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German Pig Farmers' Attitudes Towards Farm Animal Welfare And Their Willingness To Participate In Animal Welfare Programs: An Empirical Study

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ABSTRACT

Many consumers express strong demands for higher farm animal welfare standards – especially in conventional livestock husbandry systems. This applies primarily to products from pork production, as consumers have recognized a quality decrease in recent years. Although pig farmers are key stakeholders for the implementation of animal welfare programs (AWPs) there is little evidence of their attitudes towards farm animal welfare (FAW) and AWPs. Thus, the main objective of this investigation was to investigate pig farmers' attitudes towards FAW and AWPs and to determine target groups for participation in AWPs. Therefore, an explorative factor analysis and a hierarchical cluster analysis were applied. Three farmer groups were identified which significantly differ regarding their attitudes towards FAW and their willingness to participate in AWPs. This paper represents a starting point for the design of tailor-made strategies to increase the market penetration of AWPs.

Keywords: animal welfare, German pig farmers, animal welfare programs, willingness to participate, hierarchical cluster analysis

Introduction

The Image of the German meat industry has been suffering for some time. Due to constant structural change and ongoing intensification of agricultural production processes, particularly in intensive livestock production systems, the meat sector is increasingly being criticized by the public at large. Food crises and scandals (e.g. BSE-crisis, dioxin in meat, rotten meat) (Robbins et al., 2016; Kayser et al., 2012a; Böhm et al., 2010) as well as changing perceptions of agriculture by large parts of the society have significantly influenced public debate. The result is a strong aversion to current farm animal husbandry systems, especially with regard to pig and poultry livestock (Kayser et al., 2012b; Bock and van Huik, 2007). This increases the sensitivity regarding meat production and processing as well as requirements aiming to improve the level of farm animal welfare (FAW) standards (Cembalo et al., 2016; Zühlsdorf et al., 2016; BMEL, 2014a; Lagerkvist and Hess, 2011; Nocella et al., 2010; Schulze et al., 2008, Ingenbleek et al., 2012; Vanhonacker and Verbeke, 2014). As a result the meat industry and other stakeholders have expanded the meat market with a new segment; so-called animal welfare products, (van Loo et al., 2014) to close the gap between heavily criticized conventional products and organi-

cally produced and very high-priced meat products (Vanhonacker and Verbeke, 2014; de Jonge et al., 2015; Schulze et al., 2008; Weinrich et al., 2015).

Since 2015, an animal welfare initiative (AWI) in Germany has been implementing higher animal welfare standards in pig and poultry farming on a broader basis. It involves participating retailers paying 6.25 ct. per kg of pork and poultry meat sold into a fund. This compensation is intended to support farmers in implementing higher animal welfare standards (ITW, 2018). Among the various labels, there is the German animal welfare label "For more animal welfare" (in German: "Für Mehr Tierschutz"), initiated by the German animal protection league (DTB, 2018) and a plan for a state animal welfare label (in German: "Staatliches Tierwohllabel") which will be put on the market in 2018 (BMEL, 2018) and aims to ensure increased animal welfare measures and economic gain for farmers.

Although many market studies indicate increased willingness amongst consumers to pay higher prices for meat and meat products produced under higher animal welfare standards and thus some sales potential for animal welfare products (Zühlsdorf et al., 2016; Schulze et al., 2008; Makdisi und Marggraf, 2011; Fernyhough, 2012; Van Loo et al., 2014; Heise et al., 2016; Pirsich et al., 2017), the current market share in most European countries remains low (Vanhonacker und Verbeke, 2014; de Jonge et al., 2015; Schulze et al., 2008; Weinrich et al., 2015). However, the long-term success of these programs depends on several factors. On the one hand, consumers' shopping behaviour at the point of sale crucially influences the expansion of products from AWP. On the other hand, stakeholders' acceptance along the food supply chain for meat and meat products and their willingness to take part in AWP strongly determines whether an AWP will succeed or not. Farmers are considered one of the most important stakeholder groups for the successful implementation of enhanced animal welfare standards because they are directly involved in production (Theuvsen et al., 2016; Fernyhough, 2012; Deimel et al., 2010a; Franz et al., 2010; Golan et al., 2000; Gulbrandsen, 2006).

