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REVIEW PAPER

Labels for Animal Husbandry Systems Meet Consumer Preferences: Results from a Meta-analysis of Consumer Studies

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Abstract Political decision-makers in the European Union (EU) are currently discussing the introduction of a mandatory uniform labelling scheme for meat and milk that provides information on husbandry systems similar to the already existent labelling scheme in the EU egg market. The objective of this paper was to assess whether such information is relevant to consumers when buying meat and milk. The paper was based on a systematic synthesis of 53 scientific journal articles on empirical consumer studies. The review revealed that consumers perceived the aspects of outdoor access, stocking density and floor type as important factors influencing animal welfare. On average, consumers not only had a positive attitude towards more animal welfare-friendly husbandry systems with outdoor access and space allowance but were also willing to pay a price premium for products from such systems. All studies on consumer segmentation identified at least one consumer segment that placed great importance on animal welfare-friendly husbandry systems. Interestingly, many studies identified one or more other segments who still had a significant preference for animal welfare-friendly products even though other product attributes were more important to them. Based on the findings, the paper presents conclusions regarding the labelling of husbandry systems for meat and milk.

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Introduction

Political decision-makers in Europe are currently discussing the EU-wide introduction of a mandatory uniform labelling scheme for meat and milk that would provide consumers with information about the underlying type of animal husbandry system (Agra-Europe 2016). The new mandatory labelling scheme for meat and milk would be similar to the already existent scheme in the EU egg market where each pack of eggs must be marked with the respective husbandry system (Commission Directive 2002/4/EC). The egg labelling scheme differentiates four levels of production systems, categorised as cage systems, barn systems, free-range systems, and organic production (Commission Directive 2002/4/EC).

Proponents of a mandatory labelling scheme for meat and milk argue that it would provide consumers with transparent information about the underlying type of animal husbandry system (Agra-Europe 2016). For the vast majority of meat and milk products on the market, such information is currently unavailable to consumers at the point-of-purchase. With the introduction of a uniform labelling scheme, proponents hope to boost the demand for meat and milk from animal welfare-friendly systems (Agra-Europe 2016). A higher demand for these products might encourage producers to switch to such husbandry systems (Risius and Hamm 2015). In the egg market, the introduction of the mandatory labelling scheme correlated with a distinct change in hen husbandry systems, in that free-range and organic systems gained significant market shares. In 2013, the share of free-range and organic systems together accounted for 16% of the total egg production in the EU (AMI 2015).

Currently, the market shares of meat and milk from animal welfare-friendly husbandry systems are relatively low in all industrialised nations (Vanhonacker and Verbeke 2014). However, the direct conclusion that low market shares indicate consumers are not interested in such products is unjustified. An important prerequisite for consumer demand for meat and milk from animal welfare-friendly husbandry systems is that consumers are able to identify such products on the market. In fact, it is difficult for consumers to recognise meat and milk from animal welfare-friendly husbandry systems on today's market. There are only a few labels for meat and milk products indicating this kind of information (Vanhonacker and Verbeke 2014).

A mandatory uniform labelling scheme for meat and milk that provides consumers with information about the underlying animal husbandry system could only lead to higher market shares of products from animal welfare-friendly systems—as envisaged by the proponents of a mandatory labelling scheme—if a considerable share of consumers prefers these products to 'standard' products. The objective of the present paper was therefore to assess whether there is scientific evidence that consumers find information about animal husbandry systems relevant in the context of meat and milk purchase decisions and are willing to pay a price

premium for products from more animal welfare-friendly husbandry systems. The assessment was based on a synthesis of results from 53 scientific journal articles reporting empirical results of consumer studies.

The remainder of this paper is organised as follows: section "Conceptual Framework: Product Labelling and Consumer Behaviour" introduces the conceptual framework of product labelling as a policy instrument and basic concepts from consumer behaviour literature. Section "Methods and Material of the Literature Review" describes the literature search procedure. Section "Results and Discussion" presents the results of the literature review. Section "Conclusions" summarises the conclusions.

Conceptual Framework: Product Labelling and Consumer Behaviour

From a consumer's perspective, the underlying animal production methods of meat and milk products represent a special form of product attributes characterised by a high level of uneven distribution of information between suppliers and consumers. In the classification of product attributes introduced by Darby and Karni (1973) differentiating between search, experience and credence attributes, the underlying animal husbandry system is a credence attribute (Roe and Sheldon 2007). At the time of purchase, it is impossible for consumers to verify whether an animal product has been produced in a particular husbandry system because consumers do not oversee entire production processes. At the level of the product, even external institutions can hardly verify compliance with particular animal husbandry systems through laboratory analyses (Jahn et al. 2005). In the literature, it is suggested that without external intervention, credence good markets like the market for food products from animal welfare-friendly husbandry systems may fail because ''widespread deception makes consumers less responsive to messages, even those that provide truthful information'' (Golan et al. 2001, p. 130).

Product labelling like the proposed labelling of animal husbandry systems is one type of external intervention to overcome the deficiencies inherent to credence good markets. Product labelling is defined as "any policy instrument by a government or other third party that somehow regulates the presentation of product-specific information to consumers" (Teisl and Roe 1998, p. 1). Compared to other policy instruments, product labelling is considered an effective policy instrument for preventing fraud and helping non-fraudulent firms increase profits (Hamilton and Zilberman 2006).

The marketing and consumer behaviour literature suggests that a labelling scheme must fulfil a number of prerequisites to be successful in the market (Armstrong and Kotler 2009). First, it is important that consumers have positive perceptions and attitudes towards animal welfare-friendly husbandry systems and prefer such products if an increase in consumer demand for such products is to be achieved. For producers working with animal welfare-friendly husbandry systems, it is also crucial that—at least some—consumers are willing to pay higher prices for such products.

Methods and Material of the Literature Review

A literature search was conducted to analyse the state of the art of scientific evidence on consumers' and citizens' views and response towards labelling of animal husbandry practices. The two most renowned databases for scientific peer-reviewed literature were screened for relevant journal articles: 'Web of Science' and 'ScienceDirect'. Title, abstract and keywords of articles were searched with the following Boolean search term:

> (consumer* OR citizen*) AND ("animal welfare" OR husbandry OR rearing OR "production system" OR "production method" OR "production practice*")

Records were limited to articles in English and German published from January 1, 2005 to January 5, 2016. The search's focus was on *empirical* studies on consumers or citizens. Sensory studies were mostly excluded since they were assumed not to mirror a usual shopping situation in which a product can only be tested after purchase. The articles were limited to studies from Europe, Canada and the United States of America. Records were further limited to studies on pigs, poultry, beef cattle, dairy cows, sheep, goats, and farm animals in general.

The search in the database 'ScienceDirect' yielded 437 and in 'Web of Science' 1843 records which were manually screened for relevance (Fig. 1). 103 articles were included in the preliminary list of relevant literature. For two of these articles, the full-texts could neither be accessed nor obtained by directly requesting them from the authors. For 101 articles, the full-text was screened to evaluate its relevance for this review study. Of these, 35 studies were categorised as being too general in scope, i.e. researching animal welfare on a rather general level without reference to animal husbandry systems, eight studies were excluded because they were sensory studies, and five studies were not included because they did not report their own empirical results. In the end, the list of relevant studies encompassed 53 articles (see Table 4 in the Appendix).

