

**Organic consumers' attitudes and preferences
regarding alternatives to piglet castration
without anaesthesia and analgesia in organic
farming – An explorative analysis**

Astrid Christina Heid

**Dissertation at the University of Kassel
Faculty of Organic Agricultural Sciences**

Year of publication: 2013

Author: Astrid Christina Heid

Dissertation an der Universität Kassel

Fachbereich Ökologische Agrarwissenschaften

Dissertation zur Erlangung des akademischen Grades eines Doktors der Agrarwissenschaften (Dr. agr.)

Datum der Disputation: 05. Juli 2013

1. Gutachter: Prof. Dr. Ulrich Hamm, Fachgebiet Agrar- und Lebensmittelmarketing

2. Gutachterin: Prof. Dr. Ute Knierim, Fachgebiet Nutztierethologie und Tierhaltung

Acknowledgements

First of all, I would like to thank my supervisor Prof. Dr. Ulrich Hamm from the Department of Agricultural and Food Marketing of the University of Kassel. Without his continuous support, his useful advice and his encouragement, this dissertation would not have been possible.

I also thank Prof. Dr. Ute Knierim, my second supervisor, and Christine Brenninkmeyer from the Department of Farm Animal Behaviour and Husbandry of the University of Kassel for the good cooperation and the preparation of the consumer information on alternatives to piglet castration for the focus group discussions.

I am grateful to my colleagues at the Department of Agricultural and Food Marketing for their friendship and support. I very much appreciate the cooperative, creative and pleasant working atmosphere within the ALM-Team.

The primary data that are the basis of my dissertation were collected within the research project “Alternatives to castration of piglets without anaesthesia”. I gratefully acknowledge the funding of this project by the Federal Office for Agriculture and Food (BLE) within the framework of the Federal Programme for Organic Agriculture and Other Forms of Sustainable Agriculture (BÖLN).

Last but not least, I want to thank my family for supporting and encouraging me in all my academic endeavours.

Declaration of originality

This dissertation contains four scientific articles written by me as first author and Prof. Dr. Ulrich Hamm as co-author. All articles are published in refereed journals:

- Heid, A. & Hamm, U. (2010). Determinants of consumer acceptance of alternatives to piglet castration without anaesthesia: a review. *Fleischwirtschaft International* 2, 122-126.
- Heid, A. & Hamm, U. (2012). Consumer attitudes towards alternatives to piglet castration without pain relief in organic farming: Qualitative results from Germany. *Journal of Agriculture and Environmental Ethics* 25(5), 687-706.
- Heid, A. & Hamm, U. (2013). Animal welfare versus food quality: Factors influencing organic consumers' preferences for alternatives to piglet castration without anaesthesia. *Meat Science* 95(2), 203-211.
- Heid, A. & Hamm, U. (2013). Organic consumers' willingness-to-pay for boar meat products before and after tasting product samples. *Organic Agriculture*; DOI <http://dx.doi.org/10.1007/s13165-013-0047-x>

The present dissertation was based upon empirical research carried out within the project “Alternatives to castration of piglets without anaesthesia – Analysis of the impacts of alternative methods on the acceptance by consumers and producers” funded by the Federal Office for Agriculture and Food (BLE) within the framework of the Federal Programme for Organic Agriculture and Other Forms of Sustainable Agriculture (BÖLN). Prof. Dr. Ulrich Hamm was the supervisor of the consumer study within this project. The research design and procedure of data collection and analysis were developed by me. I conducted the data collection and also carried out the data analysis. I wrote the manuscripts of the journal articles presented in this dissertation. Prof. Dr. Ulrich Hamm provided advice and feedback to all steps of the research process. The consumer information about castration of piglets and alternative methods used in the focus group discussions was prepared and provided by Christine Brenninkmeyer and Prof. Dr. Ute Knierim.

Apart from the journal articles listed above, the following publications contain selected results presented in this dissertation:

- Brenninkmeyer, C., Heid, A., Hamm, U., & Knierim, U. (2010). Alternativen zur betäubungslosen Ferkelkastration – Erfahrungen im europäischen Ökolandbau und Wünsche deutscher Bio-Konsumenten. In Forschungsanstalt Agroscope Reckenholz-Tänikon (Ed.), *24. IGN Conference, 03.-05.06., Tänikon/Switzerland* (pp. 10-14).
- Heid, A. & Hamm, U. (2009). Alternativen zur betäubungslosen Ferkelkastration - Stand der Forschung zur Verbraucherakzeptanz der Alternativen. *Fleischwirtschaft*, 12/2009, 93-98.
- Heid, A. & Hamm, U. (2010). Sensorik von Eberfleisch - Vom Verbraucher akzeptiert? *DLG-Test Lebensmittel*, 2, 14-15.
- Heid, A. & Hamm, U. (2011). Alternativen zur betäubungslosen Ferkelkastration: Verbraucherakzeptanz. In G. Leithold, K. Becker, C. Brock, S. Fischinger, A.-K.

- Spiegel, K. Spory, K.-P. Wilbois, & U. Williges (Eds.), *Es geht ums Ganze: Forschen im Dialog von Wissenschaft und Praxis - Beiträge zur 11. Wissenschaftstagung Ökologischer Landbau*, Vol. 1 (pp. 374-377). Berlin: Verlag Dr. Köster.
- Heid, A. & Hamm, U. (2011). Verbraucherakzeptanz von Alternativen zur betäubungslosen Ferkelkastration. In P. Weingarten, M. Banse, H. Gömann, F. Isermeyer, H. Nieberg, F. Offermann, & H. Wendt (Eds.), *Möglichkeiten und Grenzen der wissenschaftlichen Politikanalyse*. Schriften der Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues e.V., Vol. 46 (pp. 463-464). Münster-Hiltrup: Landwirtschaftsverlag.
 - Heid, A. (2011). Der Gaumen entscheidet - Verbraucher offen für Eberfleisch. *Bioland*, 1, 21.
 - Heid, A. & Hamm, U. (2011). Consumer acceptance of alternatives to piglet castration without anaesthesia in organic farming. In D. Neuhoff, N. Halberg, I. A. Rasmussen, J. Hermansen, C. Sekyewa, & S. M. Sohn (Eds.), *Organic is life - Knowledge for tomorrow. Proceedings of the 3rd Scientific Conference of ISOFAR*, Vol. 2 (pp. 14-17). Bonn: International Society of Organic Agriculture Research (ISOFAR).
 - Heid, A. & Hamm, U. (2012). Alternatives to piglet castration without pain relief - Acceptance and willingness-to-pay of organic consumers in Germany. In G. Rahmann & D. Godinho (Eds.), *Tackling the future challenges of organic animal husbandry. 2nd Organic Animal Husbandry Conference, Hamburg, Trenthorst, 12-14 September 2012*. Agricultural and Forestry Research, Special Issue No 362 (pp. 292-295). Braunschweig: Johann Heinrich von Thünen-Institut.
 - Heid, A., Brenninkmeyer, C., Knierim, U., & Hamm, U. (2012). *Alternativen zur betäubungslosen Ferkelkastration im ökologischen Landbau - Analyse der Auswirkungen alternativer Verfahren auf die Akzeptanz bei Verbrauchern und Produzenten*. Abschlussbericht zum Forschungsprojekt im Rahmen des Bundesprogramms Ökologischer Landbau und andere Formen nachhaltiger Landwirtschaft. <http://orgprints.org/18652/>
 - Weiler, N. & Heid, A. (2011). Ebermast statt Kastration. *Biohandel*, 10, 35-37.

I declare that this dissertation is my own work. Information derived from the published and unpublished work of others has been acknowledged in the text. This work or parts thereof have not been submitted in any form for another degree at any university or other institute of tertiary education.

Hiermit versichere ich, dass ich die vorliegende Dissertation selbstständig und ohne unerlaubte Hilfe angefertigt und andere als die in der Dissertation angegebenen Hilfsmittel nicht genutzt habe. Alle Stellen, die wörtlich oder sinngemäß aus veröffentlichten oder unveröffentlichten Schriften entnommen sind, habe ich als solche kenntlich gemacht. Kein Teil dieser Arbeit ist in einem anderen Promotions- oder Habilitationsverfahren verwendet worden.

Hausen ob Verena, 16.02.2013

Astrid Heid

Table of content

ACKNOWLEDGEMENTS	I
DECLARATION OF ORIGINALITY.....	II
LIST OF TABLES	VII
LIST OF FIGURES.....	VIII
1 INTRODUCTION	1
1.1 Piglet castration and the role of organic consumers	1
1.2 Research objectives	2
1.3 Outline of the dissertation	3
2 RATIONALE FOR PIGLET CASTRATION AND ITS ALTERNATIVES.....	6
2.1 Problem of boar taint	6
2.2 Current practice: surgical castration without pain relief	7
2.3 Alternative methods	8
2.3.1 Castration with anaesthesia and/or analgesia	8
2.3.2 Immunocastration	9
2.3.3 Fattening of boars.....	9
3 CONSUMERS AND ANIMAL WELFARE	11
3.1 Consumers, citizens and farm animal welfare	11
3.2 Organic consumers and animal welfare	14
3.3 Piglet castration in the context of consumer research on animal welfare issues.....	15
4 DETERMINANTS OF CONSUMER ACCEPTANCE OF ALTERNATIVES TO PIGLET CASTRATION WITHOUT ANAESTHESIA: A REVIEW	16
4.1 Animal welfare concerns over piglet castration without anaesthesia	16
4.2 Research on consumer acceptance of boar meat	17
4.2.1 Ambiguous consumer reactions to boar meat	18
4.2.2 Influencing factors on the perception of boar taint	21
4.2.3 Androstenone and skatole thresholds.....	25
4.2.4 Consumer attitudes towards fattening of boars	26
4.3 Immunocastration	27
4.4 Castration with anaesthesia and sexing of sperm	28
4.5 Conclusions.....	28
5 METHODS AND STUDY DESIGN	30
5.1 Combining qualitative and quantitative methods	30
5.2 Focus group discussions	31
5.3 Vickrey auctions.....	33
5.4 Study design	36
5.4.1 Data collection	36
5.4.2 Data analyses.....	40
5.5 Description of sample	43

6	CONSUMER ATTITUDES TOWARDS ALTERNATIVES TO PIGLET CASTRATION WITHOUT PAIN RELIEF IN ORGANIC FARMING: QUALITATIVE RESULTS FROM GERMANY.....	45
6.1	Abstract.....	45
6.2	Introduction.....	45
6.3	Methods and procedure.....	47
6.3.1	Focus group discussions.....	47
6.3.2	Profile of the participants.....	48
6.3.3	Experimental design.....	49
6.4	Results.....	50
6.4.1	Piglet castration without pain relief in organic farming.....	50
6.4.2	Alternatives to castration without pain relief.....	51
6.4.3	Conflicting aspects of the alternatives.....	57
6.5	Discussion.....	58
6.6	Conclusions.....	62
7	ANIMAL WELFARE VERSUS FOOD QUALITY: FACTORS INFLUENCING ORGANIC CONSUMERS' PREFERENCES FOR ALTERNATIVES TO PIGLET CASTRATION WITHOUT ANAESTHESIA.....	64
7.1	Abstract.....	64
7.2	Introduction.....	64
7.3	Methods and study design.....	66
7.3.1	Data collection.....	66
7.3.2	Data analysis.....	68
7.3.3	Characterisation of the sample.....	71
7.4	Results.....	72
7.4.1	Willingness-to-pay.....	72
7.4.2	Influencing factors.....	75
7.5	Discussion.....	79
7.6	Conclusions.....	82
8	ORGANIC CONSUMERS' WILLINGNESS-TO-PAY FOR BOAR MEAT PRODUCTS BEFORE AND AFTER TASTING PRODUCT SAMPLES.....	84
8.1	Abstract.....	84
8.2	Introduction.....	84
8.3	Methods.....	86
8.3.1	Vickrey auction.....	86
8.3.2	Offering product samples for tasting.....	87
8.4	Study design and description of sample.....	87
8.4.1	Study design.....	87
8.4.2	Description of sample.....	89
8.5	Willingness-to-pay for boar salami before and after tasting of samples.....	90
8.6	Discussion and conclusions.....	94
9	CONSUMERS' OPINIONS TOWARDS LABELLING OF ALTERNATIVES.....	98

Table of content

10	DISCUSSION	100
10.1	Awareness of and attitudes towards piglet castration	100
10.1.1	Awareness of and knowledge about piglet castration	100
10.1.2	Attitudes towards castration without pain relief in organic farming	101
10.2	Alternatives to piglet castration without anaesthesia and analgesia	102
10.2.1	Castration with anaesthesia and analgesia in organic farming	102
10.2.2	Immunocastration	103
10.2.3	Fattening of boars	104
10.3	Effects of information	106
11	CONCLUSIONS	110
11.1	Implications for organic meat production and marketing	110
11.2	Research implications	113
12	SUMMARY	114
12.1	Summary	114
12.2	Zusammenfassung	118
	LITERATURE	123
	APPENDIX	136

List of tables

Table 1:	Consumer evaluation of boar meat.....	19
Table 2:	Share of people with specific anosmia for androstenone in different regions of the world.....	22
Table 3:	Thresholds for androstenone and skatole in different studies	26
Table 4:	Number of participants differentiated by gender and age in comparison to the quota	48
Table 5:	Overview of the focus groups - region, number of participants and information levels.....	50
Table 6:	Variation of the given information across the focus groups.....	67
Table 7:	Organic index in the focus groups and knowledge about castration of piglets	72
Table 8:	Average willingness-to-pay per group	73
Table 9:	Ranking of the alternatives and percentage of zero-bids per group	74
Table 10:	Ranking of alternatives and percentages of zero bids within the three different information variants	75
Table 11:	Comparison of focus groups with regard to animal welfare, food security, organic farming, taste and cost (weighted sum model, WSM)	78
Table 12:	Description of the sample.....	89
Table 13:	Average willingness-to-pay for smoked organic salami produced with boar meat (80g) and share of zero-bids before and after tasting.....	90
Table 14:	Average rating of the tasted organic salamis for odour and flavour	91
Table 15:	Indication of the preferred organic salami.....	92
Table 16:	Average willingness-to-pay for smoked organic salami with boar meat (80g) and share of zero-bids before and after tasting depending on the preference for boar or standard salami	92
Table 17:	Identification of the boar salami after tasting.....	93
Table 18:	Consumers' trust in different sources of information on food related risks.....	107

List of figures

Figure 1: Time course of pubertal development in boars 6
Figure 2: Steps of data collection..... 38
Figure 3: Labels on the packages of auctioned salami..... 39

1 Introduction

1.1 Piglet castration and the role of organic consumers

More than 58 Million pigs were slaughtered in Germany in 2010 (FAO 2012) and assuming that half of the pigs are male about 29 Million of them were routinely castrated without anaesthesia within their first seven days of life. The main reason for castration of pigs is the avoidance of so called boar taint which may occur in a proportion of uncastrated male pigs (also called entire male pigs or boars). Boar taint is a sensory impairment of pork which affects both odour and flavour of the meat and is perceived as unpleasant by many consumers. Attributes like urine, manure, naphthalene/mothballs and sweat are used to describe boar tainted meat (Dijksterhuis et al. 2000, 261ff). Surgical castration of male pigs is an effective and widely used means of eliminating the occurrence of boar taint.