Germany is Europe's largest pig producer and ranks third in the world behind China and the USA (BMEL 2014b). There is a high number of pig farmers in Germany (24.000) (DBV 2017) and pig farming practices are predominantly consistent, providing a high degree of standardization and facilitating the definition of criteria animal welfare measures for AWP. As a result, pig production provides a good opportunity to implement AWP in the meat market (Deimel et al., 2010a). In Germany most of pig farmers market their meat on the „spot market“, and are not bound by long-term contracts with other production stages. It is therefore quite difficult to establish higher FAW standards on a voluntary basis if farmers have doubts about the system and its requirements or its chances of long-term success (Deimel et al., 2010b).

However, so far there have been only a few studies investigating the attitudes of German pig farmers towards higher animal welfare standards and their willingness to participate in these so-called AWP (Franz et al., 2012). Thus, the aim of this study is to identify different clusters of pig farmers, with regard to their attitudes toward FAW and AWP and their willingness to participate in these programs. Previous research from other European countries (Bock and van Huik, 2007; Bruckmeier and Prutzer, 2007) will be used, combined with a comprehensive empirical study. The empirical results have important managerial implications and provide a starting point for the design of tailor-made strategies to increase the market penetration of AWP for products from pig production.

Material and Methods

Study design

In this study conventional pig farmers throughout Germany were questioned in summer 2014 via a standardized online-survey. They were asked about their personal attitudes towards higher animal welfare standards and their willingness to participate in AWP. The participants were recruited by means of various mailing lists and in cooperation with several agricultural trade organizations. To avoid more than one person per farm an-

swering the survey; the online link could be used only once. After removing incomplete datasets and outliers, 249 data sets were available for the analysis. Using five-point Likert scales from -2="I totally reject" to +2="I totally agree", respondents rated whether they would reject or agree with the statements about FAW and AWP. Furthermore, nominally scaled questions were used to obtain sociodemographic data and farm characteristics. The survey was divided into several major themes. At first the participants had to answer questions about several farm characteristics. Next the respondents were asked for their opinion of FAW and which criteria they perceive as important for the welfare of their pigs. After that, they had to answer various statements regarding FAW, AWP and the economic viability of AWP and products from AWP. In addition they were asked about the need to improve FAW standards in conventional livestock production systems and their willingness to participate in AWP. The penultimate part of the survey was about farmers' satisfaction with their current situation, which includes economic positions as well as what the implementation of higher national animal welfare standards would mean to their own farm. The last questions were about sociodemographic characteristics.

Statistical analysis

The analysis was carried out using IBM SPSS Statistics 24 for Windows. To get an overview of the sample, sociodemographic and farm characteristics were first analysed with univariate methods.

Next, an exploratory factor analysis was performed to combine a large number of items into a smaller number of factors, which allows a simplified interpretation of farmers' attitudes towards FAW and AWP. In this paper a principal component analysis with the Varimax rotation method and Kaiser Normalization was applied. The Varimax rotation was applied because the variance of the squared charges in this rotation reaches the maximum value (Diaz-Bone and Weischer, 2015) and thus facilitated interpretation. The factor analysis included almost all Likert scaled statements toward AWP and FAW, the market effects of higher animal welfare standards, the criteria important for a high level of FAW and farmers' willingness to improve FAW on their own farms. The selected number of items was checked for suitability for factor analysis. For this purpose the Kaiser Meyer Olkin Criteria (KMO), in the literature known as „measure of sampling adequacy (MSA), was used. If the KMO/MSA is <0.5 it is „miserable" and the factor analysis should not be performed. In the present study a value of 0.902 was determined which classified as „pretty good" (Backhaus et al., 2016). Another test criterion is the Bartlett test for sphericity, which checks the null hypothesis that the output variables from the survey population are in uncorrelated form. (ebd., 2016). In this paper, Bartlett's significance is at a value of $p = 0.000$ and is thus highly significant, as that allows the null hypothesis to be discarded. As a result, there are correlations between the variables. In addition, only those factors that have a value greater than 1 are extracted (assumption of the principal component analysis). The factor analysis explained 59.14 % of the total variance. Finally, four factors including 18 variables were identified in this paper. A reliability analysis provided information about the "internal consistency" of the factors. All factors have a valid consistency (Brosius, 2011; Bühl, 2010). To assign the farmers to different segments with regard to their attitudes toward FAW and AWP, a hierarchical cluster analysis was applied. This analysis is used to form homogeneous groups out of a heterogeneous population (Hair et al., 2013; Backhaus et al., 2016). The cluster analysis was divided in three steps. At first the Single-Linkage method was used to remove outliers. As a result the objects with the smallest distances were combined. Next, we identified the optimal number of clusters using the WARD-Method. In this paper we determined three Clusters. The dendrogram, a scree-plot and the elbow criterion were used as decision aids for the optimal number of clusters (Backhaus et al., 2016). Finally a k-Means clustering was used to optimize the results of the WARD-Method. To verify the results a discriminant was applied. In this study 100 % of the original cases were correctly classified (Backhaus et al., 2016; Brosius, 2011). Some other results (Eigenvalues and Wilks-Lambda) of the discriminant analysis also showed that the cluster analysis results are of high quality. Wilks-Lambda is a test of significance. In this study there was a significant difference between the groups. Furthermore the Eigenvalue was higher than one and there were significant differences ($p < 0.000$) between the cluster-building factors (Bühl, 2010). For a detailed characterization of the clusters we used the TamhaneT2 post-hoc multiple comparison test, which showed significant differences between the clusters. The TamhaneT2-test is based on the assumption that the groups can have different variances. For a more detailed descrip-

