pig veterinarians gave higher AC levels, and the least different in comparison with citizens and organic pig farmers, in which pig veterinarians gave lower AC levels except for time euthanasia, i.e., the time it takes before it is decided to euthanize an animal after it shows symptoms of bad wellbeing. With regard to humans and the environment, pig veterinarians more often had the probability to give higher or lower AC levels than citizens compared to the other stakeholders.

## Acceptability of issues related to pig husbandry

Respondents could indicate if they found issues related to pig husbandry acceptable or not, or if they had no judgment. For most issues, the acceptability differed between stakeholders (Table 3). The majority of the respondents ( $>58\%$ ) from all stakeholders did find interventions with sedation and euthanizing sick animals acceptable. Therefore, these issues were excluded from the table. More than one-fifth of the citizens had no judgment for a number of issues, i.e., piglet mortality, weaning age, castration of piglets, farrowing pens, pig farmer decides when to euthanize, lifespan sow and the effect of antibiotics on public health. More than half of the citizens had no judgment for piglet mortality, weaning age and lifespan sow. Weaning age was the only issue for which the probability that citizens scored 'no' for acceptability was different from organic pig farmers. Most organic pig farmers ( $>54\%$ ) and citizens ( $>60\%$ ) found tail docking, interventions without sedation, housing animals inside and the effect of antibiotics on human health not acceptable. Pig veterinarians found castration, interventions without sedation and the effect of antibiotics on public health not acceptable and the other seven issues acceptable. Most ( $>61\%$ ) of the conventional pig farmers and pig husbandry advisors found all issues, except the effect of antibiotics on public health, acceptable. For tail docking and housing animals inside, citizens had a higher probability to find these issues not acceptable than conventional pig farmers, pig veterinarians and pig husbandry advisors. For interventions without sedation, citizens had a higher probability to find this issue not acceptable than conventional pig farmers and pig husbandry advisors. Pig veterinarians also found interventions without sedation unacceptable, but had a lower probability to find this issue unacceptable than citizens. Of the conventional pig farmers, less than half of the respondents found the effect of antibiotics on public health not acceptable. This was in contrast to the other