For a long time, castration of piglets up to the age of seven days has been performed without relieving pain by anaesthesia and analgesia assuming that young piglets perceive less pain than older animals. This underlying assumption, however, has been refuted by scientific evidence (European Food Safety Authority 2004). Hence, surgical piglet castration without the use of anaesthesia to reduce pain during the intervention has to be considered a major animal welfare issue. This issue does not only apply to conventional pig production but also to organic farming as there has been no difference between castration practices in organic and conventional farming. Approximately 250,000 organically raised pigs were slaughtered in Germany in 2011 (AMI 2012, 6) which means that approximately 125,000 male organic pigs were castrated, mostly without the use of anaesthesia.

In contrast to conventional pig husbandry, for which no legally binding regulations exist yet in Germany¹, surgical castration without adequate anaesthesia and/or analgesia is not allowed in organic farming throughout the EU since the beginning of 2012 (Commission Regulation (EC) No 889/2008). Therefore, the pressure to implement alternative methods which improve animal welfare and maintain sensory product quality has been particularly high in organic farming². With respect to alternatives, the focus lies on three methods for both organic and conventional farming: surgical castration with anaesthesia and/or analgesia, vaccination against boar taint (immunocastration) and fattening of uncastrated male pigs (boars) combined with measures to reduce and detect boar taint in meat.

¹ A recent amendment of the German animal protection act includes a ban of piglet castration without anaesthesia from January 2019 (Bundesregierung 2012).

² The implementation of alternatives is also a topic in conventional farming and in some European countries there are regulations which also apply to conventional farming. For more details see Sections 2.2 and 4.1

Regarding both castration without pain relief and the implementation of alternative methods organic consumers' opinions and perceptions should be taken into consideration besides practical and economic factors. Animal welfare and taste – two aspects which are clearly affected by the issue of piglet castration – are among the main buying arguments for organic products in Germany (fischerAppelt relations 2012; Pleon 2008; Pleon 2010). It can be stated that consumers of organic food have high expectations regarding both attributes. In the case of piglet castration, however, animal welfare and meat quality may be difficult to reconcile. Castration without pain relief only ensures sensory meat quality and also the alternative methods have different advantages and disadvantages for different stakeholders including consumers. As regards consumers' perspectives of the different alternatives, there are still open questions. For example, consumers' acceptance of boar meat and their reactions to boar taint have been examined intensively but the results of different studies vary so that it is difficult to draw definite conclusions. Acceptance of immunocastration is also questioned, as consumers may perceive food safety problems (Prunier et al. 2006). It is uncertain, how consumers of organic meat in particular think about these and other aspects of alternative methods, as their attitudes may differ from other consumers and they may feel that they have to trade-off important attributes like animal welfare against taste or food safety.

1.2 Research objectives

Hence, this dissertation aims to examine organic consumers' opinions on piglet castration without pain relief in organic farming and to explore their attitudes and preferences regarding the implementation of alternative methods. This overall objective has several dimensions which need to be addressed.

Firstly, it is aimed to examine organic consumers' awareness of and attitudes towards the issue of piglet castration. This includes consumers'

- awareness of the fact that piglets are castrated,
- knowledge about the reasons for castration (particularly boar taint),
- awareness of the practice to castrate piglets without pain relief,
- attitudes and opinions towards the use of castration without pain relief in organic farming.

Secondly, organic consumers' attitudes and opinions towards the implementation of alternative methods in organic farming should be explored and their preferences and willingness-to-pay for different alternatives determined. The alternative methods under

consideration are castration with anaesthesia and analgesia, immunocastration and fattening of entire males (boars). It is relevant, which aspects are most important for consumers' assessment and acceptance of the alternatives and how factors like consumers' attitudes and their assessment of the alternatives influence preferences and willingness-to-pay.

Thirdly, it is of interest as to whether different information about the alternatives has an effect on consumers' attitudes, preferences and willingness-to-pay. It can be assumed that piglet castration is an unfamiliar topic for consumers and that therefore information provision is needed. Knowledge about how the provided information influences consumers' attitudes and preferences may help to develop appropriate communication measures. Regarding the communication and marketing of boar meat, taste is an important aspect due to the risk of boar taint. Therefore, it should also be determined how tasting of product samples as a tool of sales promotion may influence consumers' willingness-to-pay.

1.3 Outline of the dissertation

The dissertation is organised in the following way:

Chapter 2 "Rationale for piglet castration and its alternatives" provides background information on piglet castration. The main reason for piglet castration, boar taint, is explained. Then, the current practice of piglet castration including its legal basis is illustrated and the alternative methods are presented. Here, the focus lies on the three most relevant alternatives: castration with anaesthesia and analgesia, immunocastration and fattening of boars.

In chapter 3 "Consumers and animal welfare" the topic of piglet castration is put into the general context of consumer research on animal welfare issues. It is demonstrated that consumers may have ambiguous and contradicting perspectives regarding animal welfare. Consumers' attitudes towards animal welfare are often only weakly linked with their buying behaviour. For organic consumers, however, animal welfare is among the most important reasons for buying organic food. Yet, it is unclear how they react if they perceive conflicts between animal welfare and other important aspects like food safety or taste.

Chapter 4 "Determinants of consumer acceptance of alternatives to piglet castration without anaesthesia: a review" summarises consumer research regarding the alternatives to piglet castration. It is shown that the main focus laid on research about sensory perception and acceptance of boar meat and consumer reactions to boar taint. Only in recent years, consumer studies including other alternatives and focusing on consumers' attitudes or willingness-to-pay have been conducted.

Chapter 5 “Methods and study design” describes and justifies the chosen methodological approach. Both qualitative and quantitative methods were applied and a rationale for this combination is given. Focus group discussions were used to explore consumers’ attitudes and opinions and Vickrey auctions were applied to measure consumers’ preferences and willingness-to-pay for the alternatives. The adequacy of these methods in comparison to other approaches is discussed. Furthermore, the design of the study and the procedure of data analysis are outlined followed by a characterisation of the sample.

Chapter 6 “Consumer attitudes towards alternatives to piglet castration without pain relief in organic farming: qualitative results from Germany” focuses on the analysis of the focus group discussions. Consumers’ reactions to information about castration without anaesthesia in organic farming and their attitudes and opinions towards the three alternative methods are highlighted. Important aspects for consumers’ assessment of the alternatives and conflicting aspects are identified and the influence of information provision is discussed.

Chapter 7 “Animal welfare versus food quality: Factors influencing organic consumers’ preferences for alternatives to piglet castration without anaesthesia” presents the analysis of the auction data. Additionally, the findings are compared with findings from the focus groups in order to explain willingness-to-pay results. Again the effect of information provision is considered.

Chapter 8 “Organic consumer’s willingness-to-pay for boar meat products before and after tasting product samples” examines the effect of sensory evaluations on consumers’ preferences for boar salami. Auction bids for boar salami before the tasting are compared to bids after tasting.

Chapter 9 “Consumers’ opinions towards labelling of alternatives” briefly presents participants’ statements to the questions as to whether alternatives to piglet castration without pain relief should be labelled on pork products and how such a labelling could be implemented.

Chapter 10 “Discussion” reflects the key findings with regard to other studies on consumer acceptance of alternatives to piglet castration and other relevant literature. Considering the objectives of the dissertation, consumers’ awareness and attitudes towards piglet castration without pain relief in organic farming, the different alternatives and the effect of information are discussed.

Chapter 11 “Conclusions” presents implications of the findings for production and marketing of organic pork as well as for further research.

Chapter 12 “Summary” contains an English and German summary of the dissertation.

2 Rationale for piglet castration and its alternatives

2.1 Problem of boar taint

The main reason for castration of male pigs is that a proportion of adult male pigs may develop so called boar taint, an objectionable odour and flavour of pork (for consumer reactions see Chapter 4). The two substances androstenone and skatole were identified as being mainly responsible for boar taint and there are other substances including indole that also contribute to boar taint, although to a minor degree (Andresen 2006, 5).

Androstenone is a steroid produced in the testes which accumulates mainly in fatty tissue and is associated with urine like odour (Gower 1972, 47). It functions as a sex pheromone and its concentration in boar meat depends on pubertal development of the animals. As boars often reach slaughter weight in the last phase of puberty, when androstenone production increases depending on genotype as well as external factors like season, nutrition and social circumstances (Figure 1), there are large variations of androstenone levels in boar carcasses (Claus et al. 1994, 291f).

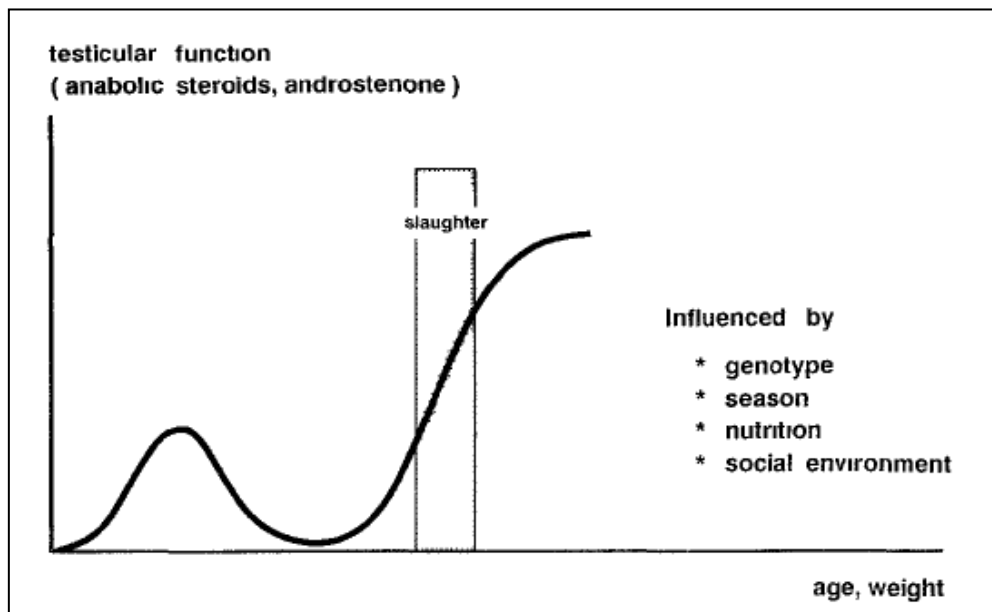


Figure 1: Time course of pubertal development in boars (Claus et al. 1994, 292)

Skatole is formed in the hind gut of pigs (and other monogastric species as well) when the amino acid tryptophan is degraded by different bacteria (Claus et al. 1994, 293). Via the bloodstream skatole is then accumulated in fatty tissues (Babol et al. 1996, 574). Skatole levels can be influenced by dietary measures prior to slaughter (Claus et al. 1994, 302). Principally, the substance is not only present in boars but also in castrates and females;

however, some boars have particularly high skatole levels which may be due to testicular steroids (like androstenone) influencing the metabolism of skatole (European Food Safety Authority 2004, 46/100). In general, surgical castration of male pigs not only reduces androstenone levels but also skatole levels in boar meat and is, therefore, a very common way of preventing the occurrence of boar taint in pig production.

2.2 Current practice: surgical castration without pain relief

In Germany and many other European countries piglets are legally castrated without anaesthesia during their first seven days of life (e.g. Council Directive 2008/120/EC, Annex I, Chapter I, No 8; Tierschutzgesetz 2006, §5). The surgical intervention is mainly performed by farmers (Fredriksen et al. 2009). During castration the piglets are restrained and the farmer incises the scrotum with a scalpel. Then the testicles are freed from the surrounding tissue, extracted and “removed either by cutting or pulling the spermatic cord (the funiculus spermaticus) so that it breaks” (Prunier et al. 2006, 278).

However, research showed that castration is very painful for pigs at any age (European Food Safety Authority 2004, 6). “All the tissues associated with castration are innervated and the tissue damage caused by surgical or chemical castration is likely to generate painful stimuli” (Prunier et al. 2006, 278). Piglets show clear signs of pain during and after surgical castration. In addition, negative effects on growth, immune system and consequently on health of the piglets may occur, particularly if castration is performed during the neonatal period (one to three days of age) (Prunier et al. 2006, 286).

Therefore, there have been efforts to abandon this practice. In several European countries piglet castration without pain relief is or will be banned either by animal welfare legislation or by voluntary agreements of the pig production sector (see also Section 4.1). In Germany, conventional farmers within the QS-System, a quality assurance scheme which certifies 95% of pork produced in Germany, are required to use analgesia to reduce post-operative pain since April 2009 (QS Qualität und Sicherheit GmbH 2009; 2013). A survey among experts (in 2010) revealed that the use of analgesics for castration was also prevalent in organic farming. It was estimated that about half of the German organic pig producers applied analgesia (Brenninkmeyer et al. 2010). So in Germany, the debate about piglet castration resulted in a widespread use of analgesics for castration. The use of anaesthesia or the implementation of other alternatives to castration without pain relief obviously need some more time. In the “European declaration on alternatives to surgical castration of pigs” various stakeholders agreed on a voluntary basis that surgical castration should be abandoned by January 2018

(European Commission 2010). A recent amendment of the German animal protection act includes a general ban of castration without anaesthesia from January 2019 (Bundesregierung 2012).

As yet (January 2013), the only legal regulation with regard to piglet castration that applies throughout the EU refers to organic farming. Here, piglet castration is still allowed to ensure meat quality; however, it has to be conducted with adequate anaesthesia and/or analgesia. A transition period ended on 31 December, 2011 (Commission Regulation (EC) No 889/2008, §18, §95). Hence, the pressure to implement alternative methods is particularly high in the organic pig sector. The phrasing of the EU regulation (“anaesthesia and/or analgesia”) leaves some room for interpretation. Currently, castration with analgesia is deemed to be sufficient to fulfil the regulation, which is a de facto extension of the previous practice as the use of analgesia has already become common over the last years. Mostly, the German organic associations followed the EU regulation in their directions (Biokreis e.V. 2011, 18; Demeter e.V. 2012, 10; Gäa e.V. 2010, 30; Naturland e.V. 2012, 24). Only Bioland e.V. requires anaesthesia and analgesia for piglet castration (Bioland e.V. 2012, 20). Presently, there are no data available to determine to what extent a combination of analgesia and anaesthesia is used for piglet castration and to what extent only analgesia is applied.

2.3 Alternative methods

Alternative methods to castration without pain relief need to improve animal welfare while maintaining sensory meat quality. There are three alternatives which are likely to be implemented in (organic) pig production while other methods will not be relevant in the foreseeable future. Sexing of sperm in order to produce only female pigs, genetic engineering of pigs so that they do not produce androstenone, pharmacological influencing of androstenone synthesis (Baumgartner et al. 2004, 200) or local destruction of testicular tissue by chemical compounds (Prunier et al. 2006, 283) are among the less relevant methods. The three alternative methods which are widely discussed among stakeholders and likely to be implemented are castration with anaesthesia and/or analgesia, immunocastration and fattening of entire males (boars). This section gives a brief introduction to each method and names the most important advantages and disadvantages.