tion and test of significant differences between the Cluster a univariate ANOVA and cross table were applied (Brosius, 2011).

Sample description

In this study 249 complete data sets were available for analysis. The respondents are on average 46 years old and 89.2 % of them are male. These facts can also be confirmed by the results of the German Federal Statistical Office (Destatis, 2012). A majority of participants stated that they have had experience in agriculture for more than 20 years. Furthermore, most of the survey respondents are from Lower Saxony (25.7 %) and North Rhine-Westphalia (24.5 %) followed by Bavaria (12.9 %), which is in line in with the high number of pig farms in these federal states (Statista, 2018). Moreover 92.8 % stated that their main income is generated by the farm. This is far above the German average as only about half of the farms in Germany are run on a full time basis (Destatis, 2011). On average, the participants cultivate 219 hectares, keeping an average of 1450 fattening pigs and an average of 383 sows and piglets. In Germany about 76 % of all pigs live on farms that keep more than 1000 pigs. The number of sows kept per farm are on average of 227 (DBV, 2017). However, due to the small sample size and the farm characteristics of the participants, this sample cannot be considered representative of all German pig farmers. Nevertheless, the dataset can be a suitable exploratory sample for large, future oriented pig farmers.

Results

Results of the factor analysis

In order to summarize the large number of selected statements on the attitude towards FAW and AWP, an explorative factor analysis was applied. Overall, four factors have been formed (see Table 1). The first factor "Attitude toward FAW and AWP" can be described by nine items. Most of them reflect the attitude of the survey participants towards FAW, AWP, concerning the market effects of AWP and the willingness to participate in it. The second factor "Animal Welfare and the Public" combines four statements which describe the attitudes toward the public discussion about FAW, the requirements made on the farmers by politicians, journalists and consumers and that farmers' opinions are often not heard in public discussions. The last statement in this factor deals with the ability of politicians, journalists and consumers to judge whether a production system is animal-friendly or not. The third factor "Animal Welfare and economy" consists of three statements. These describe the profitability of AWP and animal welfare products from the farmers' point of view. One of the statements addresses the competitiveness of German farmers in international markets when they have to comply with higher animal welfare requirements. The second statement expresses that AWP are not economically viable for the farmers. The last statement says the products from AWP will always only occupy niche markets. The last factor "Importance of animal behaviour and husbandry systems" can be described by two statements. The first of them describes the importance of the opportunity to engage in natural innate behaviour for the well-being of the animals and the second one is about the importance of structural and technical systems in barns for FAW.