The 53 articles included in the review study were based on data collected in a multitude of countries (Table 1). Most studies were conducted in the USA (12 articles), followed by Denmark (9 articles), the Netherlands (8 articles), and Belgium and Germany (7 articles each).

Table 2 shows the number of studies by animal species. The highest number of articles reported data from studies on pigs (24 articles). The number of articles on dairy cows, chickens, and beef cattle were relatively even (between 8 and 11).

The analysis of the review study was based on a qualitative synthesis of the results from the 53 reviewed articles. The synthesis of study results was organised according to the concepts of consumer behaviour outlined in "Conceptual Framework: Product Labelling and Consumer Behaviour" section, to find out whether a label regarding the type of animal husbandry system is relevant to consumers when buying meat and milk:

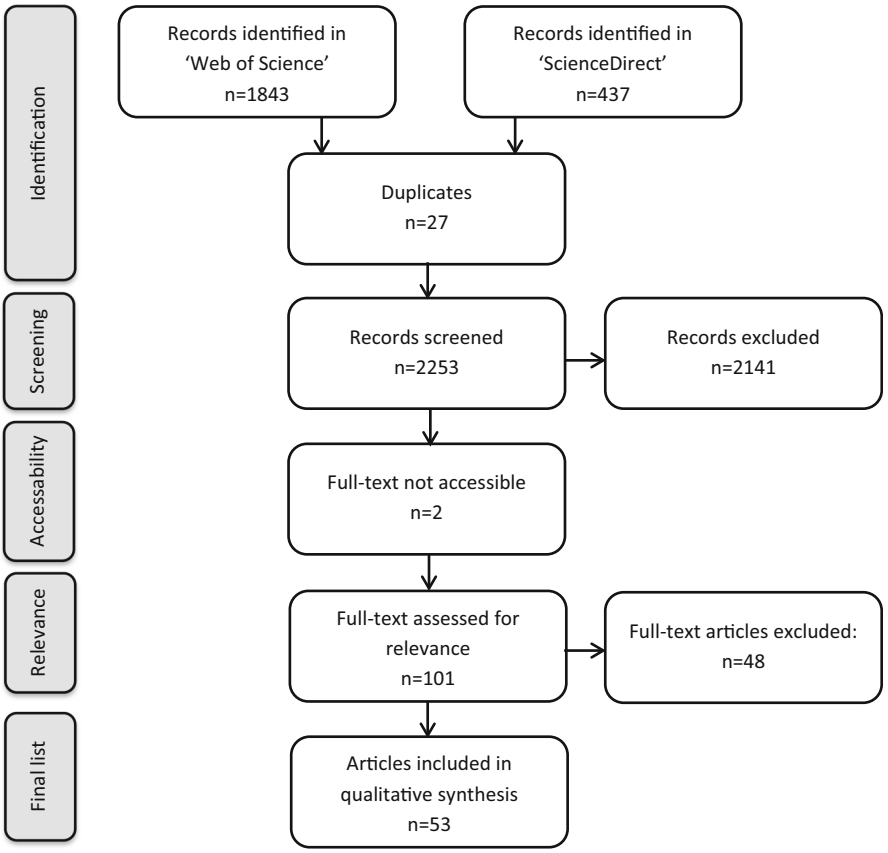

Fig. 1 Flow chart of the selection procedure of reviewed articles. (adapted from: Moher et al. 2009)

- Consumer perceptions and attitudes towards

  animal husbandry systems in general, and
  animal husbandry systems in the context of food purchases,

- Consumer preferences and willingness-to-pay for products with claims and labels on animal husbandry systems,
- Consumer segmentation based on attitudes and preferences with regards to animal husbandry systems, and
- Recommendations regarding claims and labels on animal husbandry systems.

For each concept, we differentiated between different animal species and compared the results to identify similarities and differences. If possible, emerging themes and issues were quantified in terms of the number of studies.

Table 1 Reviewed articles: Countries of study and number of articles per country

Countries of study	Number of articles (N = 53)[a]
United States of America	12
Denmark	9
Netherlands	8
Belgium	7
Germany	7
Spain	6
United Kingdom	5
Canada	4
Poland	4
Sweden	4
Finland	3
Italy	2
France	2
Greece	2
Portugal	1

[a] Several articles reported results from data collected in more than one country. The sum of the right hand column is therefore larger than 53

Table 2 Animal species studied in reviewed articles

Animal species studied	Number of articles (N = 53)[a]
Pigs	24
Dairy cows	11
Poultry	10
Beef cattle	8
Farm animals in general	6
Sheep	1
Goats	0

[a] Several articles reported results related to more than one animal species. The sum of the right hand column is therefore larger than 53

Results and Discussion

The results section is structured according to the main concepts of consumer behaviour literature outlined in "Methods and Material of the Literature Review" section.

Consumer Perceptions of and Attitudes Towards Animal Husbandry Systems

26 of the 53 articles conveyed results concerning consumer perceptions of and attitudes towards animal husbandry systems and labels. In all, 18 studies used a quantitative approach, five studies used a qualitative approach, and three studies applied a combination of both kinds of data collection methods.

Consumer Perceptions of Aspects Influencing Animal Welfare

Several studies give insights into consumers' or citizens' perceptions of aspects influencing animal welfare. Several studies revealed that consumers/citizens perceived the following aspects as having great importance for the level of animal welfare in husbandry: ample food and water, absence of diseases, space allowance, outdoor access, the opportunity to behave naturally, a good human-animal relationship, and good transport and slaughter conditions (Di Pasquale et al. 2014, Italy; Prickett et al. 2010, USA; Vanhonacker et al. 2009, Belgium; Vanhonacker et al. 2010, Belgium). A Canadian study showed that citizens viewed animal welfare as an ethical issue and linked it to the animals being allowed to behave naturally and access natural environments (Spooner et al. 2014). Intensive production was related to the denial of access to natural environments for farm animals (Spooner et al. 2014). Interestingly, even though consumers seemed to have a rather clear idea of what they found important for animal welfare, two studies showed that respondents had a relatively low self-assessed level of knowledge on husbandry practices (Di Pasquale et al. 2014, Italy; Hall and Sandilands 2007, UK).

As for dairy cows, Boogaard et al. (2008) found that animal housing, space allowance and outdoor access are important concerns related to farm animal welfare for the Dutch participants visiting the farms in the study they conducted. This finding was basically confirmed by Cardoso et al. (2016) since study participants largely referred to space allowance, pasture access, and animal health regarding dairy cows' welfare level (Canada and USA). Ellis et al. (2009) found that space allowance and outdoor access for dairy cows' welfare were the third and fourth most important aspects for consumers from the UK following appropriate feeding and good stockmanship. 95% of respondents also thought that keeping cows indoors all year was unacceptable (Ellis et al. 2009). Generally, free-range dairy cow systems had a positive connotation for German consumers (Weinrich et al. 2014b).