2.3.1 Castration with anaesthesia and/or analgesia

One approach to improve animal welfare during surgical castration is the use of anaesthetics and/or analgesics to reduce pain. Analgesics are mainly applied to reduce post-operative pain while they are not effective in reducing acute pain during castration (Rault et al. 2011, 218).

For that purpose, local or general anaesthesia is required. General anaesthesia can be induced either by injection or inhalation. General anaesthesia induced by injection involves some risks for the piglets as they need some time for recovery during which their ability for temperature regulation is impaired. Additionally, they may be injured by the sow and are not able to suckle (Prunier et al. 2006, 282; Rault et al. 2011, 217). Isoflurane and carbon dioxide (CO₂) are used as gaseous anaesthetics. In comparison to other anaesthetics, they take effect rather quickly and after castration piglets will wake up soon (Mühlbauer 2009, 9). However, research shows that carbon dioxide causes additional stress and does not meet the requirements for an anaesthesia that minimises pain and stress (Mühlbauer 2009, 87f). Altogether, all forms of anaesthesia may cause health risks for the piglets and, in addition, there are economic and legal problems involved, as anaesthesia is time consuming and the drugs may only be administered by a veterinarian (depending on national legislation), which causes additional costs for the producers. Furthermore, the number of analgesics and anaesthetics approved for use in pigs is limited (Rault et al. 2011, 218).

2.3.2 Immunocastration

Immunocastration is also called vaccination against boar taint or vaccination method. The method is a vaccination against a hormone (gonadotropin releasing hormone, GnRH) which controls functioning of the testes (Prunier et al. 2006, 284f; von Borell et al. 2008, 217). The pigs are vaccinated two times with a time lag of at least four weeks. The second injection given four to five weeks before slaughter stimulates antibodies against the hormone and sexual development of the male pigs is delayed. The procedure is relatively painless; however, welfare may be reduced due to more aggressive behaviour prior to the second injection and control for boar taint in the carcasses may be necessary, as the vaccine has only a limited effect in some pigs (Rault et al. 2011, 219; von Borell et al. 2008, 217). There is only one vaccine on the market (Improvac by Pfizer) which has been used in several countries outside Europe for some years, for example Australia, New Zealand, Brazil and South Africa (Fredriksen et al. 2009, 1486) and has recently also been approved in the EU and Switzerland.

2.3.3 Fattening of boars

Another alternative to piglet castration without pain relief is the fattening of entire males (boars) that is, the male piglets are not surgically or immunologically castrated. The alternative involves economic benefits due to better feed conversion, better growth rates and leaner carcasses (Babol & Squires 1995, 202ff; Branscheid 2009; Walstra & Moerman 1981). However, there is the risk of boar taint in a proportion of male pigs and therefore the fattening

of entire males is not very common in Europe and has only been practiced in the UK and Ireland for several decades (Fredriksen et al. 2009, 1485). Although pain and stress due to surgical castration do not occur, there may be welfare problems with this method as boars show more aggressive and mounting behaviour and low ranking animals may suffer from this (Rault et al. 2011, 219; von Borell et al. 2008, 217). If entire males are raised, there is the need to reduce and to detect boar taint in meat, which increases production costs. Also, some of the meat has to be sorted out due to strong boar taint and it is not clear how such meat can be utilized. In addition, methods of boar taint detection along the slaughter line are still under development and not practical for every slaughterhouse, yet.

3 Consumers and animal welfare

3.1 Consumers, citizens and farm animal welfare

“...the fact that consumers tend to buy the cheapest meat does not automatically mean that they are not interested in animal welfare” (Te Velde et al. 2002, 217). The quote describes the gist of research on attitudes and behaviour with regard to the welfare of farm animals and hints towards the actual market situation for animal-friendly products. It brings to mind that consumers’ perspectives on animal welfare are multifarious and often ambivalent or inconsistent.

Consumers’ interest in farm animal welfare has been well documented by a whole range of studies. More than 40% of the European consumers believed that the welfare of laying hens and chicken should be improved and almost 30% thought the same about pigs. In the same study, 43% of consumers stated that they think about animal welfare when purchasing meat (TNS Opinion & Social 2005). 34% of the European consumers rated the welfare of farm animals as very important (10 on a 1 to 10 scale) and the average rating by consumers in the EU25 member states was 7.8 (Germany 8.1) (TNS Opinion & Social 2007). Also consumers in Italy (87%), Great Britain (73%) and Sweden (83%) thought that farm animal welfare was important (Mayfield et al. 2007). In a consumer survey of the EU project “Welfare Quality” importance and concern regarding animal welfare were differentiated. While importance of animal welfare may be high, the degree of concern also depends on the evaluation of actual welfare conditions of different farm animals. While French and Dutch consumers in the study placed the least importance on animal welfare they were the most worried about welfare conditions of farm animals in their countries. In contrast consumers in Norway, Sweden and Hungary claimed a high importance of animal welfare but were the least concerned (Kjærnes et al. 2009, 31ff).

Quite a number of studies found a higher willingness-to-pay for improved animal welfare, for example for the welfare of laying hens (TNS Opinion & Social 2005), pigs “raised outside” (Dransfield et al. 2005), the use of mobile abattoirs for cattle (Carlsson et al. 2007), animal welfare information on yogurt (Napolitano et al. 2008), voluntary abandoning of gestations crates for sows (Tonsor et al. 2009), improved fish welfare (Solgaard & Yang 2011) or pork and eggs produced under improved welfare conditions (Norwood & Lusk 2011). Considering the expressed concern and willingness-to-pay for animal welfare, considerable market shares of animal-friendly products could be expected. Yet in reality, there are few labelling schemes in Europe which focus on or at least include improved animal welfare standards (e.g. UK:

Freedom Food; France: Label Rouge; Switzerland: several private labels, mainly based on two governmental animal welfare programs; Netherlands: Scharrel meat program, Beter Leven (Deimel et al. 2010, 90ff); Germany: Neuland) and information about market shares of such labels is scarce. Organic labelling can also be added to the list as it includes special animal welfare standards. Even though sales of organic meat increased by 30% in Germany in 2011, only 1.1% of the meat consumed in private households has been produced organically. For sausages and processed meat products this share was only 0.9% and for poultry 0.5% (Schaack et al. 2012, 10).

The current market situation may be explained by studies which show that animal welfare is not consumers' top priority when they make purchase decisions for animal based food products. Andersen (2011, 580) estimated Danish consumers' willingness-to-pay for eggs with different animal welfare standards and found that the effect of animal welfare was small and that purchases were mainly driven by other attributes. The author concluded from her results that the concern for animal welfare found in consumer surveys is mainly "cheap talk" and that a large hypothetical bias exists when measuring willingness-to-pay for animal welfare. Lusk and Norwood (2010) compared responses to direct and indirect questioning of consumers in the USA concluding that indirect questions lead to more accurate measures of public opinions and that "animal welfare is not as important to the general public as direct questioning and some activist groups would have us believe" (Lusk & Norwood 2010, 563). Other studies also found that consumers in different countries rated attributes like fat content, domestic production/origin, food safety, health, animal feeding or trustworthiness as more important than animal welfare (Bernués et al. 2003, 269, England, France, Italy, Scotland, Spain; Frewer et al. 2005, 355, Netherlands; Mørkbak et al. 2010, 783, Denmark; Vanhonacker et al. 2010, 559, Belgium). At the same time, consumers obviously use animal welfare as an extrinsic quality cue for other (more important) attributes like food safety, health and taste (Anwander Phan-Huy & Badertscher Fawaz 2003, 131, Switzerland; Bernués et al. 2003, 265; Vanhonacker et al. 2010, 559). In their literature review, Ingenbleek and Immink (2011, 12) summarize that basic requirements like food safety, good taste and affordable price have to be fulfilled before quality and ethical issues like animal welfare become important for consumers' buying decision for animal based products.

Other attributes being more important than animal welfare is not the only reason for consumers not buying animal friendly products. Many consumers feel a lack of information about animal welfare and production systems and they are unsure how to identify such

products at the point of sale (Mayfield et al. 2007, 67; TNS Opinion & Social 2005; TNS Opinion & Social 2007). Also availability of animal-friendly products is an issue for consumers (Mayfield et al. 2007, 70; Roex & Miele 2005, 42; Toma et al. 2012, 607).

Another explanation for the discrepancies between attitudes towards animal welfare and actual buying behaviour is that value conflicts and feelings of guilt may emerge in connection with the purchase and consumption of meat. While many consumers are concerned about farm animal welfare and feel that animals are not treated properly in intensive farming, they nevertheless continue eating meat (Schröder & McEachern 2004, 172f; Te Velde et al. 2002, 211f). As people feel the need to act in accordance with their beliefs and have a coherent picture of their environment, cognitive dissonance ensues, if this is not possible (Mayfield et al. 2007, 64; Schröder & McEachern 2004, 173). One way of dealing with cognitive dissonance is to avoid the association of meat with the live animal that it came from, a coping strategy which has been confirmed by several studies (Mayfield et al. 2007, 70; McEachern & Schröder 2002; Schröder & McEachern 2004, 174; Skarstad et al. 2007, 84; Te Velde et al. 2002, 215). According to Schröder and McEachern (2004, 174) “consumers may hold seemingly incompatible views simultaneously”. On the one hand, they may think about animal welfare as ‘citizens’ and believe that animals should have a good life; on the other hand, as meat ‘consumers’ at the point of sale, they do not want to link the meat with the animal. The gap between consumers’ attitudes and their behaviour is not specific for animal welfare issues but also well known “in ethical consumer behaviour and social research in general” (Papaoikonomou et al. 2011, 77). The attitude-behaviour-gap or citizen-consumer-duality with regard to animal welfare has also been examined by other studies which found that citizens’ attitudes are in general only weakly linked to consumers’ buying behaviour (Grunert 2006; Ngapo et al. 2004; Te Velde et al. 2002; Verbeke 2009; Verbeke et al. 2010).

Vanhonacker et al. (2007) aimed to combine both aspects – the consumer and the citizen perspective – in a segmentation study. Based on the relative importance of animal welfare as a product attribute (consumer perspective) and the evaluation of the current state of animal welfare in Flemish livestock production (citizen perspective) six segments were identified and characterized. Their potential as target groups for marketing high quality products was analysed and two segments were found which offer marketing opportunities for animal friendly produced products. Other studies also identified consumer groups that are more concerned about animal welfare than others and may offer chances for product differentiation (Meuwissen et al. 2007; Verbeke et al. 2010).

These findings may partly be explained considering that there are different coping strategies which help people to deal with cognitive dissonance regarding animal welfare and meat consumption. Te Velde et al. (2002, 212ff) found that consumers apply dissonance reduction and distancing devices as coping strategies. This includes the already mentioned disassociation of the living animal with the meat and also the shifting of responsibility for animal welfare to others. The delegation of responsibility for animal welfare also appeared in the study of Schröder and McEachern (2004, 173f). As a second strategy, the authors observed that participants framed their personality as uncaring and the third way of dealing with feelings of guilt with regard to meat consumption was to upgrade their meat purchases to meat from animals kept under better conditions, particularly to organic meat.

3.2 Organic consumers and animal welfare

Avoiding cognitive dissonance can be one reason for buying organic meat. Obviously, consumers try to bring their buying behaviour in accordance with their attitudes towards animal welfare. For many consumers organic farming is associated with high animal welfare standards (Kjærnes et al. 2009, 38). Animal welfare has been the most important reason for purchasing organic food in Germany for several years already (fischerAppelt relations 2012; Pleon 2007; Pleon 2008; Pleon 2010). Other studies also found animal welfare to be a reason for buying organic food but not the most important one (Hughner et al. 2007, 102; Zepeda & Deal 2009, 699). Besides animal welfare taste, food safety and the impact on personal health are important reasons for buying organic products (Hughner et al. 2007). While Harper and Makatouni (2002, 293ff) found that non-buyers of organic food were also concerned about health related issues like pesticides, antibiotics or additives, mostly buyers of organic food expressed strong concern over ethical issues like fair trade, environment and animal welfare. Again, animal welfare was a motive for buying organic or free-range meat. Yet, animal welfare was identified as having also a nutritional and social component (Harper & Makatouni 2002, 297). Consumers of organic products use animal welfare as a cue for other attributes like healthiness or food safety. Therefore it is not always clear whether the purchase of animal-friendly products is mainly motivated by concern for the animals or also concern about personal health. The authors even suggest that “marketing of organic animal food products is essentially about health, but consumers want to express ethical concerns, as extensions of their self-image, however ambivalent and unresolved” (Harper & Makatouni 2002, 298). Regardless of the underlying motives, a majority of organic consumers is willing to pay higher prices for additional ethical attributes and animal welfare is among the most

important of these additional attributes (Zander & Hamm 2010). Altogether, animal welfare is obviously important to consumers of organic food. Yet, its relevance in comparison to other product attributes may vary, and it also seems to be a multi-dimensional attribute which includes aspects of health and food safety besides the ethical dimension.

3.3 Piglet castration in the context of consumer research on animal welfare issues

With regard to the issue of piglet castration without pain relief and also to some extent with regard to alternative methods, a conflict between food quality attributes and animal welfare becomes apparent. Clearly, the current practice ensures sensory meat quality at the expenses of the animals' welfare. At the same time, the implementation of alternatives may require compromising with regard to for example taste (fattening of boars) or food safety (immunocastration). The apparent incompatibility of these attributes may lead to value conflicts or cognitive dissonance among organic consumers. As citizens they probably favour an immediate ban of castration without pain relief, particularly in organic farming with its perceived high animal welfare standards. When faced with the decision to buy meat that might taste unpleasant or is less safe or more expensive due to the use of alternative methods, organic consumers' preferences might not be so obvious or predictable. Consumers of organic food often use animal welfare as a quality cue (see 3.2) and therefore a situation where improved animal welfare not necessarily leads to higher food quality is difficult. Hence, it is of interest how organic consumers react when they feel the need to trade off different product attributes which are among the most important motives for buying organic products.

4 Determinants of consumer acceptance of alternatives to piglet castration without anaesthesia: a review

This chapter represents an article published by the author of this dissertation and Prof. Dr. Ulrich Hamm as a co-author. Any reference to this chapter should be cited as:

Heid, A. and Hamm, U. (2010): Determinants of consumer acceptance of alternatives to piglet castration without anaesthesia: a review. Fleischwirtschaft International 2, 122-126.

In order to prevent the occurrence of boar taint, almost all male piglets are routinely castrated in Europe. Usually, this surgical intervention is carried out without the use of anaesthesia or analgesia. Recently, animal welfare concerns over this practice have been raised and efforts are made to ban surgical castration of piglets without anaesthesia. Therefore, it is necessary to find alternatives to piglet castration without anaesthesia.