Table 1: Results of the factor analysis

Factor and statements	FL ¹	μ	σ
Factor 1: Attitude toward FAW and AWP (Cronbachs' Alpha): 0.914			
In principle, animal welfare programs are useful for farmers.	0.833	-0.12	1.077
I plan to participate in animal welfare programs in the future.	0.826	-0.19	1.250
In principle, I am willing to participate in animal welfare programs.	0.808	0.29	1.265
The Animal Welfare Initiative will not only succeed in animal welfare products in market niches but also by opening up a broad market.	0.721	-0.74	1.075
Animal welfare programs can help improve animal welfare for farm animals.	0.709	-0.19	1.186
The Animal Welfare Initiative will improve the image of agriculture and meat industry.	0.693	-0.56	1.075
The animal welfare initiative will prevail on the market in the long term.	0.678	-0.76	1.022
Farmers can gain competitive advantages by participating in animal welfare programs.	0.660	-0.37	0.976
Farmers can make more profit by participating in animal welfare programs.	0.613	-0.80	0.991
Factor 2: Animal Welfare and the Public (Cronbachs' Alpha): 0.755			
I think the public discussions about animal welfare in livestock farming are exaggerated.	0.736	1.17	0.993
The opinion of the farmers is not sufficiently heard in the public discussion on animal welfare in livestock farming.	0.643	1.58	0.629
The demands made on the farmers by politicians, journalists and consumers are hard to implement on the farm.	0.626	0.91	0.908
Politicians, journalists and consumers cannot judge whether a production system is animal-friendly or not.	0.567	1.29	0.857
Factor 3: Animal Welfare and the economy (Cronbachs' Alpha): 0.542			
Higher national animal welfare requirements will lead to competitive disadvantages for German farmers in international markets.	0.744	1.40	0.848
Participation in an animal welfare program is not economically viable for me.	0.581	0.14	1.214
Products from more animal-friendly production systems will always only occupy niche markets.	0.577	1.13	0.921
Factor 4: Importance of animal behaviour and husbandry systems (Cronbachs' Alpha):0.628			
An animal must be able to engage in natural behaviour; only then can it feel comfortable.	0.825	0.62	0.964
The structural-technical systems used in barns are particularly important for animal welfare.	0.786	0.78	0.973
KMO (Kaiser-Meyer Olkin value) = 0.902; declared total variance = 59.14%. All statements were scored with a scale from -2 = "totally disagree to + 2 = "totally agree". ¹ = factor load			

Source: Authors' calculation

The aim of the cluster analysis was to identify the most homogeneous groups of participants as possible regarding their attitudes toward FAW and AWP and to determine different target groups for participation in AWP. The following Table 2 shows the results of the cluster analysis. In addition, the cluster-building factors and the underlying items are listed.

Table 2: Results of the cluster analysis

	Cluster A n=87	Cluster B n=102	Cluster C n=60	Σ n=249
Factor 1: Attitude toward FAW and AWP ***	-0.646 ^b	0.802 ^{ac}	-0.336 ^b	0.022
In principle, animal welfare programs are useful for farmers. ***	-0.78 ^b	0.66 ^{ac}	-0.43 ^b	-0.11
I plan to participate in animal welfare programs in the future. ***	-0.92 ^b	0.82 ^{ac}	-0.83 ^b	-0.18
In principle, I am willing to participate in animal welfare programs. ***	-0.36 ^b	1.23 ^{ac}	-0.32 ^b	0.30
The animal welfare initiative will not only succeed in animal welfare products in market niches but also by opening up a broad market. ***	-1.39 ^{bc}	0.02 ^{ac}		
Animal welfare programs can help improve animal welfare for farm animals. ***			-1.05 ^{ab}	-0.73
Animal welfare programs can help improve animal welfare for farm animals. ***	-0.86 ^b	0.68 ^{ac}	-0.68 ^b	-0.19
The animal welfare initiative will improve the image of the agricultural and meat industry. ***	-1.05 ^b	0.10 ^{ac}	-0.90 ^b	-0.54
The animal welfare initiative will prevail on the market in the long term. ***	-1.34 ^b	-0.09 ^{ac}	-1.03 ^b	-0.76
Farmers can gain competitive advantages by participating in animal welfare programs. ***	-0.85 ^b	0.25 ^{ac}	-0.37 ^b	-0.37
Farmers can make more profit by participating in animal welfare programs. ***	-1.21 ^b	-0.12 ^{ac}	-1.37 ^b	-0.80
Factor 2: Animal Welfare and the Public ***	0.512 ^{bc}	-0.346 ^a	-0.076 ^a	0.186