**Table 2** Average additional care (AC) level on a five-point scale per aspect of pig husbandry per stakeholder

Entity	Aspect	Average AC level				
		Cit*	Org	Con	Adv	Vet
Animal	Metabolic/physical exhaustion	3.4 <sup>a</sup>	3.5 <sup>a</sup>	2.7 <sup>b,c</sup>	2.3 <sup>b,d</sup>	3.4 <sup>a</sup>
	Disease/infections/injuries	3.8 <sup>a</sup>	3.5	3.0 <sup>b</sup>	2.8 <sup>b,c</sup>	3.3 <sup>d</sup>
	Mortality	3.6 <sup>a</sup>	3.3	2.9 <sup>b,c</sup>	2.8 <sup>b,c</sup>	3.2 <sup>d</sup>
	Fear/anxiety	3.8 <sup>a</sup>	4.1 <sup>a</sup>	2.6 <sup>b,c</sup>	2.7 <sup>b,c</sup>	3.4 <sup>b,d</sup>
	Pain	3.9 <sup>a</sup>	3.5 <sup>a</sup>	2.6 <sup>b</sup>	2.6 <sup>b</sup>	3.5 <sup>a</sup>
	Number of animals per m <sup>2</sup>	3.9 <sup>a</sup>	4.0 <sup>a</sup>	2.3 <sup>b,c</sup>	2.1 <sup>b,c</sup>	3.2 <sup>b,d</sup>
	Environmental enrichment	3.6 <sup>a</sup>	3.9 <sup>a</sup>	2.5 <sup>b,c</sup>	2.4 <sup>b,c</sup>	3.2 <sup>b,d</sup>
	Floor cover	3.8 <sup>a</sup>	3.7 <sup>c</sup>	2.3 <sup>b,d</sup>	2.1 <sup>b,d</sup>	3.2 <sup>b,c</sup>
	Possibility to go outside	4.0 <sup>a</sup>	3.6 <sup>a</sup>	1.5 <sup>b</sup>	1.4 <sup>b,c</sup>	1.9 <sup>b,d</sup>
	Number of kept animals	3.8 <sup>a</sup>	4.1 <sup>a</sup>	2.3 <sup>b,c</sup>	2.0 <sup>b,d</sup>	2.5 <sup>b,c</sup>
	Castration	3.6 <sup>a</sup>	3.9 <sup>a</sup>	2.7 <sup>b,c</sup>	2.4 <sup>b,c</sup>	3.4 <sup>d</sup>
	Tail docking	3.6 <sup>a</sup>	4.3 <sup>b,c</sup>	2.2 <sup>b,d,e</sup>	2.2 <sup>b,d,e</sup>	3.1 <sup>b,d,f</sup>
	Time euthanasia	3.6 <sup>a</sup>	4.0 <sup>b,c</sup>	2.9 <sup>b,d</sup>	3.1 <sup>d</sup>	4.0 <sup>b,c</sup>
	Lifespan sow	3.7 <sup>a</sup>	3.5 <sup>a</sup>	2.6 <sup>b</sup>	2.4 <sup>b</sup>	3.0 <sup>a</sup>
	Number of litters per sow	3.6 <sup>a</sup>	4.0 <sup>a</sup>	2.3 <sup>b</sup>	2.1 <sup>b</sup>	2.1 <sup>b</sup>
	Litter size	3.5 <sup>a</sup>	4.1 <sup>b,c</sup>	2.4 <sup>b,d</sup>	2.2 <sup>b,d</sup>	2.3 <sup>b,d</sup>
	Weaning age	3.6 <sup>a</sup>	4.5 <sup>b,c</sup>	2.3 <sup>b,d</sup>	2.3 <sup>b,d</sup>	3.2 <sup>a,d</sup>