An important factor for the implementation of possible alternatives is consumers' acceptance of and willingness-to-pay for pork which was produced using these alternatives. Existing research on this topic mainly focused on consumer reactions to meat from entire male pigs. Only a few studies analysed consumer acceptance of immunocastration, castration with anaesthesia and sexing of sperm. This article reviews consumer research on the acceptance of alternatives to piglet castration without anaesthesia and discusses the relevance of the findings for the meat industry as well as the need for action and further research.

4.1 Animal welfare concerns over piglet castration without anaesthesia

All over Europe male piglets are usually castrated to ensure good sensory meat quality, because there is a risk of boar taint, an off-odour and off-flavour in pork from entire male pigs. Boar taint is caused by an accumulation of androstenone and skatole in the fat and meat of boars. Castration inhibits or rather reduces the synthesis of these substances. Typically, the castration is performed without anaesthesia or analgesia by the farmers themselves. Animal welfare legislation allows this practice for piglets up to the age of seven days. In Germany, the country with the largest pork production in Europe, about 20 million piglets per year are castrated without anaesthesia. However, piglet castration without anaesthesia has recently been criticised because there are no clear data that very young piglets feel less pain than older pigs during surgical castration (European Food Safety Authority 2004). Castration of piglets during the neonatal period (1-3 days) may lead to negative effects on health and growth performance (Prunier et al. 2006).

The discussion on animal welfare problems with castration without anaesthesia already had political consequences. In Norway, castration without anaesthesia has been banned since 2003 and in Switzerland since the beginning of 2010. The Netherlands aim to prohibit castration without anaesthesia from 2015 on, however, producers and retailers already agreed upon not selling pork from pigs castrated without anaesthesia from 2009 on. With the beginning of 2012, the EU regulation on organic farming prohibits castration without anaesthesia. These political measures put pressure on research and practice to develop and implement alternatives, quickly. Possible alternatives are castration with anaesthesia and/or analgesia, immunocastration (also called vaccination method), fattening of entire males and sexing of sperm. In order to successfully implement an alternative, animal welfare issues, requirements of producers and processors as well as expectations of retailers and consumers have to be considered. Consumer acceptance of alternatives to piglet castration without anaesthesia is important for the future sale of pork. While consumer acceptance of fattening of boars or rather of boar meat has been intensively researched over the last decades, the other alternatives are rather new and only a few studies analyse their acceptance by consumers. In the following, main results of consumer studies on acceptance of different alternatives to piglet castration without anaesthesia are reviewed.

4.2 Research on consumer acceptance of boar meat

Even before the current discussion on animal welfare problems with piglet castration started, there was an interest in fattening of entire males. Fattening of entire males was considered profitable because of lower production costs and leaner carcasses (Babol & Squires 1995; Branscheid 2009; Walstra & Moerman 1981). Due to concerns about consumer acceptance of boar meat, the first consumer studies were conducted in the early 1970s. Also in the recent discussion on alternatives to piglet castration without anaesthesia fattening of boars and possible consumer reactions to boar meat play a major role. Key questions are whether consumers differentiate between meat from entire males and meat from castrates or gilts and how they would react to the occurrence of boar taint in meat.

Consumer reactions to boar meat were analysed using different approaches. Mainly sensory studies were conducted. Meat samples were often tested by untrained consumer panels either under controlled conditions for example in a sensory laboratory (e.g. Font i Furnols et al. 2003; Matthews et al. 2000; Pearson et al. 1971) or under less controlled conditions directly in households in so-called in-home-use-tests (e.g. Babol et al. 2002; Desmoulin et al. 1982; Rhodes 1971; Rhodes 1972). Some studies used trained sensory panels (Bañon et al. 2003a;

Dijksterhuis et al. 2000) or a combination of untrained consumer panels and trained sensory panels (e.g. Bañon et al. 2003b; Bañon et al. 2004). Usually the testers did not know which of the meat samples was boar meat or even that boar meat was tested at all. Sensory studies aimed to analyse consumer reactions to boar taint and to identify influencing factors. Attitudes and opinions of consumers towards fattening of boars (and other alternatives), which are important with regard to the ethical assessment of animal welfare issues by consumers, were only considered by a few consumer studies (Huber-Eicher & Spring 2008; Lagerkvist et al. 2006; Liljenstolpe 2008).

4.2.1 Ambiguous consumer reactions to boar meat

Different sensory studies show a heterogeneous and even inconsistent picture of consumer acceptance of boar meat (Table 1). In a tasting of boar meat and meat from castrates, 75% of the consumers preferred the meat of castrates (Bañon et al. 2004). Similarly, when tasting dry-cured ham, 64% of the consumers preferred ham of castrates (Bañon et al. 2003b). In a study by Font i Furnols et al. (2008) 41% of the consumers disliked the odour of boar meat, while in comparison only 20 to 21% disliked meat from castrated or rather immunocastrated or female pigs. The results for flavour were similar, boar meat was clearly considered inferior to the other meat samples (Font i Furnols et al. 2008). When looking at negative assessments of boar meat it has to be kept in mind that there is always a share of negative evaluations of meat from gilts and castrates, too. The results of a large international study on the importance of androstenone and skatole for boar taint make this obvious. Pork samples from gilts and boars were analysed in order to give an overview of androstenone and skatole levels in pork from six European countries (Bonneau et al. 2000a; Walstra et al. 1999). Additionally, pork samples were evaluated by trained sensory panels and consumer panels from seven European countries (Dijksterhuis et al. 2000; Matthews et al. 2000). Consumers disliked 22% of the boar meat samples for their flavour and 34% for their odour, in comparison to 19% and 28% respectively of the samples of gilts (Matthews et al. 2000). German consumers were especially critical with regard to odour; they disliked even 41% of the boar samples for odour and 19% for flavour (Matthews et al. 2000).

Table 1: Consumer evaluation of boar meat

Study Country	Method (Number of participants)	Product (Meat samples^a)	Consumer evaluation^b
Babol et al. (2002) Canada	In-Home-Use-Test (59 households)	Chops (B, G)	-
Bañon et al. (2003b) Spain	Sensory Panel (8) Consumer Test (268)	Dry cured ham (B, C)	- -
Bañon et al. (2004) Spain	Sensory Panel (8) Consumer Test (68, 85)	Loin (B, C)	- -
Bonneau et al. (2000) 7 European countries	Simulation studies	Loin (B, G)	-
Desmoulin et al. (1982) France	In-Home-Use-Test (55 households)	Roast, cutlets, cooked ham, sausages (B, G, C)	-
Diestre et al. (1990) Spain	In-Home-Use-Test (898 bis 1566, depending on the products)	Chops, cooked ham, brine-cured bellies, dry cured ham (B, C)	-
Font i Furnols et al. (2008) Spain	Consumer Test (201)	Loin (B, C, I, G)	- -
Godt et al. (1996) Denmark	In-Home-Use-Test (539 households)	Cutlets (B, C)	o
Gullet et al. (1993) Canada	Consumer Test (96, 104)	Chops, bacon (B, G, intersex, cryptorchid)	o
Kempster et al. (1986) UK	In-Home-Use-Test (500 households), Butcher Panel	Loin chops, shoulder and leg joints (B, G)	o
Lesser et al. (1977) Ireland	In-Home-Use-Test (525 households, 1066 persons)	Bacon (B, C)	o
Matthews et al. (2000) 7 European countries	Consumer Test (1680)	Loin (B, G)	-
Nold et al. (1997) USA	In-Home-Use-Test (75, 67) Sensory Panel (7, 5)	Chops (B, G, C)	o
Pearson et al. (1971) USA	Consumer Test (2 panels: 60, 109)	22 different processed products (B, C)	o
Rhodes (1971) UK	In-Home-Use-Test (125 households, 387 persons)	Bacon (B, C)	o
Rhodes (1972) UK	In-Home-Use-Test (419 households, 1560 persons)	Joints (B,G)	o
Smith et al. (1983) UK	In-Home-Use-Test (122 households, 238 persons)	Bacon (B, C)	o
Walstra (1974) Netherlands	In-Home-Use-Test (720 households)	Cutlets, belly cuts (B, G)	-

^a B=boars, C=castrates, G=gilts, I=immunocastrated pigs

^b Consumer evaluation of odour and flavour and overall acceptability of boar meat respectively:

o = no significant differences and share of negative evaluations ≤ 10% respectively

- = Share of negative evaluations 11 to 40% (significant differences)

- - = Share of negative evaluations > 40% (significant differences)

Based on the observed androstenone and skatole levels and consumers' evaluation of pork samples Bonneau et al. (2000b) conducted simulation studies in order to predict consumer dissatisfaction with pork if all male piglets were left uncastrated. Under the assumed conditions 22% of the European consumers would be dissatisfied with the flavour of boar meat and 33% would be dissatisfied with the odour, that are 3 or rather 7 percentage points more than the share of consumers who would be dissatisfied with flavour and odour of gilt meat. For Germany, the authors predicted that consumers would rather be dissatisfied with the odour (39%) than with the flavour (19%) of boar meat. The difference between the percentage of consumers dissatisfied with boar meat and consumers dissatisfied with gilt meat added up to about 6 percentage points for both odour and flavour. The difference could be reduced to about 4 percentage points in Germany if sorting of carcasses based on androstenone and skatole would be applied. About 20% of all boars would have to be sorted out to achieve this difference (Bonneau et al. 2000b).

Desmoulin et al. (1982) partially found wide differences between negative evaluations ("unpleasant") of boar meat and control samples. 39% of the tasters rated boar roast as unpleasant for odour in comparison to 9% of them who rated the control samples as unpleasant. The difference was even wider for cutlets (37% vs. 3%), while for dry sausages and cooked ham no significant difference between the evaluation of odour of the boar products and the control samples could be observed.

These relatively high percentages of negative evaluations of boar meat are in opposition to studies which discovered no or only marginal rejection of boar meat. Rhodes (1971; 1972) conducted in-home-use-tests with pork joints and cured bacon. There were only slight differences between the evaluation of bacon from boars and gilts. Less than 1% of the participants unambiguously rated the boar bacon as "less pleasant than normal", while other consumers with unfavourable opinions on boar bacon rated the gilt bacon as less pleasant, too (Rhodes 1971). Overall, the panellists of the pork joints could not find a significant difference between the samples and the author concludes that marketing of boar meat would be possible (Rhodes 1972). Lesser et al. (1977) drew the same conclusion, since boar bacon was classified as "very much less pleasant/appetizing" as their usually purchased bacon by less than 1% of the consumers. Strength of aroma was rated very much stronger by 13% of the cooks, yet only three persons (0.6%) considered this to be much or very much less appetizing than usual. A number of other studies found similar results, that is consumers did not significantly differentiate between boar meat products and control samples or rather the share of

unfavourable evaluations of boar meat were low (Godt et al. 1996; Gullett et al. 1993; Kempster et al. 1986; Nold et al. 1997; Pearson et al. 1971; Smith et al. 1983). Even though Walstra (1974) found significant differences between the evaluation of boar and gilt meat and up to 29% of the participants rated boar meat as less pleasant than usual, the author concludes that fattening of boars should be allowed because boars with a very strong taint were selected for the study, which only occurs in a small proportion of pigs.

It is remarkable that especially in studies applying in-home-use-tests the negative reactions to boar meat are relatively low and often the participating families could not differentiate the different meat samples (Table 1). In contrast to consumer tests under controlled conditions, where two or more samples are compared directly, the evaluation of the different samples in an in-home-use-test is usually done with a time-lag of one week. In most cases consumers are asked to compare the meat sample with their usually purchased meat and in the second week additionally with the sample from the previous week. Hence, the evaluation strongly depends on consumers' capacity for remembering. Possibly, consumers are also less critical in an in-home-use-test, where they have to prepare the meat by themselves, than in a rather artificial test situation in a sensory laboratory.

Overall, it becomes obvious that a clear estimation of negative consumer reactions to boar meat is difficult due to varying research results. The reason for the difficulties in exactly estimating consumer reactions lies in the multitude of factors influencing consumer perception of boar meat. Hence, identifying the factors influencing the perception of boar taint is an important objective in consumer research on boar meat.

4.2.2 Influencing factors on the perception of boar taint

One of the most important influencing factors is that the perception of androstenone, one of the main components of boar taint, is genetically determined (Wysocki & Beauchamp 1984). Some people have a so-called specific anosmia for androstenone that is those people are not able to detect the smell of androstenone. The proportion of people with a specific anosmia for androstenone varies strongly between different regions of the world (Gilbert & Wysocki 1987). Gilbert and Wysocki (1987) found that more people in the USA cannot detect androstenone than in Europe (Table 2). Interestingly, the proportion of men and women with a specific anosmia for androstenone in the UK is higher than in the rest of Europe. The results also indicate that women are more often able to smell androstenone than men. Among those people who are able to detect androstenone some are highly sensitive to even low amounts of androstenone (Wysocki & Beauchamp 1984). Furthermore, there are indications that persons

with a specific anosmia can acquire the ability to perceive androstenone over time if they are frequently exposed to the substance (Wysocki et al. 1989). Claus (1993) suggests testing participants' ability to perceive androstenone in all consumer studies on boar taint in order to get meaningful results.

Table 2: Share of people with specific anosmia for androstenone in different regions of the world

Region	Men (%)	Women (%)
USA	37,2	29,5
Europe (continental)	24,1	15,8
United Kingdom	30,0	20,9

Source: Gilbert and Wysocki (1987)

Weiler et al. (2000) investigated the influence of sensitivity to androstenone on the acceptance of boar meat by German and Spanish consumers. In Germany, 18% of the consumers were classified as highly sensitive and even 31% in Spain, whereas the proportion of women was higher than that of men in each case. The evaluation of the odour of boar meat by highly sensitive consumers was more negative than the evaluation by mildly sensitive and insensitive consumers. Another aspect of the perception of androstenone was examined by Font i Furnols et al. (2003) as they considered the appreciation (like, indifferent, dislike) of the androstenone smell in addition to androstenone sensitivity. According to the results, 18% of the Spanish consumers liked the androstenone smell, 49% were indifferent and 33% disliked the smell. Considering the highly sensitive persons, the share of people disliking androstenone smell was considerably higher (82%) and only 8% of these people liked androstenone smell, whereas the proportion of men (16%) was much higher than the proportion of women (3%). Among the mildly sensitive and insensitive the percentage of people disliking androstenone smell was 13% while 20% liked the smell. The majority of the less sensitive persons (67%) was indifferent to the androstenone smell (Font i Furnols et al. 2003). Griffith and Patterson (1970) also determined that women were more sensitive to androstenone smell and that the evaluation of the smell was all the more negative the more sensitive a person was. Among persons with approximately the same sensitivity, women often evaluated androstenone smell more negatively than men.