I think the public discussions about animal welfare in livestock farming are exaggerated. ***	1.64 ^b	0.70 ^{ac}	1.35 ^b	1.18
The opinion of the farmers is not sufficiently heard in the public discussion on animal welfare in livestock farming. ***	1.84 ^{bc}	1.42 ^a	1.50 ^a	1.59
The demands made on the farmers by politicians, journalists and consumers are hard to implement on the farm. ***	1.34 ^b	0.44 ^{ac}	1.08 ^b	0.91
Politicians, journalists and consumers cannot judge whether a production system is animal-friendly or not. ***	1.62 ^b	0.94 ^{ac}	1.50 ^b	1.31
Factor 3: Animal Welfare and the economy *	0.218^b	-0.167^a	0.115^{n.s}	0.035
Higher national animal welfare requirements will lead to competitive disadvantages for German farmers in international markets. ***	1.68 ^b	1.14 ^{ac}	1.60 ^b	1.44
Participation in an animal welfare program is not economically viable for me. ***	0.41 ^b	-0.29 ^{ac}	0.50 ^b	0.14
Products from more animal-friendly production systems will always only occupy niche markets. ***	1.64 ^{bc}	0.80 ^a	1.02 ^a	1.15
Factor 4: Importance of Animal behaviour and husbandry systems ***	0.456^c	0.337^c	-1.279^{ab}	-0.011
An animal must be able to engage in natural behaviours; only then can it feel comfortable. ***	0.82 ^c	1.03 ^c	-0.40 ^{ab}	0.61
The structural-technical systems used in barns are particularly important for animal welfare. ***	0.95 ^{bc}	1.25 ^{ac}	-0.32 ^{ab}	0.77
Level of significance: * = p≤0.05, ** = p≤0.01, *** = p≤0.001, n.s. = not significant; Letters (a,b,c) signify a significant difference to the corresponding cluster (Tamhane post-hoc multiple comparison test at significance level 0.05). All statements were scored with a scale from -2 = "totally reject" to +2 = "totally agree".				

Source: Authors' calculation

The first cluster A distinguishes itself with 87 respondents as the second largest cluster. Factor 1 is considered predominantly negative in this group. The strongest rejection is made by the statements regarding the animal welfare initiative. The variable "The animal welfare initiative does not just succeed in animal welfare products in a market" ($\mu = -1.39$) thus adequately describes how this cluster does not believe in the initiative's market penetration, followed by the statements that this initiative will prevail on the market in the long term ($\mu = -1.34$) and the farmer will make more profit by participating ($\mu = -1.21$). In addition, the statement "I plan to participate in animal welfare programs in the future" shows the strongest opposition to participating in AWP ($\mu = -0.92$). However the third statement is still negative but rather undecided on the willingness to participate in AWP ($\mu = -0.36$). The second factor in this cluster describes the negative attitude towards public discussions and that the opinion of the farmers is not sufficiently heard ($\mu = 0.512$). Moreover, this cluster does believe that "higher national animal welfare requirements will lead to competitive disadvantages for German farmers in international markets" ($\mu = 1.68$) whereas they also have a negative but rather undecided attitude to the statement "participation in an animal welfare program is not economically viable for me" ($\mu = 0.41$). The last factor has the most positive perception concerning the husbandry systems and welfare of their animals. Overall this cluster is strongly opposed to AWP and can be considered as "The convinced animal welfare rejecters".

The second cluster B is called "the market oriented animal welfare advocates". With a total of 102 participants it is the largest cluster. The first factor is perceived comparatively most positively with a mean of 0.802. In principle, these farmers are willing to participate in animal welfare programs ($\mu = 1.23$) and also plan to do so in the future ($\mu = 0.82$). Furthermore, they recognise the chance that AWP can improve animal welfare in livestock production systems ($\mu = 0.68$). The other statements in Factor 1 are answered in the range of zero. For example, "the animal welfare initiative will improve the image of the agricultural and meat industry" ($\mu = 0.10$) or "the animal welfare initiative will not only succeed in animal welfare products in market niches but also by opening up a broad market" ($\mu = 0.02$), which could indicate slight scepticism towards animal welfare programs. Factor 2 "animal welfare and the public" met with high approval, especially the second statement "the opinion of the farmers is not sufficiently heard in the public discussion on animal welfare in livestock farming" ($\mu = 1.42$). Furthermore, the farmers also see the problems that politicians, journalists and consumers cannot judge as to whether a production system is animal-friendly or not ($\mu = 0.94$). However they do not see huge problems in implementing the demands of politicians, journalists and consumers.