Freedom to move and ground floor cover were aspects that more than half of the Dutch citizens and farmers participating in a study by Bergstra et al. (2015) found important in pig husbandry. All 26 participants of another study mentioned housing and outdoor access in pig husbandry, as well as other aspects, when they were asked what they noticed during farm visits (Boogaard et al. 2011, Netherlands and Denmark). Space allowance was one of the major concerns raised regarding pig husbandry (Boogaard et al. 2011). In an investigation of factors influencing European citizens' evaluation of husbandry systems, housing and floor type had the strongest influence together with the farmers' efforts to protect water, soil and air (Krystallis et al. 2009, Belgium, Denmark, Germany and Poland; Verbeke et al. 2010, Belgium, Denmark, France, Germany, Greece, Poland, Spain and UK). European citizens evaluated slatted floor more negatively than littered floor, whereas outdoor access was evaluated the most positively (Caracciolo et al. 2016, Belgium, Denmark, Germany, Greece and Poland; Krystallis et al. 2009; Sørensen et al. 2012, Belgium, Denmark, Germany and Poland; Verbeke et al. 2010; all studies used data from the project Q-PORKCHAINS).

Similar findings concerning the perceived importance of space allowance and outdoor access exist for poultry. Outdoor access was assessed as the most important

(de Jonge and Van Trijp 2013), or as one of the most important aspects for chicken welfare by Dutch consumers together with space allowance (de Jonge and Van Trijp 2014). Similarly, UK-based respondents of a qualitative study assumed that a comfortable stocking density had positive impacts on numerous other chicken welfare aspects and evaluated its importance on chicken welfare high although not the highest (Hall and Sandilands 2007).

Consumer Attitudes Towards Animal Welfare (Labels) in the Context of Food Purchases

Several studies revealed large shares of respondents who considered animal welfare an important factor when purchasing food (Dentoni et al. 2014, beef cattle, USA; Dransfield et al. 2005, pigs, Denmark, France, Sweden, UK; Ellis et al. 2009, dairy cows, UK; Gracia 2013, farm animals in general, Spain; Hall and Sandilands 2007, chicken, UK; Heerwagen et al. 2015, pigs, Denmark; Prickett et al. 2010, farm animal in general, USA). There is evidence that consumers associated higher animal welfare standards with higher quality (Kehlbacher et al. 2012; Vanhonacker et al. 2010). Only one study was identified according to which Spanish consumers placed rather little importance on animal welfare-friendly husbandry when they evaluated the quality of sheep lamb meat at the point-of-purchase (Sepulveda et al. 2011).

Regarding the effect of labels, Hoogland et al. (2007) showed that the organic logo on chicken and dairy products had an overall positive effect on Dutch consumers' product perception, even though the respondents did not fully understand the meaning of the label. Additional explanation about organic farming practices increased the positive beliefs consumers held about the product. Ellis et al. (2009, dairy cows, UK) and Vanhonacker et al. (2010, Belgium) confirmed that logos were often not fully understood or even misunderstood by consumers. In addition, Di Pasquale et al. (2014) found that Italian consumers generally had trouble identifying products with higher animal welfare standards. Weinrich et al. (2014a) examined consumers' understanding and perceived trustworthiness of a German animal welfare label ("Für mehr Tierschutz"). The multi-level label (consisting of a basic and an advanced level) was misunderstood by 13% of German respondents while another large share (25%) misinterpreted the label's meaning. Vanhonacker et al. (2010) also showed that Belgian citizens found animal welfare labels' trustworthiness questionable. On the other hand, 71% of respondents in this study stated that labels played a positive role as a communication tool for animal welfare. Even though Hall and Sandilands' (2007) UK-based respondents believed animal welfare labelling had a positive impact on overall chicken welfare and food quality, overall they assessed the importance of labelling as relatively low for increasing the welfare of poultry. Kehlbacher et al. (2012) reported that the majority of respondents in the UK would like a welfare scoring system on food products based on space allowance and outdoor access. A study conducted in the Netherlands also showed that respondents welcomed the use of a labelling system for animal welfare (Frewer et al. 2005).

Consumer Preferences and Willingness-to-Pay for Claims and Labels on Animal Husbandry Systems

25 of the reviewed studies investigated consumer preferences and/or willingness-to-pay (WTP) for claims and labels on animal husbandry systems with the methods of choice experiments (17 studies), conjoint analysis (four studies), auctions (two studies), or contingent valuation (two studies). All of the studies used descriptions of *concrete* products with or without pictures, e.g. milk (1 l) or beefsteak (200 g) and—except for two studies based on conjoint analysis—reported WTP values in either absolute or percentage terms. It is problematic to compare willingness-to-pay values across different studies, since most studies used slightly different products and were conducted in different countries with different food prices. Moreover, WTP values calculated from conjoint and choice experiments need to be interpreted within the context of each experiment. Therefore, in the sections below, we report whether or not consumers were willing to pay a significant price premium for claims/labels on animal husbandry systems but concrete WTP values are not reported.

Table 3 provides an overview of the aspects of animal husbandry systems analysed in the reviewed studies on consumer preferences and WTP. It becomes obvious that outdoor access was subject to many studies, whereas only few studies specifically analysed other single husbandry aspects (e.g. livestock density). Several studies investigated the effect of claims or labels indicating improved animal welfare encompassing a bundle of aspects related to animal husbandry, among others outdoor access and lower livestock density. Almost all studies also tested other attributes in addition to those displayed in Table 3 and there was a great diversity across the studies.

Pigs

Ten studies investigated consumer preferences for pork. Carlsson et al. (2005) conducted choice experiments in Sweden. Consumers preferred pork from herds kept outdoors in summer versus indoors all year round. The claim ‘outdoor access’ had the highest WTP values. The product attribute pertaining to ‘information on genetically modified fodder’ was second most important. The attribute regarding the aspects of transport to slaughter had a low, yet significant influence, while the tested label on ‘farm of origin and choice of husbandry method’ was not significant for the choice of pork (the authors did not explain what is meant by ‘choice of husbandry method’).

Liljenstolpe (2008, 2011) also conducted choice experiments in Sweden with a range of different attributes on pig husbandry practices. Like Carlsson et al. (2005), Liljenstolpe (2008, 2011) also observed the highest price premium for pork from a husbandry system with outdoor access. The claim ‘feed from own farm’ had the second strongest influence, followed by the claim ‘stock limit to 100 pigs’. There was also a significant positive preference for pork from the husbandry system ‘deep litter’ that provides more space per pig compared to a system with pens holding eight pigs. However, other attributes were still more important than this aspect.

Table 3 Aspects of animal husbandry systems analysed in the reviewed studies on consumer preferences and WTP

Aspects of animal husbandry systems[a]	Study results: influence on consumers' product evaluation[b]	
	Number of studies reporting a significant positive influence	Number of studies reporting no significant influence
Outdoor access provided[c]		
Pigs	6	–
Poultry	5	–
Beef cattle	3	1
Dairy cows	5	–
Total	19	1
Improved animal welfare (label/claim encompassing outdoor access, lower density, among others)		
Pigs	4	–
Poultry	4	–
Beef cattle	2	–
Dairy cows	1	1
Total	11	1
No use of gestation crates		
Pigs	4	–
Lower livestock density		
Pigs	1	–
Bedding straw		
Pigs	1	–

[a] Analysed in the form of product claims or labels

[b] No study was found reporting a significant negative influence

[c] Tested as a single product attribute and not in the form of a combined label/claim

Mørkbak et al. (2010) analysed preferences for minced pork among consumers in Denmark and found that minced pork from a so-called 'alternative system' incorporating outdoor access, more hay, and more space for the pigs was preferred over pork from a conventional indoor system. Consumers were willing to pay a price premium for pork from the 'alternative system' but the price premium was lower than the price premium for the product attributes 'fat content', 'domestic production', and 'salmonella-free'.