When researching boar taint a second important component has to be considered: Skatole. For skatole there is no specific anosmia, 99% of consumers are able to perceive skatole (Weiler et al. 1997). The importance of both substances for the occurrence and perception of boar taint

are of interest to researchers. The aim of an international study by Dijksterhuis et al. (2000) was to objectify the perception of boar taint. Sensory panels were specifically trained in seven European countries. The results over all countries showed that androstenone and skatole were perceived differently and that varying concentrations of both substances in boar meat could lead to differences in human perception. It proved difficult to relate specific odour and flavour attributes to both substances because of a certain degree of confusion between androstenone and skatole smell in heated meat. This was partly ascribed to the finding that especially the smell of skatole varies with differing concentrations in meat and not necessarily equals the smell of the pure substance. To some extent synergistic effects were observed which means one component is perceived more strongly when the other component is present. Altogether, skatole was often related to “manure/stable” as well as “mothballs/Naphthalene”. Androstenone was more difficult to identify and was mainly associated with urine (Dijksterhuis et al. 2000).

Synergistic effects between androstenone and skatole were also observed in other studies, however, the exact interaction between the substances is not completely explored yet and other substances like indole may have an additional effect (Annor-Frempong et al. 1997b; Bañon et al. 2003b; Godt et al. 1996; Jeremiah et al. 1999). Also, the question as to whether skatole or androstenone is crucial for consumer reactions to boar meat cannot be answered definitely. Consumers in a study by Matthews et al. (2000), whose sensitivity to androstenone was not tested, reacted more negatively to odour than to flavour of the meat samples. The authors found a significant effect of skatole on the perception of meat in different European countries, while the influence of androstenone was low. Godt et al. (1996) assume that skatole is more appropriate to identify boar taint and that androstenone will only become relevant if there are high concentrations.

A correlation between androstenone concentration and overall liking of boar meat was visible in the results of Babol et al. (2002): Pork chops from entire male pigs with a high androstenone level (56 to 114 $\mu\text{g/g}$ androstenone in salivary glands) got 26% of unfavourable evaluations, with a medium androstenone level (35 to 55 $\mu\text{g/g}$) they received 21% negative evaluations and 14% of pork chops with a low androstenone level (6 to 26 $\mu\text{g/g}$) were rated unfavourably. The control group (gilts) received 15% of negative evaluations, which means boar meat with low androstenone levels was evaluated slightly better (Babol et al. 2002). Diestre et al. (1990) also observed a more negative evaluation of boar meat with high androstenone levels. Weiler et al. (2000) conclude that skatole is important to people who are

less sensitive to androstenone. However, androstenone is relevant for highly sensitive persons. The authors assume a higher dissatisfaction with boar meat due to high androstenone concentrations because a proportion of the population reacts highly sensitive to the substance and in Europe the share of pigs with a high androstenone level in their meat (60%) is considerably higher than the share of pigs with high skatole levels (15%).

In addition to androstenone sensitivity and synergistic effects between androstenone and skatole other factors also influence the perception of boar taint. Women react more sensitive to both pure androstenone and boar taint in meat than men (de Kock et al. 2001b; Griffiths & Patterson 1970; Matthews et al. 2000). Moreover, Matthews et al. (2000) determined that older people evaluate boar meat less critical and that frequency of cooking and consumption also influence the evaluation of boar meat. Consumers who often cook pork rated the boar meat more negatively and those people who eat pork less often were also more critical.

Temporal aspects and meat temperature have an effect on the perception of intensity and character of boar taint which can be explained by volatilisation of androstenone and skatole. Skatole is released faster and therefore it is perceived initially directly after heating. After cooling, androstenone becomes more evident and it has a more lingering odour (de Kock et al. 2001a).

The degree of processing influences consumer acceptance of boar meat as well. Desmoulin et al. (1982) analysed consumer acceptance of different boar meat products. For overall acceptance the share of evaluations as “unpleasant” was 23% for boar roasts and cutlets (control 7%, significant), for cooked ham it was 28% (control 23%, not significant) and for dry sausages from boar meat the share of unfavourable evaluations was 24% (control 18%, significant). The different evaluations are partly explained by the reduction of androstenone during processing. Moreover, boar taint is less perceivable when boar products are consumed cold and spices in processed products can mask boar taint to a certain degree. Diestre et al. (1990) assumed that processed and cold consumed products like cooked ham could be made from boar meat without problems while fresh pork and products that are heated previous to consumption might cause negative reactions. Also, Pearson et al. (1971) suggest the use of boar meat mainly for processed and cold consumed products. Lunde et al. (2008) tested the effect of marinating ready-to-eat pork chops from boars on perception of boar taint. Liquid smoke and oregano extracts seemed to have potential for shifting sensory thresholds to a certain degree. Also cold serving and reheating of boar products reduced the perception of

boar taint. A masking effect of liquid smoke in fermented sausages was also reported by Stolzenbach et al. (2009).

Summarising, it can be established that a multitude of factors influence the perception of boar taint. In addition to influences concerning consumers, there is variability within the meat samples. Hence, varying results about consumer acceptance in different studies are not surprising, especially when those studies are conducted in different countries. Therefore, difficulties in finding exact thresholds for androstenone and skatole are comprehensible.

4.2.3 Androstenone and skatole thresholds

Matthews et al. (2000) could not find evidence for definite thresholds for androstenone and skatole in their results. In contrast, other studies aim to determine exact thresholds. With a few exceptions the threshold for androstenone is accepted to be 0.5 µg/g fat and for skatole 0.25 µg/g fat. Corresponding results are presented in Table 3. Annor-Frempong et al. (1997a) found detection thresholds of 0.43 µg/g androstenone and 0.03 µg/g skatole on average on the basis of pure samples of the substances as well as mixtures of both components. In a study by Griffiths and Patterson (1970) detection thresholds for pure androstenone varied between 0.05 ng and 100 ng. Bañon et al. (2003a) determined that boar odour in cooked meat was perceived by a trained sensory panel from 0.1 µg/g skatole even if androstenone levels were low (<0.5 µg/g). Boar flavour was perceived from 0.5 µg/g androstenone independent of the skatole levels. For dry cured ham the detection thresholds were higher with 2 µg/g androstenone and 0.12 µg/g skatole. A higher androstenone threshold for processed products (1 µg/g) in comparison to fresh meat (0.5 µg/g) was also detected by Desmoulin et al. (1982). In a study by de Kock et al. (2001a) skatole was clearly perceived from 0.25 µg/g in heated meat, while the perception of androstenone became increasingly stronger from 0.5 µg/g in cold meat samples. Lunde et al. (2008) showed that boar meat with skatole levels up to 0.4 µg/g could be used for pre-flavoured (marinated) chops by the meat industry. Rhodes (1971) supposed that boar meat has to be sorted out if androstenone levels are higher than 1 µg/g. In contrast, Fischer and Weiler (1995) come to the conclusion that boar taint can be detected even if androstenone levels are below 0.5 µg/g. If pure androstenone samples are used thresholds obviously turn out to be lower than with meat samples. The same applies for skatole where the thresholds in meat samples of 0.1 µg/g to 0.25 µg/g (Bañon et al. 2003a; de Kock et al. 2001a; Jeremiah et al. 1999) were much higher than the above mentioned detection threshold (Annor-Frempong et al. 1997a).

Table 3: Thresholds for androstenone and skatole in different studies

Study	Threshold	
	Androstenone	Skatole
Annor-Frempong et al. (1997a)	0,426 µg/g	0,026 µg/g
Bañon et al. (2003a)	0,5 µg/g	0,1 µg/g
de Kock et al. (2001a)	0,5 µg/g	0,25 µg/g
Desmoulin et al. (1982)	0,5 µg/g (1 µg/g)	^a
Griffiths and Patterson (1970)	0,049 ng-100,0 ng	^a
Jeremiah et al. (1999)	50 µg/g (salivary gland)	0,2-0,25 µg/g
Rhodes (1971)	1,0 µg/g	^a
Fischer and Weiler (1995)	<0,5 µg/g	^a

^a Skatole not included in the study

4.2.4 Consumer attitudes towards fattening of boars

Besides aspects of sensory perception also consumer opinions and attitudes have to be included in the assessment of consumer acceptance of boar meat. So far, only a few studies did so even though consumer attitudes can influence sensory perception of boar meat. Consumers who were aware that boar meat was among the meat samples were overall more critical in their evaluations (Malmfors & Lundström 1983). In recent years consumer acceptance of alternatives to piglet castration without anaesthesia was also analysed applying consumer surveys. Acceptance of fattening of boars as an alternative was comparatively low. Among Swedish consumers Lagerkvist et al. (2006) and Liljenstolpe (2008) determined a lower willingness-to-pay for boar meat than for meat from castrates or immunocastrated pigs or rather for meat from pigs castrated with or without anaesthesia. In Switzerland 40% of the consumers rejected fattening of boars as an alternative, the rest of the participants were indecisive. However, participants also did not approve of the other alternatives, castration with anaesthesia and immunocastration. There were significant differences between the evaluations of men and women and between participants from the French and the German part of Switzerland (Huber-Eicher 2008; Huber-Eicher & Spring 2008). The high rate of rejection and indecision concerning the different alternatives among the participants was explained by insufficient information and insecurity due to missing knowledge about the methods (Huber-Eicher 2008; Huber-Eicher and Spring 2008).

4.3 Immunocastration

Consumer acceptance of immunocastration is often regarded as problematic because the vaccination might be seen as a hormonal treatment. Up to now there are only very few studies on this subject. Within the framework of the research project ProSchwein two consumer surveys were conducted in Switzerland which also included immunocastration as an alternative to piglet castration without anaesthesia. Only 11% of the participants spontaneously associated immunocastration with the word 'hormone', most of them (69%) did not link a certain association with immunocastration (Huber-Eicher 2008). In comparison the results of the two studies seem to be inconsistent. While immunocastration had the highest rejection of all alternatives in the first study (Huber-Eicher 2008; Huber-Eicher and Spring 2008), the method was readily accepted in the following survey (Hofer & Kupper 2008). According to the authors, the inconsistent results are due to different levels of information of the participants. In the second study more detailed information about immunocastration were given because lack of information had been recognised as a problem in the first study (Hofer and Kupper 2008; Huber-Eicher 2008).

In addition to the information, also the understanding of the method played a role for its acceptance. Participants who stated that they found the method understandable had a higher acceptance of immunocastration (Hofer and Kupper 2008). Hofer and Kupper (2008) conclude that immunocastration is a feasible alternative for Switzerland under the condition that adequate and appropriate information is given.

Swedish consumers preferred meat from immunocastrated pigs to meat from boars and pigs castrated without anaesthesia which was expressed by a higher willingness-to-pay for meat from immunocastrated pigs (Lagerkvist et al. 2006). The authors draw the conclusion that consumers regard the risk of boar taint as very similar for surgical castration without anaesthesia and immunocastration, however, they prefer immunocastration for animal welfare reasons.

In a recent study Flemish consumers had a relatively positive general attitude towards immunocastration. 60% of participants preferred immunocastration over surgical castration without anaesthesia (Vanhonacker et al. 2009), which was mainly due to perceived animal welfare improvements. However, the favourable attitude towards immunocastration was not translated into a strong self-reported willingness-to-pay. The authors explained that animal welfare concerns are often of secondary importance and traded off against other criteria. In the study respondents perceived meat from immunocastrated pigs as less safe and more

expensive. They suggest for the implementation of immunocastration a clear communication of price, food safety and taste and emphasise the importance to avoid incorrect information on these issues.

The previously mentioned studies examined consumer acceptance of immunocastration via surveys. In contrast, a Spanish study focused on the sensory evaluation of meat from immunocastrated pigs. Consumers could not detect sensory differences between meat from immunocastrated pigs and meat from castrates and gilts (Font i Furnols et al. 2008). A tasting in Switzerland showed the same results (Hofer and Kupper 2008). Looking at the present results consumer acceptance of immunocastration seems to depend mainly on consumer attitudes and the kind of information they receive.

4.4 Castration with anaesthesia and sexing of sperm

So far, consumer acceptance of castration with anaesthesia was only analysed in the study by Huber-Eicher (2008). Here, Swiss consumers had a rather negative opinion towards castration with anaesthesia, however, less strongly as towards fattening of boars or immunocastration.

Sexing of sperm is a relatively new alternative and still needs technical development before it can be used in a larger scale (von Borell et al. 2008). Therefore, there are no publications concerning consumer acceptance of this alternative.

4.5 Conclusions

A large number of studies examined consumer acceptance of boar meat. However, the results of these studies are rather inconsistent. Overall, the assumption that boar meat is generally rejected by consumers cannot be confirmed. The varying results are due to a multitude of factors influencing human perception of boar taint. According to the present data two problems must be solved if boar meat is supposed to be sold successfully: On the one hand, sales of strongly tainted meat have to be prevented through appropriate measures. On the other hand, survey results indicate negative opinions towards fattening of boars among consumers relatively independent of actual sensory meat quality, which have to be resolved. Consumer acceptance of immunocastration has only been analysed by a few studies. According to the results acceptance depends on information and opinions of consumers.

All in all, there is an imbalance concerning the research results on consumer acceptance of different alternatives to castration of piglets without anaesthesia and there is still a need for further research. Fattening of boars has been intensively studied, while for other alternatives there are only very few data on consumer acceptance. Moreover, studies on acceptance of

boar meat mainly focused on sensory evaluations. Consumer opinions towards boar meat and especially the influence of the knowledge that boar meat is tasted on sensory perception have hardly been examined, yet. Furthermore, other factors like ethical considerations are likely to influence consumer opinions towards alternatives to castration without anaesthesia. Ethical values and especially animal welfare issues have an increasing impact on consumers' buying behaviour and willingness-to-pay (TNS Opinion & Social 2005; TNS Opinion & Social 2007; Zander & Hamm 2009).

Additionally, concerns about food safety, e. g. concerning immunocastration, could affect consumer opinions. So far, these aspects have been intensively investigated neither for fattening of boars nor for other alternatives. Hence, there is still a lot of information missing for a final assessment of the different alternatives to piglet castration with regard to consumer acceptance so that further research is absolutely necessary. In addition to developing and implementing animal friendly alternatives, the meat industry must evaluate those alternatives with regard to consumers and then communicate them in an appropriate way. Given the controversial public discussions on piglet castration and possible alternatives everything should be done to prevent ambiguity and uncertainty of consumers concerning those alternatives.

5 Methods and study design

For the purpose of this dissertation a combination of qualitative and quantitative methods was applied. Focus groups discussions as a qualitative method were used to explore consumers' attitudes, opinions and perspectives on piglet castration without anaesthesia and the three alternatives castration with anaesthesia and analgesia, immunocastration and fattening of boars. Additionally, Vickrey auctions were applied to determine consumers' preferences and willingness-to-pay, thereby introducing a quantitative method. The qualitative data from the focus group discussions could then be used to enhance understanding of and explain the bidding behaviour in the Vickrey auctions.

The next section gives some background information on mixed method studies. Then the two methods applied in this dissertation are described and the reasons for choosing the particular methods are discussed. As both focus group discussions and Vickrey auctions were conducted in one session, the complete study design including data analysis is then presented in the fourth section. The description of the sample is also included in this chapter.