	Motherless care	3.7 <sup>a</sup>	4.0 <sup>a</sup>	2.7 <sup>b,c</sup>	2.3 <sup>b,d</sup>	3.1 <sup>c</sup>
	Care for individual animal	3.8 <sup>a</sup>	4.2 <sup>b,c</sup>	2.5 <sup>b,d</sup>	2.7 <sup>b,d</sup>	3.4 <sup>c</sup>
	Use of antibiotics (animal)	4.2 <sup>a</sup>	4.5 <sup>a</sup>	3.2 <sup>b</sup>	3.4 <sup>b</sup>	3.8 <sup>b</sup>
Animal keeper	Enough income	3.6 <sup>a</sup>	4.3 <sup>b</sup>	4.5 <sup>b</sup>	4.4 <sup>b</sup>	4.3 <sup>b</sup>
	Freedom to act	3.3 <sup>a</sup>	3.7 <sup>c</sup>	3.7 <sup>b,c</sup>	3.4 <sup>b,c</sup>	2.7 <sup>b,d</sup>
	Working conditions	3.5	3.7	3.4	3.1	3.4
	Health risks	3.8 <sup>a</sup>	3.8 <sup>a</sup>	3.3 <sup>b</sup>	3.2 <sup>b</sup>	3.4
	Physical burden	3.5	3.7	3.4	3.1	3.2
	Mental burden	3.5 <sup>a</sup>	4.1 <sup>b</sup>	3.8 <sup>b</sup>	3.8 <sup>b</sup>	3.7 <sup>b</sup>
Consumer	Price product	3.3 <sup>a</sup>	3.9 <sup>b</sup>	4.1 <sup>b</sup>	3.9 <sup>b</sup>	3.8 <sup>b</sup>
	Freedom of choice	3.4 <sup>a</sup>	3.9 <sup>b</sup>	3.2 <sup>a</sup>	3.2 <sup>a</sup>	2.9 <sup>a</sup>
	Food safety risks	4.0 <sup>a</sup>	3.7 <sup>a</sup>	2.8 <sup>b</sup>	2.6 <sup>b</sup>	2.7 <sup>b</sup>
	Public health risks	4.0 <sup>a</sup>	3.8 <sup>a</sup>	2.8 <sup>b</sup>	2.7 <sup>b</sup>	2.8 <sup>b</sup>
	Use of antibiotics (human)	4.2 <sup>a</sup>	3.9 <sup>a</sup>	3.2 <sup>b</sup>	3.4 <sup>b</sup>	3.5 <sup>b</sup>
	Experience meat products	3.4 <sup>a</sup>	4.5 <sup>b,c</sup>	3.7 <sup>b,d</sup>	3.9 <sup>b</sup>	3.5 <sup>b,d</sup>
Environment	Environmental waste	4.0 <sup>a</sup>	3.3 <sup>c</sup>	2.5 <sup>b,d,e</sup>	2.5 <sup>b,e</sup>	3.0 <sup>b,f</sup>
	Smell	3.6 <sup>a</sup>	3.5 <sup>c</sup>	2.6 <sup>b,d</sup>	2.5 <sup>b,d</sup>	2.9 <sup>b,c</sup>
	Change in infrastructure	3.7 <sup>a</sup>	3.3 <sup>c</sup>	2.5 <sup>b,d</sup>	2.5 <sup>b,d</sup>	2.8 <sup>b</sup>
	Image landscape	3.6 <sup>a</sup>	3.7 <sup>a</sup>	2.7 <sup>b,c</sup>	2.4 <sup>b,d</sup>	2.8 <sup>b,c</sup>