McKendree et al. (2013) observed high WTP values for the claims 'pasture access' and 'no antibiotic use' among US consumers. The claim 'individual crates/stalls not permitted' also had a significant positive influence but the influence was lower than for the two other claims tested. Also Olynk et al. (2010) recorded high WTP values for the claim 'pasture access' among US consumers. The attributes with the second strongest influence were 'no antibiotic use' and 'individual crates/

stalls not permitted', while the claim 'certified trucking/transport' did not have a significant influence. Similarly, Pozo et al. (2012) recorded high preferences for pork chops with the claim 'antibiotic-free', followed by the claim 'pasture access provided'. The claim 'individual crates/stalls not permitted' had a lower (but still significant positive) influence, while the claim 'from small farms' did not have a significant influence. A study from Canada reached slightly different conclusions. On average, Uzea et al. (2011) observed a high preference for the claim 'use of group pens' (instead of gestation crates), followed by 'outdoor housing system'. The claims 'hoop housing system' and 'no antibiotic use' were not significant. Nilsson et al. (2006) investigated consumer preferences in the USA for pork chops certified as environmentally-friendly, animal welfare-friendly and/or antibiotic-free, and recorded a significant positive preference for all the claims tested.

Compared to the studies above, Weinrich et al. (2014a) took a slightly different approach and investigated a multi-level animal welfare label in a study from Germany with the method of contingent valuation. The label encompassed two levels (one or two stars) and was not on the market at the time of data collection. The participants of Study 1 received background information about the different levels of the label; the participants of Study 2 were not informed about the different levels. The results showed significant positive average price premiums for meat products with the animal welfare label compared to conventional products without a label. Interestingly, a significantly higher price premium for the 2-star animal welfare label compared to the 1-star label was recorded in Study 1 (information provided) but not in Study 2 (no information), indicating that a multi-level system is not self-explanatory.

In a study from Spain, Gracia et al. (2011) analysed the WTP for a hypothetical 'EU Animal Welfare Label' with experimental auctions. Before the auction, the participants were informed about current, minimum requirements on animal welfare for pigs in the EU, and the requirements applied for products with the suggested 'EU Animal Welfare Label'. The results indicated that consumers were willing to pay a significant price premium for ham with the animal welfare label compared to unlabelled ham.

Poultry

Seven studies investigated consumer preferences for chicken meat. Marian and Thøgersen (2013) conducted a conjoint analysis in Denmark comparing conventional chicken production with the two husbandry systems organic and free-range. The results indicated that chicken from organic production and from free-range production were both strongly favoured over conventional chicken. The product attribute 'information about the farmer and the rearing conditions' also had a significant influence; however it was smaller compared to the aforementioned attributes.

In their study from Sweden, Carlsson et al. (2005) recorded the highest WTP values for the product attribute 'information on genetically modified fodder'. The second most important attribute was 'slower growth chicken'. The attribute on housing practices was third most important in influencing consumer preferences.

The attribute on aspects of transport to slaughter had the lowest influence but was still significant.

Pouta et al. (2010) conducted choice experiments in Finland including the product attributes geographical origin, husbandry system, and seasoning. Four different husbandry systems were analysed. The authors found that chicken from a system with improved animal husbandry standards (decreased animal density, outdoor access, among others) and organic chicken were preferred over conventional chicken. It also needs to be acknowledged that 'geographical origin' was by far the most important attribute for determining consumer preferences; the type of husbandry system ranked second.

Van Loo et al. (2014) conducted choice experiments in Belgium also investigating organic and free-range production alongside other product attributes. In all, the authors tested three different free-range claims, two different organic labels, two different carbon footprint claims, and a hypothetical European animal welfare label. Interestingly, the highest preferences were recorded for the three free-range claims tested, followed by the hypothetical European animal welfare label. The two carbon footprint claims and the two organic labels had a weaker influence on consumer preferences.

De Jonge et al. (2015) investigated consumer preferences for the Dutch animal welfare label 'Better Life Hallmark' with three different levels (one, two or three stars) indicating the level of improvement of animal welfare standards. In addition, the Dutch organic label's effect was tested in the choice experiments. Overall, the highest preferences were observed for the 2-star 'Better Life Hallmark', followed by the 3-star 'Better Life Hallmark', and the 3-star 'Better Life Hallmark' combined with the organic logo. The authors compared consumers' choice behaviour with their reported real buying behaviour and concluded that the tested 'intermediate options' (1-star and 2-star 'Better Life Hallmark') gained a large choice share particularly at the cost of conventional chicken, but also at the cost of organic chicken (de Jonge et al. 2015).

A Canadian study based on conjoint analysis with different product attributes (husbandry system, chicken part, cooking method) found that free-range production was preferred over organic and conventional production and it had the greatest influence on consumer choice (Martinez Michel et al. 2011).

Vander Naald and Cameron (2011) conducted choice experiments in the USA eliciting consumer preferences for chicken labelled with the claims 'humanely raised' and 'free-range'. The results indicated a high consumer preference for 'humanely raised' chicken compared to 'free-range' and conventional chicken; however, it needs to be mentioned that descriptions of humane farming practices were provided to the participants.

Beef Cattle

Six studies investigated consumer preferences for beef. Risius and Hamm (2015) analysed German consumers' preferences for beef from suckler cow husbandry, beef from pasture-raised cows, and organic beef. Choice experiments with a split-sample design were conducted. In the three samples provided with information on

suckler cow husbandry, this was the most preferred claim, followed by organic production. The claim 'pasture-raised' also had a significant positive influence on consumer choice, but to a lower extent than the aforementioned attributes. A completely different picture was found in the control group which had received no information. Those participants mostly based their choice on the claim 'organic production', followed by the claim 'pasture-raised'.

In their sample for beef, Carlsson et al. (2005) found that the attribute 'pasture access' (all year versus only in summertime) had no significant influence on Swedish consumers' preferences. The highest preference was recorded for 'information on genetically modified fodder', followed by the attributes 'label on farm of origin and choice of husbandry method', and 'mobile slaughter house' (instead of transport of animals to slaughterhouse).

In a study from Spain analysing the product attributes husbandry system, geographical origin, and quality labelling, the husbandry system 'free-range' was preferred over 'stall-fed' (Mesías et al. 2005). The most important attribute influencing consumer preferences was 'geographical origin' followed by 'quality labelling' while 'husbandry system' ranked third. García-Torres et al. (2016) investigated the attributes husbandry system, geographical origin, and colour of the meat and reached similar conclusions. Two different organic production methods were tested. The results indicated that Spanish consumers preferred free-range organic beef to organic beef from intensive farming that was in turn preferred to conventional beef. However, the attribute 'husbandry system' had the lowest relative importance of all tested attributes.

A study from Portugal testing three kinds of labels (animal welfare label, food safety label, environmental protection label) revealed that beef with the animal welfare label signalling improved animal husbandry standards (decreased animal density, increased training for caretakers, mandatory pasture access) was preferred over conventional beef (Viegas et al. 2014). The label on improved animal husbandry was as important to consumers as the label on food safety, while the tested environmental protection label had a lesser influence.