Based on the apparent slight scepticism regarding AWP’s market penetration, the third factor also describes the attitude to FAW and economics. The statement “higher national animal welfare requirements will lead to competitive disadvantages for German farmers in international markets” gets the biggest approval rating ($\mu=1.14$), followed by “products from more animal-friendly production systems will always occupy market niches only” ($\mu=0.80$). The last factor ascribes the importance of structural-technical husbandry systems for animal welfare and that animals are able to exercise their innate behaviour ($\mu=0.337$). Taken together, Cluster B has a positive attitude towards AWP’s and FAW but is also market-oriented and sees possible weaknesses in AWP’s.

Cluster C consists of 60 survey respondents and is called “Moderate Animal welfare Sceptics”. The farmers have a fairly negative attitude toward AWP’s and are not willing to participate in such programs. The attitude to Factor 2 “Animal welfare and the public” is quite similar to the other clusters. However, when looking at the mean of the second factor, these farmers have a slightly indifferent attitude ($\mu=-0.076$). The third factor shows that Cluster C farmers are also sceptical toward the economic effects of higher animal welfare requirements and have a negative attitude about the public discussions.

With regard to the last factor, Cluster C attaches less importance to opportunities for their animals to engage in natural innate behaviour and the structural husbandry system ($\mu=-1.279$). Table 3 shows some interesting characteristics in the clusters analyzed clusters. However most of the differences between them are not at significant levels. Most of the pigs/sows live on farms in Cluster A (1598.59/459.26) followed by Cluster C (1526.74/385.93) and Cluster B (1288.13/331.38). However Cluster B includes the largest farms with on average of 274.17 hectares, Cluster A cultivates 196.90 hectares on average and Cluster C has the smallest farm size (159.56 hectares) on average. The average age in the clusters is nearly the same. Most of the women are part of Cluster C (15 %). However, once again the results do not indicate significant differences between the clusters.

Table 3: Sociodemographic and farm characteristics of the clusters

	Cluster A n=87	Cluster B n=102	Cluster C n=60
Sample size [n]	87	102	60
Ø Age in years ^{n.s.}	45.52	46.92	45.70
Share of women [%] ^{n.s.}	8.0	10.8	15.0
Ø Farm size [hectares] ^{n.s.}	196.90	274.17	159.56
Ø number of pigs ^{n.s.}	1598.59	1288.13	1526.74
Ø number of sows ^{n.s.}	459.26	331.38	385.93
Number of sow farmers [n]	42	40	27
Number of pig farmers [n]	66	86	54
Level of significance: * = $p \leq 0.05$, ** = $p \leq 0.01$, *** = $p \leq 0.001$, n.s. = not significant; Letters (a,b,c) signify a significant difference to the corresponding cluster (Tamhane post-hoc multiple comparison test at significance level 0.05).			

Source: Authors’ calculation

Discussion and Conclusion

The aim of the study was to investigate the willingness of German pig farmers to participate in AWP’s and to identify a potential target group for those programs. The results show that pig farmers cannot be regarded as a homogenous group because of their different attitudes towards FAW and AWP’s. Previous studies also confirm that German farmers are rather heterogeneous in terms of FAW and AWP’s (Franz et al., 2012, Heise and Theuvsen, 2016).

In this paper, three clusters (farmer groups) could be identified. From these clusters different target groups for AWP’s can be derived. Clusters A and C show a negative attitude towards participation in AWP’s. The difference between these farmers is also rather slight. Cluster B, on the other hand, has a very positive attitude towards AWP’s.

Cluster A "The convinced animal welfare rejecters" consists of farmers who reject AWP strongly. They believe that FAW and AWP will always remain a niche market and do not achieve large market penetration. Furthermore, they doubt the positive effects (more profit and higher competitiveness) that AWP can bring. Nevertheless, they are aware that it is particularly important for the welfare of their animals that they have the opportunity to engage in innate behaviour as well as having the structural-technical equipment in barns to ensure animal welfare. However, due to their strongly negative attitude towards AWP and the public discussion about animal welfare, it can be assumed that this group of farmers will probably not participate in AWP.