\* *Cit* citizens, *Con* conventional pig farmers, *Org* organic pig farmers, *Adv* pig husbandry advisors, *Vet* pig veterinarians

<sup>a, b</sup> The probability that respondents in the stakeholder group with 'a' gave higher/lower AC levels than respondents in the stakeholder group with 'b' was significant ( $P < 0.05$ ) for that particular aspect

<sup>c, d</sup> The probability that respondents in the stakeholder group with 'c' gave higher/lower AC levels than respondents in the stakeholder group with 'd' was significant ( $P < 0.05$ ) for that particular aspect

<sup>e, f</sup> The probability that respondents in the stakeholder group with 'e' gave higher/lower AC levels than respondents in the stakeholder group with 'f' was significant ( $P < 0.05$ ) for that particular aspect

stakeholders of which more than 58 % of the respondents found the effect of antibiotics on public health not acceptable.

Sometimes there was a difference between the acceptability of issues from pig husbandry and AC levels assigned to these issues. Citizens gave high AC levels to

**Table 3** Percentage of respondents of stakeholders per answer option for the acceptability per issue of pig husbandry

Issue acceptable	Percentage respondents				
	Cit*	Org	Con	Adv	Vet
<i>Piglet mortality</i>					
Yes	15.3	72.7	82.3	72.9	65.2
No	20.7 <sup>a</sup>	18.2	13.8 <sup>b,c</sup>	22.8	31.8 <sup>b,d</sup>
NJ	64.0	9.1	3.9	2.9	3.0
<i>Weaning age</i>					
Yes	25.1	36.4	97.2	87.2	69.7
No	21.6 <sup>a</sup>	63.6 <sup>b,c</sup>	2.8 <sup>b,d,e</sup>	11.4 <sup>b,d,f</sup>	28.8 <sup>a</sup>
NJ	53.3	0.0	0.0	1.4	1.5
<i>Castration</i>					
Yes	45.4	72.7	61.9	65.7	44.0
No	31.0 <sup>a</sup>	18.2 <sup>a</sup>	32.0 <sup>a</sup>	27.2 <sup>a</sup>	54.5 <sup>b</sup>
NJ	23.6	9.1	6.1	7.1	1.5
<i>Tail docking</i>					
Yes	20.4	9.1	92.2	84.3	59.1
No	60.3 <sup>a</sup>	81.8 <sup>a</sup>	3.9 <sup>b,c</sup>	5.7 <sup>b,c</sup>	36.4 <sup>b,d</sup>
NJ	19.3	9.1	3.9	10.0	4.5
<i>Interventions no sedation</i>					
Yes	4.7	18.2	77.3	64.3	21.2
No	82.5 <sup>a</sup>	81.8 <sup>c</sup>	13.3 <sup>b,d,e</sup>	25.7 <sup>b,d,f</sup>	72.7 <sup>b,c</sup>
NJ	12.8	0.0	8.8	10.0	6.1
<i>Housing inside</i>					
Yes	16.6	27.3	98.3	98.6	95.5
No	68.5 <sup>a</sup>	54.5 <sup>a</sup>	0.6 <sup>b</sup>	1.4 <sup>b</sup>	3.0 <sup>b</sup>
NJ	14.9	18.2	1.1	0.0	1.5
<i>Farrowing pens</i>					
Yes	40.6	27.3	97.8	94.3	84.8
No	33.8 <sup>a</sup>	54.5 <sup>a</sup>	1.1 <sup>b,c</sup>	1.4 <sup>b</sup>	10.7 <sup>b,d</sup>
NJ	25.6	18.2	1.1	4.3	4.5
<i>Pig farmer decides when to euthanize</i>					
Yes	50.0	90.9	98.3	92.9	59.1
No	28.3 <sup>a</sup>	9.1	1.1 <sup>b</sup>	5.7 <sup>b</sup>	31.8 <sup>a</sup>
NJ	21.7	0.0	0.6	1.4	9.1
<i>Lifespan sow</i>					
Yes	24.3	27.3	90.5	82.9	78.8
No	14.9 <sup>a</sup>	27.3 <sup>a</sup>	7.2 <sup>b</sup>	12.8	18.2 <sup>a</sup>
NJ	60.8	45.4	1.7	4.3	3.0
<i>Effect antibiotics on public health</i>					
Yes	8.5	9.1	45.9	30.0	22.7
No	63.7 <sup>a</sup>	63.6	35.9 <sup>b</sup>	58.6 <sup>a</sup>	65.2 <sup>a</sup>

**Table 3** continued

Issue acceptable	Percentage respondents				
	Cit*	Org	Con	Adv	Vet
NJ	27.8	27.3	17.1	11.4	12.1

Answer options Yes, No, NJ no judgment

\* *Cit* citizens, *Con* conventional pig farmers, *Org* organic pig farmers, *Adv* pig husbandry advisors, *Vet* pig veterinarians

<sup>a, b</sup> The probability that respondents in the stakeholder group with 'a' chose for the answer option 'no' was significantly ( $P < 0.05$ ) higher/lower compared to respondents in the stakeholder group with 'b' for that particular issue

<sup>c, d</sup> The probability that respondents in the stakeholder group with 'c' chose for the answer option 'no' was significantly ( $P < 0.05$ ) higher/lower compared to respondents in the stakeholder group with 'd' for that particular issue

<sup>e, f</sup> The probability that respondents in the stakeholder group with 'e' chose for the answer option 'no' was significantly ( $P < 0.05$ ) higher/lower compared to respondents in the stakeholder group with 'f' for that particular issue

(piglet) mortality, weaning age, castration and lifespan sow (Table 2), but only a small percentage ( $\leq 30\%$ ) of citizens indicated to find these issues not acceptable (Table 3). For organic pig farmers this was the case for (piglet) mortality, castration and lifespan sow (Tables 2, 3). The other three stakeholder groups found the same issues acceptable as to which they assigned low AC levels (Tables 2, 3).

## Discussion

The present study is the first study that compared attitudes of different stakeholders toward different entities associated with pig husbandry, i.e., animals, humans and environment. The focus was on citizens, rather than on consumers, because citizens show negative attitudes toward pig husbandry. By offering the questionnaire online instead of approaching people face-to-face in the supermarket we hope to have reached citizens. Although consumers and citizens are the same person, citizens' attitudes have in general a low effect on purchasing behavior as consumers (De Jonge and van Trijp 2013; Harper and Henson 2001). That is why a focus on consumers would give distorted results of societal attitudes toward pig husbandry.