A study from Finland on minced meat (beef and pork) reached similar results (Koistinen et al. 2013). The authors tested the attributes fat content, type of meat, husbandry system, and carbon footprint label. The analysis regarding the four tested husbandry systems indicated that minced meat from a system with improved animal husbandry standards (decreased animal density, outdoor access, among others) as well as organic minced meat were preferred over conventional. However, the product attributes type of meat (beef preferred over pork) and fat content were more important to consumers.

Dairy Cows

Six studies investigated consumer preferences for milk or milk products. In the Swedish study by Carlsson et al. (2005), the attribute 'housing system' (free-range indoor versus stanchion system) had the second strongest influence on consumer choice after 'information on genetically modified fodder'. The claim on 'increased

time cows and calves spend together' also had a positive significant influence but it was smaller compared to the first two attributes.

Tempesta and Vecchiato (2013) analysed consumer preferences in Italy for milk including the attributes husbandry system (pasture access versus indoor system), geographical origin, and area of production (mountain versus plain). They recorded a significant preference for the claim 'pasture access'; however, the attribute 'geographical origin' had the greatest influence on consumer choice.

In choice experiments for milk with US consumers, Olynk et al. (2010) observed the highest preference for the claim 'pasture access'. The claims with the second strongest influence were 'no antibiotic use' and 'individual crates/stalls not permitted'. The claim 'certified trucking/transport' did not have a significant influence on the choice of milk (Olynk et al. 2010). In a similar study on ice cream and yogurt (Olynk and Ortega 2013), the claim 'pasture access' was the most important choice criterion for ice cream, followed by the claim 'no antibiotic use', while the order was reversed for yogurt. In both cases, the claim 'no rbST use' had a relatively low, yet significant positive influence.

With the method of contingent valuation, Weinrich et al. (2014b) analysed the WTP for milk labelled with the claim 'pasture-raised' among consumers in Germany. The results indicated that, on average, the WTP value for milk from a pasture system corresponded with the reference price for organic milk (in the experiments, the participants were presented with a set of different conventional and organic milk products labelled with prices).

A US study based on different kinds of experimental auctions analysed consumers' WTP for dairy products with the claim 'humane animal care' (Elbakidze and Nayga 2012; Elbakidze et al. 2013). A split-sample design was used with a control group and a detailed information treatment about principles of humane animal care practices in dairy production. The results indicated a significant, but relatively low, WTP for ice cream labelled with the claim 'humane animal care' but no significant WTP for cheese. However, the authors pointed out that the study results need to be interpreted with care since more than half of the sample consisted of college/university students and the test product was a very uncommon type of cheese (Elbakidze and Nayga 2012; Elbakidze et al. 2013).

Synthesis of Key Results

The reviewed studies on consumer preferences have in common that they all investigated either the aspect 'outdoor access' in animal husbandry systems or a claim/label on improved animal welfare encompassing 'outdoor access'. The results confirm that husbandry systems providing outdoor access for animals have a significant positive influence on consumer preferences for meat and milk and consumers are willing to pay a price premium (see Table 3). In the vast majority of the studies, systems with outdoor access were between the *two top* attributes with the *highest* influence on consumer preferences.

Consumer Segmentation

The results reported in the previous sections referred to average results across the whole sample. However, heterogeneity of consumer perceptions, attitudes, preferences and/or WTP was observed in the vast majority of studies reviewed. Fifteen of these studies conducted a consumer segmentation (using cluster analysis, latent class analysis, or descriptive analysis) and identified different consumer segments. The segments had significantly different perceptions, attitudes, preferences and/or WTP concerning animal welfare-friendly husbandry systems. One group of studies conducted a consumer segmentation based on consumer attitudes (e.g. importance ratings of a set of production characteristics or product attributes). The other group of studies segmented consumers according to preferences for different product attributes elicited with the methods of choice experiments or conjoint analysis.

Consumer Segmentation Based on Attitudes

In a study conducted in Belgium, Vanhonacker et al. (2010) identified a consumer segment (10% of respondents) who considered animal welfare more important than food quality, safety and health. A study from the USA revealed a relatively large consumer segment (46% of the sample) that stated it placed great importance on the aspects outdoor access and the opportunity to behave naturally for animals; accordingly, price played a relatively unimportant role for these consumers (Prickett et al. 2010).

As for pig husbandry in five European countries (Belgium, Denmark, Germany, Greece, Poland), Verbeke et al. (2010) identified two segments of consumers (each representing 11% of respondents) with strong positive attitudes towards pig welfare. The authors characterised one segment as putting the most emphasis on the type of housing and the other as extremely supportive towards extensive pig farming (Verbeke et al. 2010). Krystallis et al. (2009) analysed data from the same project and reached similar conclusions.

Weinrich et al. (2014b) distinguished four segments of German milk consumers: The largest segment (28%) placed great importance on pasture access. The second largest cluster (28%) also considered pasture access as very important but at the same time product quality was also seen as very important. A study conducted in Spain with consumers of sheep lamb found that of two consumer segments, one rated animal welfare together with environmentally-friendly production as more important than the other (Sepulveda et al. 2011).

Consumer Segmentation Based on Consumer Preferences

Liljenstolpe (2011) distinguished three segments of Swedish pork consumers: one segment (26% of participants) oriented towards high levels of husbandry practices, one segment (55%) oriented towards intermediate levels of husbandry practices, and another segment (19%) oriented towards food safety and the price of pork. Similarly, Uzea et al. (2011) identified five segments of Canadian pork consumers, two of which were willing to pay high price premiums for all of the tested animal

welfare-friendly husbandry practices (29 and 26% respectively). A third segment (21%) placed importance only on some of the tested practices, while another segment (22%) was mostly price-oriented. Nilsson et al. (2006) found three segments of US consumers, one of which (43%) had high preferences for the product claims 'certified animal welfare-friendly' and 'certified free of antibiotics'.

Koistinen et al. (2013) identified six consumer segments in Finland with diverging preferences for minced meat (pork and beef). One segment (11%) based the choice primarily on the husbandry system and was willing to pay above-average price premiums for animal welfare-friendly husbandry systems. In four other segments, the method of production also had a significant influence on choice although other attributes were more important. The sixth segment (14%) hardly cared about the husbandry system.

A Finnish study on chicken also found a relatively small consumer segment (9%) with significantly above-average preferences for the husbandry system (Pouta et al. 2010). Another segment (16%) based the choice mostly on geographical origin although the husbandry system also played a role. Two other segments (62 and 12% respectively) had below-average preference values for the type of husbandry system (Pouta et al. 2010). De Jonge et al. (2015) identified six consumer segments in their study on consumer preferences for chicken with the animal welfare label 'Better Life Hallmark' in the Netherlands. Two segments (each representing 8% of the sample) held negative attitudes regarding the consumption of conventional chicken and either turned to chicken produced at high animal welfare standards or reduced their overall meat consumption. Two other segments (19 and 13%, respectively) were willing to pay a price premium for intermediate animal welfare standards. The two remaining segments were not willing to pay a price premium for animal welfare-labelled products (de Jonge et al. 2015). The two chicken consumer segments revealed in a US study were even more distinct (Vander Naald and Cameron 2011): one segment had a high preference for 'humanely raised' and 'free-range' labelled chicken, while another segment did not value these claims at all.