5.1 Combining qualitative and quantitative methods

Definitions of qualitative research generally involve some key elements: Qualitative approaches aim at in depth understanding and usually involve a small number of participants. The data collection is interactive and emerging issues can be explored. The generated data are "detailed, information rich and extensive"; data analysis is "open to emergent concepts and ideas" and may develop classifications, typologies or explanations (Snape & Spencer 2006, 3ff). In contrast, quantitative research is usually characterised by a larger sample size, a more structured approach to data collection and analysis and a numerical calculation of results (Wiid & Diggins 2009, 86f).

A combination of qualitative and quantitative methods within one project, also called mixed methods research, has increasingly been used by researchers over the last decades (Bryman 2008, 603), in order to "expand the scope of, and deepen the insights from, their studies" (Sandelowski 2000, 246). Bryman (2006) examined how qualitative and quantitative research has been integrated in different studies and classified the rationales given for the combination of the research strategies. Referring to the aspects of mixed methods research identified by Bryman (2006, 98) and the classification of rationales (Bryman 2006, 105ff), the approach of this dissertation can be characterized as follows: Qualitative and quantitative data are collected sequentially; however, both types of data were collected from the same person (single source). Within the study design priority was given to the qualitative part (focus

groups), which had effects on the design and analysis of the quantitative part (Vickrey auctions; Section 5.4). The function of or rationale for combining qualitative and quantitative research was to explore different aspects of the research topic (different research questions). The focus group discussions should give insights into consumers' attitudes and opinions while the Vickrey auctions should reveal preferences and willingness-to-pay. Additionally, findings from the focus group discussions are used to explain and illustrate results of the Vickrey auctions. Therefore, the integration of qualitative and quantitative methods occurred not only during data collection but also during data analysis and interpretation.

5.2 Focus group discussions

Focus group discussions are counted among qualitative data collection methods and are increasingly applied in social and marketing research (Finch & Lewis 2006, 170). The aim of this qualitative research method is to identify participants' attitudes and opinions about the research topic, in order to gain background information on consumer behaviour (Burns & Bush 2010, 241ff). In contrast to in-depth interviews, focus groups specifically use interaction within the group. Participants not only relate their own point of view, but also reflect and comment on what others contribute, which generates additional insights and richness of data on the subject of interest (Finch & Lewis 2006, 171f). Stimulating interaction between focus group participants generates a broad spectrum of experiences and opinions (Blank 2007, 284). However, regarding the depth of inquiry on a certain subject, in-depth interviews allow for more detailed responses by individual participants. Additionally, focus groups are less suited than in-depth interviews for sensitive topics which may be embarrassing for people to discuss in front of a group or for subjects on which people would not voice their true opinions due to perceived peer pressure (Wiid & Diggins 2009, 90ff). Focus group discussions are often used when there is little previous knowledge about the research topic because important impressions about relevant topics and possible hypotheses can be gathered. Yet, they are also applicable for explaining quantitatively observed phenomena as they allow for deep and differentiated insights to consumers' motives, barriers and arguments (Blank 2007, 284f).

The number of participants of a focus group discussion ranges from five to twelve. Participants may not be able to voice their opinions in larger groups due to time constraints, while smaller groups may be dominated by one participant (Mayerhofer 2007, 481f). Recruitment of participants can be done by phone, mail, internet or personally on the street (Mayerhofer 2007, 481). Socio-demographic characteristics and screening questions regarding aspects relevant for the research topic are normally used to select participants

(Blank 2007, 295; Mayerhofer 2007, 481). The intended degree of homogeneity or heterogeneity among participants depends on the aim of the study. Communication within socio-demographically homogeneous groups may be easier and polarisation among participants, which could negatively affect the discussion process, may be avoided. However, the discussion may be more lively and inspiring within a more heterogeneous group creating a higher degree of variety of opinions and arguments (Blank 2007, 295).

Focus group discussions are led by a skilled moderator who has a key role in facilitating the discussion (Mayerhofer 2007, 482). The moderator initiates and facilitates the discussion based on a topic guide or discussion guide which outlines the main topics to be covered during the discussion (McDaniel & Gates 1998, 106). There should be some flexibility regarding the order of questions in the topic guide so that the discussion may progress relatively freely (Bryman 2008, 480; Mayerhofer 2007, 482). Nevertheless, the moderator needs to focus the discussion on the research topic and to create a pleasant atmosphere which encourages and enables discussion (Mayerhofer 2007, 482). If necessary, the moderator has to ensure that every participant has the chance to contribute. This may mean to restrain too dominant participants in a non confrontative way or to encourage quiet participants to voice their opinions (Finch & Lewis 2006, 182ff).

One question that has to be addressed when planning focus group discussions is the number of groups required. Usually at least two or three focus group discussions are conducted as the results from only one single group may be just coincidental. The number of groups depends on the research question and the target groups which need to be included (Blank 2006, 296f).

A practical problem of focus group facilitation may be that not all recruited participants show up at the appointed time and place for the discussion (Burns & Bush 2010, 241ff; Mayerhofer 2007, 481). There are several ways of dealing with this problem. One strategy may be over-recruiting to compensate for “no shows”; participants may also be called shortly before the focus group to remind them of the appointment. Moreover, incentives for participation may be offered which can include monetary compensation for the participant’s time (Burns & Bush 2010, 241ff). However, it should be avoided that people participate mainly for the money and that “professionals” are recruited who participate in different focus groups on a regular basis. Additionally, it is usually recommended that participants of a focus group discussion are not acquainted because the group dynamics differ from groups with strangers (Blank 2007, 295f). Focus groups have advantages in comparison to in-depth interviews with regard to the use of

resources. A larger amount of data can be collected in a shorter period of time and at lower costs (Aaker et al. 2010, 171).

Against this background, focus group discussions were chosen for this dissertation. Particularly, with regard to the research topic and objectives of this study the method seemed preferable to in-depth interviews which were an alternative option. There was little previous knowledge about organic consumers' perspectives on alternatives to piglet castration without pain relief. Additionally, the objective of the study was to gather a broad spectrum of attitudes and opinions on the research topic which is more easily done with focus groups than with in-depth interviews. The topic of agricultural practices, food production and purchase is generally not considered to be of a sensitive nature. Other characteristics of focus group discussions influencing the research design are addressed in the study design section (5.4).

5.3 Vickrey auctions

Consumers' willingness-to-pay may be measured in numerous ways. The various methods differ in their conceptual foundations and methodological implications (Breidert et al. 2006, 1). There are various classifications of methods which differ in the way the methods are organised and arranged hierarchically (see for example Breidert et al. 2006; Völckner 2006b). Below, the main approaches to elicit willingness-to-pay measures and their applicability for the purpose of this dissertation are discussed, mostly following the classification by Völckner (2006b).

Observed market data (panel data or sales records) can be used to estimate aggregated demand functions in order to predict future market behaviour (Breidert et al. 2006, 3f; Völckner 2006b, 36f). However, it is not possible to use this approach for new products because of missing market data (Breidert et al. 2006, 4). As this dissertation deals with products which are not available in the market yet, this approach will not be further discussed. The following approaches measure willingness-to-pay on an individual level and it is possible to include new products. On an individual level, willingness-to-pay can be elicited directly by asking consumers what they are willing to pay for a certain product. Different procedures for direct customer surveys have been developed asking for highest and/or lowest acceptable prices (Breidert et al. 2006, 8). Contingent valuation is a widely used form of direct willingness-to-pay measurement, particularly for public goods. It either asks for the maximum price a respondent is willing to pay for a good (open-ended approach) or respondents indicate whether they would be willing to buy the good for a given price (closed-ended approach) (Völckner 2006b, 36). Direct surveys have in common that they can be easily conducted but

there is no incentive for participants to reveal their true willingness-to-pay (incentive compatibility) and there may be discrepancies between their valuations and real purchasing behaviour (Breidert et al. 2006, 8). Due to the lack of incentive compatibility direct approaches were not taken into further consideration.

Willingness-to-pay can also be elicited indirectly by using conjoint measurement or choice based conjoint analysis, which require participants to rate, rank or chose product alternatives according to their preferences (Völckner 2006b). Indirect price elicitation methods systematically vary prices and product attributes. Respondents' overall product preferences are then used to estimate the importance of and willingness-to-pay for different product attributes (Breidert et al. 2006).

Lotteries and auctions are further methods to measure willingness-to-pay. The BDM (Becker-DeGroot-Marschak) mechanism is counted among lotteries (Völckner 2006b). Respondents submit a bid for a product. Then, a random price is drawn. "If the bid is greater than the randomly drawn price, the bidder "wins" and purchases a unit of the good for an amount equal to the randomly drawn price" (Lusk & Shogren 2007, 24).

Auctions can be distinguished according to the mechanisms "used to determine the market price and auction winner(s)" (Lusk & Shogren 2007, 16). Völckner (2006b) differentiates between four general types of auctions: English auction, Dutch auction, first-price sealed-bid auction and Vickrey auction. In an English auction bidding starts at a low level and the ascending bids are publicly announced until only one bidder is left who pays the price determined by the last bid (Rutstrom 1998; Völckner 2006b). In contrast, in a Dutch auction a price determined by the seller is gradually reduced until a bidder accepts the latest price. In a first-price sealed-bid auction bids are submitted simultaneously and the highest bid wins. The price payable equals the highest bid (Völckner 2006b). In a Vickrey auction all participants simultaneously place their sealed bids. The highest bid ,wins'; however, the price payable is determined by the second highest bid (Lusk & Shogren 2007). Hence, Vickrey auctions are also known as „sealed-bid second-price auctions“(McAfee & McMillan 1987). As the price to be paid is not dependent on a persons' own bid, second-price auctions are incentive compatible, which means the optimal strategy for bidders is to reveal their real value of the product (Lusk & Shogren 2007; Vickrey 1961). The BDM mechanism and English auctions are also considered to be incentive compatible (Lusk & Shogren 2007, 69; Völckner 2006b).

Considering the various approaches to measure willingness-to-pay, it is the task of the researcher to identify the method most appropriate for the research question at hand. The

following considerations led to a decision about the method to elicit consumers' willingness-to-pay in this dissertation:

- As willingness-to-pay for the alternatives to piglet castration without pain relief should be measured subsequently to the focus group discussions, it was necessary that the method allowed eliciting willingness-to-pay measurements in a group setting within a reasonable time frame. Hence, willingness-to-pay measures should be collected at once from all participants of the focus group.
- The method should reveal participants' real willingness-to-pay, thus, be incentive compatible.
- Willingness-to-pay should be elicited from every participant.
- Willingness-to-pay measures generally suffer from hypothetical bias, that is willingness-to-pay is overstated, if no real economic commitment is required. Hypothetical bias can be avoided if participants are required to actually purchase the offered product (Völckner 2006a). Hence, the method should allow for a non-hypothetical setting.

The first consideration reduced the number of methods considerably as auctions and the BDM mechanism are particularly suited for group settings with auctions actually requiring a group of participants. The requirement of incentive compatibility led to a choice between English auction, BDM mechanism and Vickrey auction. As English auctions do not elicit willingness-to-pay of every participant, it was also eliminated. So, the choice was reduced to Vickrey auction and BDM mechanism. They mainly differ in the way the price payable by the “winner” is determined (Kaas & Ruprecht 2006). In contrast to for example choice experiments at the point of sale, both the BDM mechanism and Vickrey auction are relatively abstract and do not reflect real purchasing situations. However, it can be stated that auction mechanisms are increasingly used for online purchases (for example on the popular online auction website e-bay). Therefore, it can be assumed that an auction mechanism may not be as unfamiliar for consumers as the BDM mechanism. Noussair et al. (2004) concluded from their comparison of the BDM mechanism and Vickrey auction that the Vickrey auction is “preferable to the BDM mechanism as an instrument for the elicitation of the willingness-to-pay for private goods”. Also Skiera and Revenstorff (1999) suggest that Vickrey auctions offer interesting features for the elicitation of willingness-to-pay. Against this background, the Vickrey auction was chosen for this dissertation. In contrast to other auction mechanisms, Vickrey auctions collect willingness-to-pay measures of all participants (Skiera & Revenstorff

1999). A weakness of this auction mechanism is that the best bidding strategy is not always obvious to participants. Therefore, it is necessary to explain the best bidding strategy that is, indicating one's true willingness-to-pay, with an example (Skiera & Revenstorff 1999).

5.4 Study design

A special feature of this dissertation is that the two described methods of data collection were applied in the same session. Therefore, the following sections give an overview of how the focus group discussions and Vickrey auctions were combined regarding data collection and analysis.

5.4.1 Data collection

Data collection for the dissertation took place in three cities in Germany, Göttingen, Kassel and Stuttgart, in autumn 2009. Three focus groups were conducted in each city. In order to acquire participants for the study, specifically instructed student assistants addressed consumers in front of retail stores which offer organic meat products. A screening questionnaire (see Appendix 1) was used to identify consumers of organic pork and quotas for gender and age were applied (for details see 5.5). If consumers met the criteria and agreed to participate, they were invited to one of the three focus groups in the respective city and received a note with date, time and location of the event. One day before the focus group sessions, participants were called to remind them of the appointment.

The procedure of each focus group discussion with following Vickrey auction is described step-by-step in Figure 2. Before the focus group discussions started, all participants were asked to fill in a questionnaire (see Appendix 2). It included questions about the frequency of consumers' consumption of six product groups in organic quality and also a question concerning their knowledge of piglet castration for fattening³. Then, in a brief initial part of the focus group, the moderator informed consumers that male piglets raised for meat production are castrated (referring to the questionnaire). At that point, it was not mentioned that castration is usually performed without anaesthesia. Participants were asked which reasons for castration they could think of. In the next step, a brief presentation was given using Microsoft Power Point slides, with standardized information on piglet castration and the

³ The question "Have you ever heard that male pigs are castrated for fattening?" (Answers: yes or no) was only added to the questionnaire after the first focus group discussion had been conducted, in order to obtain information from each participant, which turned out to be difficult during the focus group discussions.

alternative methods⁴. In addition to the oral presentation, the main facts were summarized in a handout. Information provision served the purpose to give an informational basis for the following part of the discussion as it could be assumed that participants' knowledge of the issues was low. There were three variants of the information given (see Appendix 3) which were varied systematically so that each variant was presented once in each city (Table 5, p. 50). Variation of information was chosen in order to examine whether more information would influence participants' attitudes and preferences.

Initially, all participants were told that the castration of piglets without anaesthesia is also a common practice in organic husbandry and that it will be banned in organic farming in the EU from 2012. The reasons for castration were explained in terms of the prevention of boar taint, and calmer animals. The castration procedure and the three alternative methods (castration with anaesthesia and/or analgesia, immunocastration and fattening of boars) were described in three variants. Variant 1 gave only basic descriptions of the methods (minimal information) and in Variant 2 the pros and cons for each alternative were added (full information). Variant 3 differed from Variant 2 only in its description of immunocastration, including the word 'hormone' which had been avoided in the other variants (full information incl. 'hormone'). The rationale for introducing Variant 3 was that European consumers seem to be very sensitive with regard to risks from residues in meat like antibiotics and hormones (TNS Opinion & Social 2006; Verbeke et al. 2007). So it was expected that explicitly mentioning the word hormone would lead to more negative attitudes towards immunocastration, even though the information given did not state that hormones were used: "The vaccine is similar to a hormone produced naturally in the body. The pig generates antibodies against the vaccine and the hormone".