The group of organic pig farmers may have been too small ( $n = 11$ ) to represent reliable significant results. However, it still gives an idea of differences in attitudes and acceptability between organic pig farmers and the other stakeholder groups. The group of citizens was considered representative for all socio-demographic features, except age. Socio-demographic features such as age can have an effect on attitudes toward animal husbandry (Bergstra et al. 2013; Boogaard et al. 2006; Frederiksen et al. 2010; Herzog 2007; Knight et al. 2004; María 2006; Prickett et al. 2010; Tuytens et al. 2010; Vanhonacker et al. 2010). Despite this effect the results of the present study give an indication of attitudes of citizens, because the number of younger citizens was respectable ( $n = 277$  below 40 years of age). To exclude the effect of socio-demographic features on significant differences between stakeholder groups we corrected for these features.

There are different ways to indirectly measure peoples' attitudes, e.g., by letting participants indicate on a Likert-scale what relates to them (e.g., agree/disagree, good/bad) for several propositions (Boogaard et al. 2006; María 2006) or by willingness to pay for certain measures (Meuwissen and van der Lans 2005). We did not choose for willingness to pay because we wanted the citizen state of mind instead of the consumer state of mind. We chose to use additional care (AC) levels because the focus of this study was on issues of pig husbandry that raised societal discussions about the attention that was given to these issues by the pig sector. Just as indicating whether you agree or disagree to a proposition, AC levels per aspect gives information about how participants feel about certain aspects and indirectly about their attitudes toward those aspects. The acceptability of aspects that were also issues, gives information on which issues are important to focus on in the development of measures for pig husbandry. It also gives an indication of which issues receive high AC levels but are, in spite of these high levels, found acceptable in the current pig husbandry system. This indicates that these issues in general are found to be important, but that these issues with regard to the current pig husbandry system are less important.

Based on the significant differences between stakeholders in attitudes toward pig husbandry and acceptability of issues of pig husbandry, it can be stated that the studied stakeholders can be divided into three distinctive groups. The first group, i.e., citizens and organic pig farmers, showed negative attitudes toward all defined aspects of pig husbandry and found the same issues of pig husbandry not acceptable. The second group, i.e., conventional pig farmers and pig husbandry advisors, showed positive attitudes toward aspects related to animals and the environment and negative attitudes toward aspects related to humans. This group found all issues of pig

husbandry, except the effect of the use of antibiotics on public health, acceptable. The third group, i.e., pig veterinarians, showed negative attitudes toward specific aspects of pig husbandry and found specific issues of pig husbandry not acceptable. The afore mentioned differences between the three distinctive groups may be influenced by interests (Boogaard et al. 2006). Citizens have an interest in animal welfare and healthy meat (Te Velde et al. 2002) and pig farmers have an interest in economics (Bracke et al. 2005; Te Velde et al. 2002). Based on the results of the present study it can be stated that the interests of conventional pig farmers are mainly in economics, while organic pig farmers have, besides their interest in economics, an interest in aspects related to animals, human health and the environment. The difference in interest in animal welfare between pig farmers may be explained by how they define animal welfare. Conventional pig farmers define animal welfare mainly on the basis of physical health and production level of the animals (Bock et al. 2007), while organic pig farmers focus on both physical and mental aspects of animal welfare (Te Velde et al. 2002) and look at the possibility for the animals to perform natural behavior (Bock et al. 2007). Citizens also consider both the physical and mental status in defining animal welfare (Te Velde et al. 2002). Sharing this interest and their interest in naturalness (Lassen et al. 2006; Te Velde et al. 2002; Verbeke 2009), may be a reason why citizens and organic pig farmers share attitudes toward pig husbandry and why they agree on which issues of pig husbandry are not acceptable. The group of citizens and organic pig farmers was the only group that found some issues of pig husbandry, i.e., piglet mortality, weaning age, castration and lifespan sow, acceptable but showed negative attitudes toward these issues. Organic pig farmers maybe accept these issues despite their negative attitudes toward them because they know the limitations of the animal production systems. For citizens these conflicting results may be caused by their moral values on the one hand and their knowledge on the other hand. Because citizens are of the opinion that animals have value and that humans should do good to animals (Cohen et al. 2012), they show negative attitudes toward issues of pig husbandry. Because of a lack of knowledge (Boogaard et al. 2006; Kendall et al. 2006; Knight and Barnett 2008) citizens are not always able to judge issues in current animal practices. In the questionnaire no information was given about these facts, so respondents had to use their own knowledge to answer the questions. The high percentage of citizens that indicated to have no judgment about the aforementioned issues suggests that citizens indeed have a lack of knowledge about these issues. For the issue 'castration' it is possible that more than one-fifth of the citizens had no judgment