Mesías et al. (2005) revealed one segment (35%) of Spanish beef consumers who evaluated the products mostly on the type of husbandry system. Another segment (25%) while placing great importance on geographical origin also cared about the husbandry system, unlike the third segment (40%) that placed great importance mostly on quality labelling. Tempesta and Vecchiato (2013) identified two segments of Italian consumers (54 and 18%, respectively) with a high preference for milk from pasture systems, while this aspect was of relatively low importance for the third segment (28%).

Synthesis of Key Results

All segmentation studies identified at least one segment of consumers who placed relatively great importance on animal husbandry systems. The size of the segment(s) varied from 9 to 54% across the reviewed studies. In part, the variation in segment size can probably be attributed to the fact that—across the studies—different product attributes and questionnaire items were used as segmentation criteria. Interestingly, eleven studies identified one or more other segments to whom

product attributes such as geographical origin were of great importance but who still had a significant preference for animal welfare-friendly products (though not as strong as the first segment).

Recommendations from the Reviewed Studies

The discovery of consumer segments with relatively high valuation of welfare-enhancing animal husbandry systems led several authors to appeal for a labelling system for animal welfare. In all, 18 of the 53 reviewed studies recommended a label or claim for different animal husbandry practices. No study was found explicitly *not* recommending a label or claim.

Kehlbacher et al. (2012, farm animals in general, UK) argued that consumers with high preferences for meat from husbandry with higher welfare standards cannot currently satisfy their preferences due to a lack of available information. The authors raised the point that, given the degree of preference heterogeneity among consumers, establishing an animal welfare label as a logo or a rating system seems feasible. De Jonge et al. (2015, pigs, Netherlands) explicitly concluded that consumers, animals and the meat sector would be better off with a multi-level labelling system for a more differentiated meat assortment. In the same vein, de Jonge and van Trijp (2014, chicken, Netherlands) suggested that gradual labelling indicating overall animal welfare levels together with specific information tailored to consumer concerns would be a way to develop the meat market. Similarly, Mesías et al. (2005, beef cattle, Spain) suggested a larger product assortment would enable the targeting of marketing activities to consumer groups with matching preferences. Heerwagen et al. (2015, pigs, Denmark) warned that consumers who prefer animal welfare-friendly husbandry systems, but at the same time keep their eye on the price tag when food shopping, are choosing the conventional product if there is no medium level animal welfare-friendly product available.

Di Pasquale et al. (2014, farm animals in general, Italy) considered an animal welfare labelling system an effective compensation strategy for the efforts of farmers to improve the welfare level in animal husbandry. Risius and Hamm (2015, beef cattle, Germany) also argued that higher prices could be achieved for beef products originating from different husbandry systems and that a labelling system of husbandry practices would be helpful in achieving this price differentiation. Van Loo et al. (2014, Belgium) made the same case for chicken.

Weinrich et al. (2014b) concluded that the segment of consumers being potential buyers of pasture-raised milk is large enough to justify the introduction of a label for pasture-raised milk. Similarly, Nilsson et al. (2006, pigs, USA) also confirmed that there seems to be a market potential for certified products such as animal welfare-friendly products. Finally, Ellis et al. (2009, dairy cows, UK) presumed that a clear animal welfare labelling system would have the effect of an easier integration of animal welfare aspects into habitual product-choice behaviour.

Another theme emerging from the reviewed studies was the issue of responsibility for animal welfare and the provision of information on animal welfare. Gracia et al. (2011, pigs, Spain) proposed that an animal welfare label be granted by the EU in order to promote product differentiation. A study from Belgium showed that

participants preferred a neutral agent such as the government (versus an animal welfare organisation) to take responsibility for the provisioning of animal welfare information on products (Vanhonacker et al. 2010, farm animals in general, Belgium). Frewer et al. (2005, pigs, Netherlands) also suggested that a governmental monitoring system for animal welfare combined with a label would likely be important for consumers. The majority of respondents in a US study also agreed that the government should take an active role in promoting animal welfare (Prickett et al. 2010, farm animals in general, USA). The government was the preferred verification body for higher animal welfare standards compared to other actors such as farmers, supermarkets, industry organisations, or consumer groups in five North American studies as well (Uzea et al. 2011, pigs, Canada; McKendree et al. 2013, pigs, USA; Olynk et al. 2010, pigs and dairy cows, USA; Olynk and Ortega 2013, dairy cows, USA; Tonsor and Wolf 2011, pigs, USA).

Conclusions

The present review study aimed to assess whether there is scientific evidence that consumers find information about animal husbandry systems relevant in the context of meat and milk purchase decisions. According to the synthesis of 53 empirical studies published between 2005 and 2016, consumers perceived the aspects of outdoor access, stocking density and floor type as important factors influencing animal welfare. There is strong evidence that considerable shares of consumers not only have positive attitudes towards (more) animal welfare-friendly husbandry systems providing outdoor access and freedom to move but are also willing to pay a price premium for meat and milk produced in such systems.

Interestingly, the fifteen segmentation studies included in the review *all* identified at least one segment of consumers who placed great importance on animal welfare-friendly husbandry systems. These consumers were willing to pay relatively high price premiums for meat and milk produced in animal welfare-friendly husbandry systems. It is remarkable that many of the studies identified further consumer segments of relevant size that placed great importance on animal welfare-friendly husbandry although they had a lower willingness-to-pay than the segment mentioned above. It can be assumed that people from this segment will choose a conventional product at the point-of-purchase if they only have the choice between a high-priced premium product with certified animal welfare-friendliness and a conventional product (Heerwagen et al. 2015).

Given the evidence from the literature review, it seems advisable that producers who engage in animal welfare-enhancing practices should clearly label their products with information on the type of husbandry system to reach those consumers who want to make an informed choice. Many authors have recommended the introduction of a multi-level labelling scheme for meat and milk to differentiate products from animal welfare-friendly systems from ‘standard’ products. Producers should thus consider using a labelling system offering multiple levels of animal welfare-friendliness, e.g. with a level for organic products and different levels for conventional products exceeding the minimum legal

requirements for animal husbandry. The literature review provided initial insights into consumer preferences regarding the institutional framework behind a labelling scheme on animal husbandry systems. Several studies revealed a high level of consumer trust in a governmental system. This finding corresponds with empirical studies on consumer trust in organic logos confirming a high level of trust in governmental organic logos (Janssen and Hamm 2012). The developments in the egg market since the introduction of the mandatory labelling of the farming system also suggest a high level of consumer trust in the governmental labelling system. Ever since eggs from caged hens have been labelled as such, the market share of this husbandry system has decreased in favour of more animal welfare-friendly systems. However, it needs to be acknowledged that the present literature review focused on the consumer's perspective. The producer's side was not analysed. It needs to be recognised that a governmental labelling scheme for meat and milk would entail costs along the supply chain.

The initial starting point of the present review study was the discussion about the introduction of a mandatory labelling scheme for the type of husbandry system among political decision-makers in the EU. With regards to this initial question, it needs to be emphasised that our literature search yielded no study specifically analysing consumer views on a *mandatory* labelling of husbandry systems. Therefore, we recommend conducting a consumer study in several European countries specifically analysing consumer views on a *mandatory* labelling scheme.