Subsequently, the main part of the discussion began. Following the structured topic guide (see Appendix 4) the moderator asked consumers to exchange opinions about the current practice of castration without anaesthesia, with special regard to organic farming. Then the participants discussed each of the presented alternatives whereas they were specifically asked to voice their personal opinions on a possible implementation of the respective alternative in organic pig production. They were also asked for their willingness to eat pork which was produced using one of the alternatives. Finally, participants could voice their opinions

⁴ I would like to thank Christine Brenninkmeyer and Prof. Dr. Ute Knierim very much for preparing and providing the information about piglet castration without pain relief and alternative methods which were used in the focus group discussions.

regarding a possible labelling of the alternatives to piglet castration without anaesthesia in organic farming.

Steps	Objectives	Details
Questionnaire for study participants	Gathering background information for analyses	Information about participants' buying frequency of organic products and their knowledge about piglet castration
Brief initial discussion	Starting the focus group discussions and getting more information about participants knowledge of the topic	Introduction and discussion of reasons for piglet castration (no mentioning of lack of pain relief)
Information provision	Giving informational basis for the following discussion	Presentation of standardised information in three variants (current practice of piglet castration, reasons and alternative methods)
Focus group discussion (main part)	Gathering data on participants' attitudes, opinions and acceptance of piglet castration without pain relief and alternative methods	Discussion of piglet castration without pain relief and the implementation of three alternative methods in organic farming
Vickrey auction I	Determining participants' preferences and willingness-to-pay for different alternatives to piglet castration without pain relief	Auction of four organic salamis differing only in the method of castration or rather non castration
Tasting of boar product	Gathering data on participants' evaluation of the salami as background for further analyses	Tasting of salami samples with and without boar meat
Vickrey auction II	Determining the effect of tasting on preferences and willingness-to-pay	Auction of boar salami

Figure 2: Steps of data collection

The moderator's role was to provide the standardized information at the beginning of the discussion, to introduce the discussion topics according to the structured topic guide, to make sure that all consumers could participate equally and to keep the discussion on the main topic. The focus group sessions took between sixty to ninety minutes.

At the end of each focus group discussion, the consumers were asked to participate in a Vickrey auction of smoked organic salami. Salami was chosen as the test product because it is a very popular sausage in Germany and its production includes measures which are helpful in masking tainted meat. Smoking, seasoning and the cold consumption of a pork product can reduce the perception of boar taint (Desmoulin et al. 1982; Diestre et al. 1990; Lunde et al. 2008; Pearson et al. 1971; Stolzenbach et al. 2009). In addition, tainted and untainted meat

can be mixed during production of sausages like salami, in order to achieve a diluting effect and to further reduce the perception of boar taint. Consequently, salami production offers an opportunity to sell (tainted) boar meat.

Before the auction, the moderator explained the procedure of the auction and illustrated the optimal bidding strategy with an example (following Skiera & Revenstorff 1999). The prices mentioned in the example were in a completely different price range than normal prices for organic salami in order to avoid anchoring (Kaas & Ruprecht 2006). It was emphasized that the ‘winner’ of an auction must buy the product. The respective price would be set off against the allowance for participating in the study. Each person could only obtain one package of salami. If one participant placed the highest bid in several auctions, one auction would be determined as binding by drawing lots. Subsequently, the products were presented: four 80g packages of smoked organic salami. The only difference in the salamis was the method of piglet castration or, alternatively, non-castration: castration without pain relief, castration with anaesthesia and analgesia, immunocastration and fattening of boars (Figure 3). Participants placed their bids simultaneously on a prepared form for all four salami variants (see Appendix 5).



Figure 3: Labels on the packages of auctioned salami

Following the first round of bidding (Auction I), samples of two salamis were offered for tasting. For comparison, two salamis were presented which had a similar recipe and were commercially available. An expert panel assisted in the choice of product and the specific brands used for the tasting. One of the salamis contained boar meat (boar salami) and the other was produced with the usual meat from female or castrated pigs ('standard' salami). The producer of the boar salami used both tainted and untainted boar meat for his products, but the exact content of tainted boar meat in the tested salami was not indicated. To gain background information for the analysis, participants were asked to rate the odour and flavour of each of the salamis on a seven point scale, and to indicate which of them they preferred and which they assumed to be the boar salami (see Appendix 6). The products were handed to participants one after another, and the order in which they were presented was changed between groups. The samples were only indicated by the letters A and B. Between samples, participants were requested to drink some water and eat a small piece of white bread (following Buchecker 2008). After tasting, the product that contained boar meat was revealed, and another round of bidding for the boar salami was conducted (Auction II; see Appendix 7). The highest bidders and prices of both rounds were only announced after the second bidding.

5.4.2 Data analyses

The focus group discussions were recorded (audio and video) and transcribed verbatim. Qualitative content analysis following Gläser and Laudel (2006, 191ff) was applied to identify consumers' attitudes and opinions regarding piglet castration without pain relief and the possible implementation of alternative methods in organic farming. Gläser and Laudel (2006) modified the qualitative content analysis developed by Mayring (Mayring 2010, first edition 1983) with the openness of the category system being one of the main changes. This means that the category system which has been developed based on theoretical considerations can be adapted to the data during the extraction process by adding relevant categories if necessary. The initial category system in this study was based on the key questions of the topic guide and was refined during the extraction process. The transcribed data material was searched for relevant statements, which were then extracted, summarised and analysed. In a first step of the content analysis the focus lay on exploring the spectrum of consumers' perspectives on the research topic and on identifying important aspects or criteria participants used to evaluate the alternatives.

In a second step of the analysis it was of interest, whether and how the attitudes and opinions expressed during the focus group discussions were reflected in the willingness-to-pay

measures of the Vickrey auctions. Therefore, a way to further analyse the focus group data was needed in order to make them comparable with the results of the Vickrey auctions. As participants were faced with a decision between several alternatives with multiple attributes, applying and adapting decision making methods stood to reason. Hence, a scoring model was chosen, to further aggregate the data of the content analysis. Scoring models are counted among qualitative decision making methods and are often used in marketing practice (Benkenstein 2001, 311ff). They allow for the assessment of alternatives, which can only be described by qualitative attributes, by allocating scores which are derived from the characteristics of an alternative regarding certain decision criteria (Adam 1996, 412). There are several variants of scoring models as there are different ways to allocate, weigh and combine the scores (Adam 1996, 413). A total score for each alternative can be computed by adding the weighted scores of the different decision criteria (Bouyssou et al. 2006, 209). The weighted sum model (WSM) is a very common method in multi-criteria decision making (Triantaphyllou 2010, 6). The total score of an alternative (WSM score) expresses its subjective 'preferability' (Adam 1996, 412). Here, in contrast to the usual multi-criteria decision process, the WSM was adapted to reproduce the evaluations of participants in the focus groups (at group level). So far, this is a unique approach to combining qualitative and quantitative data. The appeal of the approach is that a WSM allows ranking alternatives according to their total scores. So, the results could be easily compared to the ranking of alternatives derived from the auction data. It has to be kept in mind that the WSM involves a high degree of subjectivity (Benkenstein 2001, 314). Therefore, the steps of analysis are presented as transparent as possible.

In marketing and management literature decision processes are formalized and divided into several steps (e.g. Adam 1996; Robbins & Coulter 2009). Adam (1996, 413) distinguishes five steps of the decision making process, which were adapted to the approach used in this study:

- I. Definition of adequate assessment criteria: As it was the objective to reproduce participants' evaluation of the four alternatives (at group level), the decision criteria used were based on the content of the focus group discussions and not, as is usual, on theoretical considerations. Content analysis revealed that participants regarded five aspects (criteria) as particularly relevant for their assessment of the alternatives: animal welfare, food safety, organic farming, taste and costs. The data set was then further analysed in order to identify "sub-criteria" for each of the main criteria. This

resulted in different sets of sub-criteria for the different alternatives, which is a deviation from standard procedure.

- II. Definition of weights for the criteria: Weights for the different criteria were determined on the basis of recent studies of consumers' motives for buying organic products (Fischer-Appelt relations, 2012; Zander & Hamm, 2010). Animal welfare received the highest weight (0.3), followed by food safety (0.25), organic farming (0.2), taste (0.15) and costs (0.1). As there were different sets of sub-criteria for each criterion and alternative, it was only regarded as to whether the sub-criterion was a positive or negative aspect. The 'direction' of the respective sub-criteria was considered by using positive or negative algebraic signs for the weights. Stolz et al. (2009) evaluated the relevance of topics discussed in focus groups on the basis of the assumption that more relevant topics are addressed more frequently by a higher number of participants. Following this argument, we assumed that arguments appearing in several focus groups were of greater importance than others. Hence, those sub-criteria which appeared in at least six out of nine groups were assigned double weights.
- III. Selection of possible characteristics of the criteria: The focus group data were analysed in terms of the selected criteria and it was determined as to whether the sub-criteria were discussed or not and how intense the discussion was in each group.
- IV. Assessment of the alternatives by experts: The scores for each criterion were assigned according to the variety of arguments and the intensity of discussion (0=not discussed, 1=discussed, 2=discussed intensively). High scores for the criteria indicate an intensive discussion with many arguments, with the arguments (sub-criteria) being clearly discussed in a positive or negative 'direction'. Due to the positive and negative weights of the sub-criteria, positive and negative aspects could cancel each other out. Therefore, controversial discussions led to relatively lower scores for the criteria (for an exemplary calculation see Appendix 8).
- V. Calculation of the total WSM score for each alternative and ranking the alternatives based on the scores.

The Vickrey auctions as well as data from the sensory evaluations were analysed using descriptive statistics (measures of location and statistical dispersion, frequency distributions). As the main emphasis of the study design was placed on the focus group discussions and the number of cases was small, no multivariate methods, which are typically used for analysing auctions (Lusk & Shogren 2007, 95ff), were applied. In view of the fact that the primary focus

was on consumers' relative preferences expressed by different bids, the alternatives were ranked at an individual level. Thus, the influence of different bidding levels between individuals and groups could be eliminated. Individual rankings were then summarized in order to obtain rankings at group level and overall.

5.5 Description of sample

All focus groups participants were at least occasional consumers of organic pork and salami produced with pork, which was determined by a screening questionnaire (see Appendix 1). Additionally, quotas for gender and age were applied. 30 to 40% of the participants chosen should be male and 60 to 70% female, because different consumer studies have shown that women are still mainly responsible for grocery shopping in Germany (Platzmann & Hamm 2009; Spiller et al. 2004). Half of the participants were required to be aged between 18 and 44 years and the other half between 45 and 75 years, which is consistent with the average proportions in the German population (Statistisches Bundesamt 2008). Overall, 89 consumers participated in the survey (34 men and 55 women). The number of people per focus group lay between seven and twelve. The quotas for gender and age were met, with a relatively high proportion of men (38%; Table 4, p. 48).

Participants indicated their buying frequency of six product groups in organic quality. An 'organic index' was generated for each participant, which could theoretically range from 0 (hardly ever buying any of the product groups in organic quality) to 12 (almost always buying every product group in organic quality). As participants were required to buy organic meat products at least occasionally an index value of zero was not possible. On average the participants had a relatively high organic index of 9.4 (range: 4 to 12), with 80% of them having an index value of 8 or higher. Almost 30% of the participants bought all six product groups almost always in organic quality (index value 12; Table 12, p. 89). The highest average index value per focus group was reached in focus group 5 (11.3) and the lowest in focus group 8 (8.3; Table 7, p. 72). Obviously, most participants were frequent buyers of organic food products. This was not surprising, as panel research has shown that only a relatively small group of dedicated consumers of organic food buys most of the organic pork in Germany (Buder et al. 2010).

The question about knowledge of piglet castration was asked before the beginning of the focus group discussions. At this point, the participants had not received any information about the issue from the moderator. Consequently, the knowledge that piglets are castrated could not be equated with the knowledge that castration is usually performed without pain relief. This

position was also confirmed by remarks made during the focus group discussions. Altogether, more than half of the participants did not know that male piglets are commonly castrated. Knowledge about piglet castration differed between groups: the highest share of participants who stated that they were informed about piglet castration was found in Group 5 (83%), while this share was lowest in Group 9 (27%; Table 7, p. 72).

6 Consumer attitudes towards alternatives to piglet castration without pain relief in organic farming: Qualitative results from Germany

This chapter represents an article published by the author of this dissertation and Prof. Dr. Ulrich Hamm as a co-author. Any reference to this chapter should be cited as:

Heid, A. and Hamm, U. (2012): Consumer attitudes towards alternatives to piglet castration without pain relief in organic farming: Qualitative results from Germany. Journal of Agriculture and Environmental Ethics 25 (5), 687-706.

6.1 Abstract

In order to avoid the occurrence of boar taint, castration of piglets without pain relief is a common practice in pork production. Due to increasing animal welfare concerns, the practice will be banned in organic agriculture from 2012 and alternative methods will have to be implemented. An important factor for the successful implementation of such alternatives is consumers' acceptance of the methods, as consumers' daily buying decisions are crucial to the further development of the organic pork sector. Thus, this paper explores organic consumers' attitudes towards piglet castration without pain relief and three alternative methods and examines which aspects of these alternatives are important to consumers of organic products. The analysis of nine focus group discussions in Germany conducted in fall 2009 and involving a total of 89 participants, shows that castration without pain relief in organic farming was unacceptable for participants. Animal welfare, food safety, taste and costs were principal aspects that participants used to assess the three alternatives. Participants had mainly favorable attitudes towards castration with anesthesia and analgesia. Although participants had some concerns regarding the fattening of boars (taste), there was openness towards this alternative due to its perceived naturalness. Immunocastration was seen quite critically because participants feared that this alternative might lead to (hormone) residues in meat. Overall, the results suggest that fattening of boars and castration with anesthesia and analgesia could be acceptable alternatives to consumers of organic pork.

6.2 Introduction

Animal welfare is becoming increasingly important to consumers in Germany and other European countries (TNS Opinion & Social 2005; 2007) and it is one of the main reasons for buying organic food (Hughner et al. 2007). The welfare of farm animals is not only seen as an ethical issue but is also used as an indicator for other product attributes like food safety, health and sensory quality (Anwander Phan-Huy & Badertscher Fawaz 2003; Harper & Makatouni

2002). However, the simple equation ‘better animal welfare equals higher product quality’ may not be valid for organic pork, as male piglets are routinely castrated, in order to prevent the occurrence of ‘boar taint’, an unpleasant odor and flavor of pork.