because of moral ambivalence. On the one hand, citizens reject the castration of piglets (Frederiksen et al. 2010; Heid and Hamm 2012, 2013; Lagerkvist et al. 2006), but on the other hand they do not want the risk of boar taint (Frederiksen et al. 2010; Lagerkvist et al. 2006). This means that both attitudes toward animals and toward humans are in play, and that these attitudes are conflicting.

Our results suggest that the three different groups judge pig husbandry from different perspectives. Pig veterinarians have to deal with conflicting interests of animals, animal keepers and public health in their daily practice. Because of their relations with animal keepers, pig veterinarians might also consider the effects on the animal keeper in their judgment of animal welfare. Conventional pig farmers and pig husbandry advisors judge pig husbandry from an entrepreneurial point of view. In their judgment of pig husbandry they consider the effect of different factors on their business based on their interests and legal rules they have to obey (Van Huik and Bock 2007). As their interest in economics is obvious, the economic effects of measures for pig husbandry will often outweigh the positive effects on animal welfare (Van Huik and Bock 2007). Organic pig farmers also have an economic interest for a better access to markets (Bock and van Huik 2007). However, organic farming depends on ethical concerns and the image of good animal welfare and the possibility for animals to perform natural behavior (Bock and van Huik 2007; Lund 2006). Organic pig farmers do not strive for the highest possible earning per animal (Bock and van Huik 2007), but rather strive for good animal welfare for lower earnings. This means that organic pig farmers judge animal welfare from a different perspective than conventional pig farmers. Our results suggest that citizens have the same perspective as organic pig farmers. For both these stakeholders, in the judgment of pig husbandry, the aspects related to animals, humans and the environment have a value on its own, based on interests, emotional experiences and knowledge (Boogaard et al. 2006; Knight and Barnett 2008; Knight et al. 2004).

The different attitudes toward pig husbandry between stakeholder groups can be conflicting (Bracke et al. 2005; De Greef et al. 2006; Te Velde et al. 2002). This can make it difficult for these groups to understand each other's judgment of pig husbandry. As organic pig farmers have the same perspective as citizens, citizens understand the choices that are made by the organic pig sector and support this sector (Sundrum 2001). To make citizens understand the choices that are made within the conventional pig sector it is important for this sector to focus on the aspects toward which attitudes differ between them and citizens. Based on results of the present study it can