Farmers in Cluster B, on the other hand, argue that AWP are fundamentally beneficial, both to farmers and to improving animal welfare in livestock farming. In addition, they fully agree that an animal should be able to exercise its innate behaviour and that structural-technical equipment in barns is particularly important for animal welfare. These aspects might suggest a higher understanding of animal welfare for Cluster B farmers due to their more positive attitude to AWP. Nevertheless, this cluster is also very market-oriented and is slightly sceptical about the profitability of AWP. However, they are very willing to participate, making this group the potential target group for AWP. If AWP are economically viable for these farmers, they should constitute an important target group for participation.

Farmers in Cluster C also show a negative attitude towards participation in AWP and their positive market effects. However, in comparison with Cluster A their views are relatively moderate. In addition, they do not believe that animals' ability to act naturally or that appropriately designed housing are important factors for their well-being. Moreover this cluster would rather not take part in AWP as they are not convinced of existing AWP's economic effects on their own farms and the meat market. It can be assumed that these farmers do not see any need to implement higher animal welfare standards because they regard animals behaving naturally and appropriate barn design as rather unimportant. For the time being therefore, these farmers will probably not participate in AWP.

Some studies into conventional pig farmers' understanding of animal welfare have shown that farmers tend to consider animal biological functions performance to be very important criteria for the well-being of animals (Bock and van Huik, 2007; Vanhonacker et al., 2008; Te Velde et al., 2002). However, previous studies concerning animal welfare also show that farmers attach some importance to animal behaviour and husbandry systems (Deimel et al., 2010b). Our results confirm the findings of Deimel et al. (2010b) and Franz et al. (2012) that farmers who have a positive attitude to FAW and AWP are more willing to participate in AWP than those who are critical towards higher FAW standards and AWP. Cluster B "the market oriented animal welfare advocates" confirms this approach as those farmers plan to participate in AWP, thereby improving animal welfare.

Looking at all the commonalities in the clusters, it can be seen that economic effects (more profit, competitive advantage, international competitiveness) as well as AWP's market penetration and the long-term success of such programs are considered very critical. This may be partly due to the fact that the implementation of animal welfare measures in pig production poses a certain challenge. There is often no vertical integration and thus control is difficult as there are many participants along the whole supply chain, which in turn leads to high transaction costs (e.g. for monitoring, search and information cost) (BVL, 2016; Spiller and Schulze, 2006). On the other hand, some of the clusters are convinced that participating in AWP is not profitable for the farm and that higher national animal welfare standards on international markets lead to competitive disadvantages. An older study by Vanhonacker et al. (2008) also found that the implementation of higher animal welfare standards in production is associated with high costs and the farm's economic situation is thus endangered. It also implies that monetary aspects are the most important criteria when it comes to participation in quality programs or special AWP (Franz et al., 2012; Veissier et al., 2008; Bruckmeier and Prutzer, 2007). However, farmers have been rather critical towards the financial effects of AWP so far and this certainly hinders participation for many of them.

Furthermore, in this investigation farm size made no significant difference between the clusters, which may indicate that farmers from both larger and smaller farms are equally interested in FAW and AWP. However, this result is in contrast to results from Heise and Theuvsen (2017a) and Busch et al. (2013), who found that many consumers associate small farms with higher animal welfare standards and more comfortable living conditions for farm animals. Additionally the results from Bock and van Huik (2007) underline the fact that small farmers are more willing to participate in AWP. Despite these results, more recent studies show that the farm size is rather unimportant in any discussion about FAW and AWP and that the focus should be much more on other factors (e.g. management and husbandry systems) which improve animal welfare (Busch, 2016; Meyer-Hamme, 2016; WBA 2015).