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Appendix

See Table 4.

Table 4 List of reviewed articles

Author(s)	Year	Title	Journal	Country	Animal species	Method of data collection	Sample size
Bergstra, T.J.; Gremmen, B.; Stassen, E.N.	2015	Moral values and attitudes toward Dutch sow husbandry	Journal of Agricultural and Environmental Ethics	Netherlands	Pigs	Online survey	1607 consumers (+181 pig farmers)
Boogaard, B.K.; Boekhorst, L.J.S.; Oosting, S.J.; Sørensen, J.T.	2011	Socio-cultural sustainability of pig production: citizen perceptions in the Netherlands and Denmark	Livestock Science	Denmark, Netherlands	Pigs	Farm visits with self-administered questionnaire	26
Boogaard, B.K.; Oosting, S.J.; Bock, B.B.	2008	Defining sustainability as a socio-cultural concept: citizen panels visiting dairy farms in the Netherlands	Livestock Science	Netherlands	Dairy cows	Farm visits with self-administered questionnaire	39
Caracciolo, F.; Cicia, G.; Del Giudice, T.; Cembalo, L.; Krystallis, A.; Grunert, K.G.; Lombardi, P.	2016	Human values and preferences for cleaner livestock production	Journal of Cleaner Production	Belgium, Denmark, Germany, Greece, Poland	Pigs	Online survey with conjoint experiments	2437
Cardoso, C.S.; Hötzel, M.J.; Weary, D.M.; Robbins, J.A.; von Keyserlingk, M.A.G.	2016	Imagining the ideal dairy farm	Journal of Dairy Science	Canada, USA	Dairy cows	Online survey	468
Carlsson, F.; Frykblom, P.; Lagerkvist, C.J.	2005	Consumer preferences for food product quality attributes from Swedish agriculture	Ambio	Sweden	Chicken, beef cattle, dairy cows, laying hens, pigs	Mail survey with choice experiments	710

Table 4 continued

Author(s)	Year	Title	Journal	Country	Animal species	Method of data collection	Sample size
de Jonge, J.; van Trijp, H.C.M.	2014	Heterogeneity in consumer perceptions of the animal friendliness of broiler production systems	Food Policy	Netherlands	Chicken	Online survey	1269
de Jonge, J.; van Trijp, H.C.M.	2013	The impact of broiler production system practices on consumer perceptions of animal welfare	Poultry Science	Netherlands	Chicken	Self-administered survey (interviewer present) with conjoint experiments	209
de Jonge, J.; van der Lans, I.A.; van Trijp, H.C.M.	2015	Different shades of grey: compromise products to encourage animal friendly consumption	Food Quality and Preference	Netherlands	Pigs	Online survey with choice experiments	1339
Dentoni, D.; Tonsor, G.T.; Calantone, R.; Peterson, H.C.	2014	Disentangling direct and indirect effects of credence labels	British Food Journal	USA	Beef cattle	Online survey	460
Di Pasquale, J.; Nannoni, E.; Del Duca, I.; Adinolfi, F.; Capitanio, F.; Sardi, L.; Vitali, M.; Martelli, G.	2014	What foods are identified as animal friendly by Italian consumers?	Italian Journal of Animal Science	Italy	Farm animals in general	Face-to-face interviews	355
Dransfield, E.; Ngapo, T.M.; Nielsen, N.A.; Bredahl, L.; Sjödén, P.O.; Magnusson, M.; Campo, M.M.; Nute, G.R.	2005	Consumer choice and suggested price for pork as influenced by its appearance, taste and information concerning country of origin and organic pig production	Meat Science	France, Denmark, Sweden, UK	Pigs	Face-to-face interviews	695
Elbakidze, L.; Nayga, R.M., Jr.	2012	The effects of information on willingness to pay for animal welfare in dairy production: application of nonhypothetical valuation mechanisms	Journal of Dairy Science	USA	Dairy cows	Experimental auctions	215

Table 4 continued

Author(s)	Year	Title	Journal	Country	Animal species	Method of data collection	Sample size
Elbakidze, L.; Nayga, R.M., Jr.; Li, H.	2013	Willingness to pay for multiple quantities of animal welfare dairy products	Canadian Journal Of Agricultural Economics	USA	Dairy cows	Experimental auctions	215
Ellis, K.A.; Billington, K.; McNeil, B.; McKeegan, D.E.F.	2009	Public opinion on UK milk marketing and dairy cow welfare	Animal Welfare	UK	Dairy cows	Face-to-face interviews	363
Frewer, L.J.; Kole, A.; Van De Kroon, S.M.A.; De Lauwere, C.	2005	Consumer attitudes towards the development of animal-friendly husbandry systems	Journal of Agricultural and Environmental Ethics	Netherlands	Pigs, fish	Online survey	1000
García-Torres, S.; López-Gajardo, A.; Mesías, F.J.	2016	Intensive versus free-range organic beef. A preference study through consumer liking and conjoint analysis	Meat Science	Spain	Beef cattle	Sensory analysis with conjoint experiment	150
Gracia, A.	2013	The determinants of the intention to purchase animal welfare-friendly meat products in Spain	Animal Welfare	Spain	Pigs	Self-administered survey (interviewer present)	335
Gracia, A.; Loureiro, M.L.; Nayga, R.M., Jr.	2011	Valuing an EU animal welfare label using experimental auctions	Agricultural Economics	Spain	Pigs	Experimental auctions	70
Hall, C.; Sandilands, V.	2007	Public attitudes to the welfare of broiler chickens	Animal Welfare	UK	Chicken	Cognitive mapping, Q methodology	16
Heerwagen, L.R.; Mørkbak, M.R.; Denver, S.; Sandøe, P.; Christensen, T.	2015	The role of quality labels in market-driven animal welfare	Journal of Agricultural and Environmental Ethics	Denmark	Pigs	Online survey with choice experiments, focus group discussions	1633

Table 4 continued

Author(s)	Year	Title	Journal	Country	Animal species	Method of data collection	Sample size
Hoogland, C.T.; de Boer, J.; Boersema, J.J.	2007	Food and sustainability: do consumers recognize, understand and value on-package information on production standards?	Appetite	Netherlands	Chicken, dairy cows	Self-administered survey (interviewer present)	371
Kehlbacher, A.; Bennett, R.; Balcombe, K.	2012	Measuring the consumer benefits of improving farm animal welfare to inform welfare labelling	Food Policy	UK	Farm animals in general	Telephone -mail/ email-telephone survey	300
Koistinen, L.; Pouta, E.; Heikkilä, J.; Forsman-Hugg, S.; Kotro, J.; Mäkelä, J.; Niva, M.	2013	The impact of fat content, production methods and carbon footprint information on consumer preferences for minced meat	Food Quality and Preference	Finland	Pigs, beef cattle	Online survey with choice experiments	1623
Krystallis, A.; de Barcellos, M.D.; Kügler, J.O.; Verbeke, W.; Grunert, K.G.	2009	Attitudes of European citizens towards pig production systems	Livestock Science	Belgium, Denmark, Germany, Poland	Pigs	Online survey with conjoint experiments	1931
Liljenstolpe, C.	2008	Evaluating animal welfare with choice experiments: an application to Swedish pig production	Agribusiness	Sweden	Pigs	Focus group discussions, mail survey with choice experiments	1250
Liljenstolpe, C.	2011	Demand for value-added pork in Sweden: a latent class model approach	Agribusiness	Sweden	Pigs	Focus group discussions, mail survey with choice experiments	1250