be stated that the focus should be on aspects related to animals, human health and the environment and less on economic aspects. With regard to these aspects, the sector should learn to empathize in the perspective of citizens in order to predict the response of citizens to animal welfare measures. In the process of learning to empathize in citizens' perspectives, pig veterinarians may be helpful for conventional pig farmers because they share perspectives with both citizens and conventional pig farmers. To predict citizens' responses to animal welfare measures it is important to take into account that there are four different clusters of Dutch citizens that differ in attitudes toward pig husbandry (Anonymous 2016; Bergstra et al. 2015). These clusters of citizens can respond differently to measures introduced in pig husbandry. Based on the attitudes it can be decided which clusters will be focused on. As citizens' attitudes toward pig husbandry keep changing over time (Chrispeels and Mandoli 2003; Rollin 2004), it is important for the pig sector to stay informed about these attitudes, for example, by means of questionnaires on a regular basis. The results of a questionnaire can then be compared with results of previous questionnaires in order to determine the attitudes that have changed. Another possibility is to organize meetings with stakeholders, including citizens. During these meetings issues of pig husbandry can be discussed in order to determine the aspects that raise conflicting attitudes between the different stakeholders. These meetings can also be useful for the different stakeholders to learn to understand each other's perspectives with regard to pig husbandry and for citizens to get the feeling they are included in the process of improvement. For the pig sector to get support from citizens, the way of communication is important. Citizens base their attitudes toward pig husbandry on information they receive (Kanis et al. 2003). Results of the present study showed that citizens do not by definition find aspects of pig husbandry unacceptable as for some issues a high percentage of citizens indicated to have no judgment. This gives the pig sector the opportunity to influence citizens' acceptance by providing information. Information should not be too technical as citizens are not so much interested in technical information but rather in the feelings they have with pig husbandry (Backus and van der Schans 2000). This means that when citizens have a good feeling with animal welfare measures they will support these measures. To create a good feeling among citizens it is important to make them understand the benefits of animal welfare measures with regard to aspects that citizens find important. For example, when the pig sector decides to implement more environmental enrichment to decrease tail biting, they should explain the benefits of these enrichments on natural behavior instead of just mentioning that tail biting decreases.

## Conclusions

Attitudes toward pig husbandry differ between stakeholders. Organic pig farmers and citizens showed negative attitudes toward all defined aspects related to animals, humans and the environment with regard to pig husbandry. Conventional pig farmers and pig husbandry advisors showed positive attitudes toward aspects related to animals and the environment and negative attitudes toward aspects related to humans. Pig veterinarians showed negative attitudes toward specific aspects of pig husbandry that are related to animals, humans or the environment. With regard to the acceptability of issues related to pig husbandry the stakeholders with the same attitudes toward pig husbandry agreed with each other. Organic pig farmers and citizens found the same issues of pig husbandry not acceptable. Conventional pig farmers and pig husbandry advisors found all, except one, issues of pig husbandry acceptable. Pig veterinarians found specific issues of pig husbandry not acceptable.

Based on results of this study, stakeholder groups could be divided into three distinctive groups—conventional pig farmers and pig husbandry advisors, organic pig farmers and citizens, and pig veterinarians. Because the interests and perspectives of these stakeholder groups differ it is difficult for these groups to understand each other's judgment of pig husbandry. In order to understand each other, these groups should learn to empathize in the interests and perspectives of the other stakeholder groups. For the pig sector to understand citizens' attitudes toward pig husbandry, pig veterinarians may be useful because pig veterinarians share attitudes with both other distinctive groups.

For the pig sector to get support from citizens for animal welfare measures, the sector should focus on aspects of pig husbandry that receive negative attitudes from citizens. Citizens showed negative attitudes toward aspects related to animal welfare, human health and the environment with regard to pig husbandry. This means that the focus should be on these aspects and less on economic aspects. The pig sector can learn to predict how citizens will respond to animal welfare measures when they empathize in citizens' perspectives and attitudes in relation to pig husbandry. When they understand these perspectives and attitudes, the pig sector can learn how to communicate with citizens to get their understanding and support for animal welfare measures. Based on the difference in attitudes toward pig husbandry between citizens and conventional pig farmers and pig husbandry advisors, it can be concluded that the pig sector should take this communication to a whole other level. To improve communication between the pig sector and citizens we recommend including citizens in the development of animal welfare measures. That way the pig

sector stays informed about citizens' interests and attitudes with regard to pig husbandry and has the opportunity to explain why certain choices are made in a way that citizens understand.

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