Our findings also show that even in Cluster B, answers concerning the animal welfare initiative (AWI) tended towards zero, which indicates a lack of confidence in German AWP. This attitude towards AWI is most likely because this program has only existed since 2015 and the long-term effects cannot yet be evaluated. So far, farmers expect the financial return to be insufficient to fund a more appropriate livestock farming process. Moreover, according to the results concerning the market potential of animal friendly products in different consumer studies (Schulze et al., 2008; Weinrich et al., 2015; Zühlsdorf et al., 2016; Heise et al., 2016), all groups of farmers are of the opinion that products from AWP will always be only for a niche market. Additionally, a barrier to participating in AWP might be reinforced by consumer buying behaviour, known in the literature as the “consumer citizen gap” (Bock and van Huik, 2007; Vanhonacker and Verbeke, 2014). The “consumer citizen gap” describes the disparity between consumers’ intention to buy animal friendly products and their actual behaviour (de Barcellos, 2011; Verbeke et al., 2010). This aspect depends on several factors. There is a lack of information about animal welfare standards and no animal welfare label. The difficulty in marketing animal welfare products is due to the lack of awareness and trust in product labelling. According to a German study, 85% of consumers either do not know any animal welfare label (Zühlsdorf et al., 2016) or do not know what they mean (Sander et al., 2016). In addition, all farmers are convinced that other stakeholders, such as policymakers and consumers, cannot judge whether a production system is animal friendly or not. Another specific problem is that consumers’ understanding of animal welfare differs from that of producers (Sørensen and Fraser, 2010; Heise and Theuvsen, 2017b), which is also due to the changing perception of agriculture (von Alvensleben, 2002; WBA, 2015; Nast, 2006). Additionally, consumers have a different attitude regarding FAW (de Jonge et al., 2015; Verbeke, 2009; Pirsich et al., 2017). Nevertheless several research studies found a high potential for products from welfare friendly production systems (de Jonge et al., 2015; Schulze et al., 2008; Nocella, 2010; Zühlsdorf et al., 2016), which again is related to the “consumer-citizen gap”. This discrepancy between the results of the investigation of previous studies and consumers’ behaviour represents a major challenge for the meat products value chain (Schulze et al., 2008; Bakker and Dagevos, 2012).

These aspects show that orientation in the production process depends on many factors and, in turn, influences farmers’ decision. For some farmers’ premium prices are the primary motivation, for others there are ethical reasons to participate in animal welfare schemes (Sørensen and Fraser, 2010). Another previous study shows that Swedish pig farmers are strongly motivated by non-monetary factors such as getting support from AWP in case of disease outbreaks or receiving additional feedback. However, again economic reward is a reason for participation (Bruckmeier and Prutzer, 2007). The emphasis on market potential and the creation of financial incentives should therefore be given priority in the implementation of AWP in order to increase farmers’ participation.

Like all non-experimental investigations, this study has to deal with some limitations. The current paper has a small sample size (n=249) and the sample composition differs in comparison with the population of German pig farmers (Destatis, 2011 and 2012). As a result, this study cannot be considered representative. Additionally, there could be an element of self-selection bias, meaning that mainly farmers who are positively interested in AWP and FAW participated in the surveys. In addition, social desirability bias may have influenced farmers to answer the questions with a more positive attitude about their willingness to participate in AWP.

Furthermore, most of the statements in the survey were framed positively. It should also be noted that attitudes regarding AWI may have changed as AWI was not established in the market at the time of data collection (2014). It could be that pig farmers who then had a negative attitude toward AWP have changed their opinion and would now take part in AWP.

Besides these limitations, this study leads to interesting results which may provide an opportunity for stakeholders in the agricultural and food chain to influence pig farmers' production decisions. The negative aspects and fears that prevent participation in AWP have to be reduced in the future. Financial aspects and the attitude of other stakeholders certainly influence farmers to participate in AWP (Buller and Cesar, 2007; Miele et al., 2011). It is therefore important to convince all relevant stakeholders (politicians and consumers) of the usefulness of AWP. Another possibility is increased cooperation between farmers and retailers in order to reach a large target group for animal welfare products and to have a fixed contract partner, who will sell their meat. Financial incentives must be created to motivate ever more farmers to participate in AWP. Another prerequisite is an international, market-oriented approach to improve FAW in intensive livestock farming across the European Union, as pig farmers are quite apprehensive that higher national welfare requirements will lead to competitive disadvantages for German farmers on international markets. There is also no legal definition of animal welfare, which makes it difficult to measure (Pirsich et al., 2014).

The lack of representativeness and the limitations mentioned above mean it is necessary to conduct further research work. The economic benefit of participating in animal welfare related programs has to be clarified. Currently, most farmers do not see any financial advantage in AWP. However there is no scientific study which confirms this assumption. Future research applying an economic feasibility study would allow researchers to identify economic differences between participants and non-participants in animal welfare schemes. Such a scientific comparison between participants and non-participants is certainly possible. Furthermore, it would be useful to investigate the specific cost of various animal welfare measures in order to estimate respective costs for farmers. Finally, it is very important that higher animal welfare standards are easier to control through appropriate measures and that a legal definition of animal welfare is created.

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