Table 4 continued

Author(s)	Year	Title	Journal	Country	Animal species	Method of data collection	Sample size
Marian, L.; Thøgersen, J.	2013	Direct and mediated impacts of product and process characteristics on consumers' choice of organic versus conventional chicken	Food Quality and Preference	Denmark	Chicken	Email and online survey with conjoint experiments	384
Martinez Michel, L.; Anders, S.; Wismer, W.V.	2011	Consumer preferences and willingness to pay for value-added chicken product attributes	Journal of Food Science	Canada	Chicken	Self-administered survey (interviewer present) with conjoint experiments	276
McKendree, M.G.S.; Widmar, N.O.; Ortega, D.L.; Foster, K.A.	2013	Consumer preferences for verified pork-rearing practices in the production of ham products	Journal of Agricultural and Resource Economics	USA	Pigs	Online survey with choice experiments	798
Mesías, F.J.; Escribano, M.; de Ledesma, A.R.; Pulido, F.	2005	Consumers' preferences for beef in the Spanish region of Extremadura: a study using conjoint analysis	Journal of the Science of Food and Agriculture	Spain	Beef cattle	Face-to-face interviews with conjoint experiments	575
Mørkbak, M.R.; Christensen, T.; Gyrd-Hansen, D.	2010	Consumer preferences for safety characteristics in pork	British Food Journal	Denmark	Pigs	Online survey with choice experiments	1322
Nilsson, T.; Foster, K; Lusk, J.L.	2006	Marketing opportunities for certified pork chops	Canadian Journal of Agricultural Economics	USA	Pigs	Mail survey with choice experiments	642
Olynk, N.J.; Ortega, D.L.	2013	Consumer preferences for verified dairy cattle management practices in processed dairy products	Food Control	USA	Dairy cows	Online survey with choice experiments	1000

Table 4 continued

Author(s)	Year	Title	Journal	Country	Animal species	Method of data collection	Sample size
Olynk, N.J.; Tonsor, G.T.; Wolf, C.A.	2010	Consumer willingness to pay for livestock credence attribute claim verification	Journal of Agricultural and Resource Economics	USA	Pigs, dairy cows	Online survey with choice experiments	1334
Pouta, E.; Heikkilä, J.; Forsman-Hugg, S.; Isoniemi, M.; Mäkelä, J.	2010	Consumer choice of broiler meat: the effects of country of origin and production methods	Food Quality and Preference	Finland	Chicken	Online survey with choice experiments	1312
Pozo, V.F.; Tonsor, G.T.; Schroeder, T.C.	2012	How choice experiment design affects estimated valuation of use of gestation crates	Journal of Agricultural Economics	USA	Pigs	Online survey with choice experiments	800
Prickett, R.W.; Norwood, F.B.; Lusk, J.L.	2010	Consumer preferences for farm animal welfare: results from a telephone survey of US households	Animal Welfare	USA	Farm animals in general	Telephone survey	1019
Risius, A.; Hamm, U.	2015	Product and price differentiation for beef according to rearing system of cattle	Fleischwirtschaft	Germany	Beef cattle	Self-administered survey (interviewer present) with choice experiments	676
Sepulveda, W.S.; Maza, M.T.; Pardos, L.	2011	Aspects of quality related to the consumption and production of lamb meat. Consumers versus producers	Meat Science	Spain	Sheep lambs	Face-to-face interviews	371 consumers (+49 sheep farmers)
Sørensen, B.T.; de Barcellos, M.D.; Olsen, N.V.; Verbeke, W.; Scholderer, J.	2012	Systems of attitudes towards production in the pork industry. A cross-national study	Appetite	Belgium, Denmark, Germany, Poland	Pigs	Online survey with conjoint experiments	1931

Table 4 continued

Author(s)	Year	Title	Journal	Country	Animal species	Method of data collection	Sample size
Spooner, J.M.; Schuppli, C.A.; Fraser, D.	2014	Attitudes of Canadian citizens toward farm animal welfare: a qualitative study	Livestock Science	Canada	Farm animals in general	In-depth personal interviews	24
Tempesta, T.; Vecchiato, D.	2013	An analysis of the territorial factors affecting milk purchase in Italy	Food Quality and Preference	Italy	Dairy cows	Face-to-face interviews with choice experiments	400
Tonsor, G.T.; Wolf, C.A.	2011	On mandatory labeling of animal welfare attributes	Food Policy	USA	Pigs, laying hens	Online survey with contingent valuation	2001
Uzea, A.D.; Hobbs, J.E.; Zhang, J.	2011	Activists and animal welfare: quality verifications in the Canadian pork sector	Journal of Agricultural Economics	Canada	Pigs	Online survey with choice experiments	623
Van Loo, E.J.; Caputo, V.; Nayga, R.M., Jr.; Verbeke, W.	2014	Consumers' valuation of sustainability labels on meat	Food Policy	Belgium	Chicken	Online survey with choice experiments	359
Vander Naald, B.; Cameron, T.A.	2011	Willingness to pay for other species' well-being	Ecological Economics	USA	Chicken	Self-administered survey with choice experiments	240
Vanhonacker, F.; Verbeke, W.; Van Poucke, E.; Buijs, S.; Tuyttens, F.A.M.	2009	Societal concern related to stocking density, pen size and group size in farm animal production	Livestock Science	Belgium	Farm animals in general	Self-administered survey	980
Vanhonacker, F.; Van Poucke, E.; Tuyttens, F.A.M.; Verbeke, W.	2010	Citizens' views on farm animal welfare and related information provision: exploratory insights from Flanders, Belgium	Journal of Agricultural & Environmental Ethics	Belgium	Farm animals in general	Focus groups, self-administered survey	550

Table 4 continued

Author(s)	Year	Title	Journal	Country	Animal species	Method of data collection	Sample size
Verbeke, W.; Pérez-Cueto, F.J.A.; de Barcellos, M.D.; Krystallis, A.; Grunert, K.G.	2010	European citizen and consumer attitudes and preferences regarding beef and pork	Meat Science	Study 1: France, Germany, Spain, UK Study 2: Belgium, Denmark, Germany, Greece Poland	Beef cattle, pigs	Study 1: focus groups Study 2: online survey	Study 1: 65 Study 2: 2437
Viegas, I.; Nunes, L.C.; Madureira, L.; Fontes, M.A.; Santos, J.L.	2014	Beef credence attributes: implications of substitution effects on consumers' WTP	Journal of Agricultural Economics	Portugal	Beef cattle	Face-to-face interviews with choice experiments	613
Weinrich, R.; Franz, A.; Spiller, A.	2014a	Analyses into consumers' willingness to pay a certain price in multi-level labelling systems: the animal welfare label as an example	Berichte über Landwirtschaft	Germany	Pigs	Online survey	948
Weinrich, R.; Kuehl, S.; Zuehlsdorf, A.; Spiller, A.	2014b	Consumer Attitudes in Germany towards different dairy housing systems and their implications for the marketing of pasture raised milk	International Food and Agribusiness Management Review	Germany	Dairy cows	Online survey with contingent valuation	1009

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