In most European countries, piglets can be legally castrated without pain relief in the first seven days of life. Castration without anesthesia and analgesia has been heavily criticized by animal welfare organizations for quite some time. Since there is scientific evidence that castration is painful at any age (European Food Safety Authority 2004; Prunier et al. 2006) and possible alternatives to this practice are available, or at least under development, the justification and necessity for this common practice are being questioned. As a reaction to increasing animal welfare concerns, both the meat sector and policy makers have taken up the issue. Several European countries have decided to ban piglet castration without pain relief, and stakeholders in the meat sector are working on the implementation of alternative methods. The first EU-wide regulation concerning piglet castration applies to organic farming: from 2012 onwards, the castration of piglets without anesthesia or analgesia will not be allowed in certified organic pig production (Commission Regulation (EC) No 889/2008 2008b). Therefore, the pressure to implement alternatives is particularly high.

Several alternatives to the practice of piglet castration without pain relief are under consideration for organic, as well as conventional, pig production. Firstly, surgical castration can be undertaken with anesthesia and/or analgesia. Analgesics only reduce post-operative pain; pain during castration has to be inhibited by local or general anesthesia. To relieve both pain during castration and post-operative pain, anesthesia has to be combined with analgesia. Secondly, there are non-surgical alternatives, namely immunocastration and the fattening of boars. Immunocastration is also called vaccination against boar taint. The vaccine inhibits “testicular development and functions via the neutralisation of the hormones of the hypothalamic-pituitary-gonadal axis by specific antibodies” (European Food Safety Authority 2004). The fattening of boars (entire males) means that piglets are not surgically castrated. However, each of these alternatives has its drawbacks for either consumers or producers. Castration with anesthesia and analgesia has to be performed by veterinarians and/or requires expensive equipment, immunocastration may be seen as a hormonal treatment by the consumer, and entire male pigs may develop boar taint.

While ethical reasons demand an immediate abandonment of piglet castration without anesthesia, considerations about the possible effects on meat quality and even meat safety are likely to impact on consumers’ acceptance of alternatives and their buying behavior. So far,

there is little knowledge about the acceptance of such alternatives by consumers of organic pork, and about influences on their buying behavior. However, such knowledge is important, as consumers' every day buying decisions are crucial for the further development of the organic pork sector. German organic consumers' preferences are not only relevant for organic pork production in Germany but also for organic pig producers in other European countries. Germany is the biggest (conventional) pig producer in the EU and at the same time an important export country for piglets, pigs and pork for several EU member states especially Denmark, Belgium, the Netherlands and Spain (Weiß & Kohlmüller 2010). Although there are hardly any official statistics the organic market for pigs and pork mirrors the conventional market on a much smaller scale. The German organic pork production is with 0.4% (2008) of the total pork production proportionally small. However, Germany has, after Denmark, the second highest number of organic pigs (on average 115.000 in 2008) in the EU (Schaack et al. 2010). Organic meat consumption in Germany is continuously increasing (7.6% in 2009) and in the last couple of years demand for pork exceeded supply (AMI 2011; Schaack et al. 2010), so that Germany is a net importer of organic pork.

This paper examines consumers' awareness and opinions regarding the issue of piglet castration without anesthesia in organic farming. The main objectives are to explore organic consumers' attitudes towards three alternatives to piglet castration without pain relief and to determine which aspects of the issue are of importance to consumers of organic meat.

6.3 Methods and procedure

6.3.1 Focus group discussions

Focus group discussions were applied to explore consumers' attitudes and opinions about piglet castration without anesthesia and the three alternatives. A focus group discussion usually has six to twelve participants and is led by a moderator. The aim of this qualitative research method is to identify participants' attitudes and opinions about the research topic, in order to gain background information on certain consumer behavior (Burns & Bush 2010). Focus groups use interaction within the group to gather detailed and in-depth data on the subject of interest (Finch & Lewis 2006). Since the topic of piglet castration was likely to be unfamiliar to consumers and it was not clear which aspects were relevant to them, this qualitative approach was chosen.

6.3.2 Profile of the participants

In the fall of 2009, nine focus group discussions were conducted in three cities, located in Northern, Central and Southern Germany (three focus groups per city). All focus groups participants were at least occasional consumers of organic meat and meat products and, additionally, quotas for gender and age were applied (Table 4). It was determined that 30-40% of the participants chosen should be male and 60-70% female, because different consumer studies have shown that women are still mainly responsible for grocery shopping in Germany (Plaßmann & Hamm 2009; Spiller et al. 2004). Half of the participants were required to be aged between 18 and 44 years and the other half between 45 and 75 years, which is consistent with the average proportions in the German population (Statistisches Bundesamt 2008). Overall, 89 consumers participated in the survey (34 men and 55 women).

Table 4: Number of participants differentiated by gender and age in comparison to the quota

Gender Age (years)	Men		Women		Total	
	Actual number of men	Quota	Actual number of women	Quota	Actual number of participants	Quota
18-44	17	14-18	28	27-32	45	45
45-75	17	13-18	27	27-31	44	45
Total	34	27-36	55	54-63	89	90

Participants indicated their buying frequency of six product groups in organic quality. An ‘organic index’ was generated for each participant, which could range from 0 (buying all product groups hardly ever in organic quality) to 12 (buying all product groups almost always in organic quality). On average the participants have a relatively high organic index of 9.4 (range: 4 to 12), with 80% of them having an index value of 8 or higher. Almost 30% of the participants buy all six product groups almost always in organic quality (index value 12). The highest average index value per focus group is reached in focus group 5 (11.3) and the lowest in focus group 8 (8.3). Obviously, most participants were frequent buyers of organic food products. This could be expected, as the market share for organic meat and meat products is much lower than for other product categories in Germany, and only a small share of dedicated buyers of organic food actually buys organic pork and meat products with pork (Buder et al. 2010).

6.3.3 Experimental design

Before the focus group discussions started, all participants were asked to fill in a questionnaire, which included questions about the frequency of consumers' consumption of organic food products and also a question concerning their knowledge of piglet castration for fattening⁵. At the beginning of the group discussion, the moderator informed consumers that male piglets that are reared for meat production are castrated (referring to the questionnaire). At that point, it was not mentioned that castration is usually performed without anesthesia. After a short discussion about the possible reasons for castration, a brief presentation was given, with standardized information on piglet castration and the alternative methods. Information provision varied between each of the three focus groups per region in order to examine the influence of different levels of information (Table 5). In addition to the oral presentation, the main facts were summarized in a handout (for a translation of the three variants of the presentation see Appendix 3).

Initially, all participants were told that the castration of piglets without anesthesia is also a common practice in organic husbandry and that it will be banned in organic farming in the EU from 2012. The reasons for castration were explained in terms of the prevention of boar taint, and calmer animals. The castration procedure and the three alternative methods (castration with anesthesia and/or analgesia, immunocastration and fattening of boars) were described in three variants. Variant 1 gave only basic descriptions of the methods (minimal information) and in Variant 2 the pros and cons for each alternative were added (full information). Variant 3 differed from Variant 2 only in its description of immunocastration, including the word 'hormone' which had been avoided in the other variants (full information incl. 'hormone'). Each variant was presented once in each of the three regions.

Subsequently, the main part of the discussion began. Following the structured topic guide the moderator asked consumers to exchange opinions about the current practice of castration without anesthesia, with special regard to organic farming. Then the participants discussed each of the presented alternatives whereas they were specifically asked to voice their personal opinions on a possible implementation of the respective alternative in organic pig production. They were also asked for their willingness to eat pork which was produced using one of the alternatives. The moderator's role was to provide the standardized information at the beginning of the discussion, to introduce the discussion topics according to the structured

⁵ The question "Have you ever heard that male pigs are castrated for fattening?" (Answers: yes or no) was only added to the questionnaire after the first focus group discussion had been conducted, in order to obtain information from each participant, which turned out to be difficult in the course of the focus group discussions.

topic guide, to make sure that all consumers could participate equally and to keep the discussion on the main topic. The focus group sessions took between sixty to ninety minutes. They were recorded (audio and video) and transcribed. Content analysis following Gläser and Laudel (2006) was applied to identify consumers' attitudes and significant aspects of the discussion.

Table 5: Overview of the focus groups - region, number of participants and information levels

Focus group number	Region	Number of participants	Information
1	North	11	Minimal information ^a
2		9	Full information ^b
3		9	Full information incl. 'hormone' ^c
4	Central	10	Minimal information ^a
5		7	Full information ^b
6		9	Full information incl. 'hormone' ^c
7	South	11	Minimal information ^a
8		11	Full information ^b
9		12	Full information incl. 'hormone' ^c
	Total	89	

^aMinimal information about piglet castration and alternative methods

^bMore detailed information (incl. pros and cons) about piglet castration and alternative methods

^cMore detailed information (like full information), description of immunocastration includes the word 'hormone'

6.4 Results

6.4.1 Piglet castration without pain relief in organic farming

Participants had very limited knowledge of piglet castration. The proportion of participants who were not aware of piglet castration ranged between 17% (focus group 5) and 73% (focus group 9) in the different focus groups, with in total 54% of participants not knowing that male piglets are castrated for fattening. In the first brief part of the discussion, participants thought of several reasons for castration. Calmer animals and advantages for fattening were mentioned in every focus group. In all but one focus group, some participants pointed out that meat of uncastrated male pigs may have an off-flavor or objectionable odor. The term 'boar taint' was only mentioned by one person in focus group 2. The fact that castration is usually performed without anesthesia or analgesia was widely unknown, even among those participants who claimed to know about castration of male piglets. The few participants that were aware of

castration without anesthesia mainly obtained their knowledge from recent media reports. Several participants expressed surprise and disappointment, especially with reference to organic farming, when they were informed about the usual practice. Castration without anesthesia was regarded as unnecessary cruelty to animals. It did not fit into the picture that most participants had of animal husbandry in organic farming. Typical statements were:

“Well, I must admit I’ve never heard about it before. And I’m a bit disappointed now that it’s that way in organic husbandry [...], too. Actually, I don’t like it” (woman, focus group 3, age 45 to 75).

“Well, I didn’t know it and I’m a bit shocked now” (woman, focus group 7, age 18 to 44).

“I did know that about the castration, I read a lot of awful things about it [...] however, that this is done in organic farming I did not know and I think that it’s a scandal. It’s a shame. I never would have guessed” (woman, focus group 5, age 18 to 44).

Consequently, a few participants said they would eat less or even no pork in the future. Another reaction to the information about piglet castration was to think about reasons why it is usually performed without pain relief. Participants came up with the higher costs of less painful alternatives and the supposition that castration without anesthesia is a traditional procedure which is not questioned by farmers; or they suspected that farmers might be less sensitive or think that piglets do not perceive pain.

6.4.2 Alternatives to castration without pain relief

Animal welfare, food quality and safety, taste and costs were important for participants’ evaluation of alternatives to piglet castration without anesthesia. In particular, costs were discussed not only with regard to a certain alternative, but also in a more general way. Several participants assumed that implementation of the alternative methods would lead to higher prices for pork. In contrast, some participants held the opinion that pork prices would not increase much if alternative methods were used. In focus group 8, the higher costs of alternatives were debated at some length. A number of participants wondered if consumers with a low income would still be able to afford pork, while others claimed that consumers should be willing to pay more in order to support animal welfare and farmers. They argued that German consumers are not willing to pay proper prices for their food, in contrast to other countries where consumers pay appropriate prices for good food quality. It was assumed that

the implementation of alternatives to piglet castration without pain relief would depend strongly on costs. Farmers would only use alternative methods if they could expect higher prices for the pork they produced. In a few cases, general skepticism about the alternatives was expressed or participants said that they would not like to decide between the alternatives. Insufficient information on which to justify a decision for or against a particular alternative was the main reason given. This occurred in groups receiving minimal information as well as in groups receiving full information (incl. 'hormone').

6.4.2.1 *Castration with anesthesia and analgesia*

Castration with anesthesia and analgesia was mainly rated positively with regard to animal welfare. One of the most important positive aspects of this alternative for the participants was the absence of pain for the piglets. Only very few participants (focus groups 5, 6, 9) mentioned possible stress for piglets during anesthesia with gas, and pain through injections into the testicles for local anesthesia. Also, the question was raised as to who controls whether anesthetics and analgesics are actually used during castration (focus groups 5, 8).

The food safety aspect was also assessed rather positively. Several participants mentioned that they were not concerned about residues of anesthetics or analgesics because of the time lag between castration and slaughter and the assumption that the drugs used would be metabolized quickly (focus groups 1, 2, 4, 5, 8, 9). However, some participants questioned the assumption that there would be no residues in the meat. Obviously, this alternative was easily comprehensible for participants. They compared the use of anesthetics and analgesics with medical treatment in humans, that is, with anesthesia at the dentist or during surgery, or the taking of pain relievers.

Comments with regard to organic farming indicated a critical view of the use of drugs in animal husbandry. This was deemed inappropriate for organic production.

The supposedly high costs were an important negative aspect of this alternative for the participants. They believed that small-scale farms could not bear these costs and the survival of such small farms was important to a few participants (focus group 9). Furthermore, participants feared increasing meat prices. The remarks of two female participants summarize important arguments:

“Well, if it has to be done, then I would rather choose this way. Anyway, as humane as possible, because I always think, like, how would one want it for oneself? That is assuming one would want that at all. However, no one would

have surgery done without anesthesia. I believe no one would do that. And who gives anyone the right to do so with other living creatures?” (woman, focus group 3, age 45 to 75).

“Well, of course it’s positive that the animals don’t suffer pain. The question for me is what of the anesthetics passes over into the meat and what will I take in as a consumer. And of course, what it will cost eventually. If pork prices escalate, I will have to consider again: Well, do I still buy that or is it too expensive for me?” (woman, focus group 7, age 18 to 44).

In comparison to the other alternatives there were relatively few negative remarks on castration with anesthesia and analgesia (in focus group 3, there were none).

When asked about their willingness to eat pork from pigs which were castrated with anesthesia and analgesia, the evaluation of the risk of drug residues played a decisive role but only a few (focus groups 5, 6, 8) participants expressed significant concerns about eating such pork. These participants assumed a high risk of residues. Altogether however, the remarks revealed a willingness to eat meat from pigs castrated with anesthesia and analgesia. Participants’ reasons varied slightly: some assumed that there would be no residues because the drugs are metabolized quickly, while others rated residues of anesthetics or analgesics as less harmful than residues of, for example, antibiotics and hormones. Residue-free pork was named as a condition for the willingness to buy or, rather, eat pork produced with this alternative.

6.4.2.2 Immunocastration

The vaccination against boar taint was seen as quite an animal-friendly alternative because it causes less pain than surgical castration. Application of the vaccine was perceived as relatively simple because it requires only two injections. Some participants trusted the information given: that residues were unlikely to remain in the meat (especially focus group 2). However, there were many comments emphasizing good animal welfare and/or the simplicity of the method while, at the same time, certain concerns about residues were expressed. Positive assessments were followed by the statement that they were made under the condition that there are no residues in the meat. For example, a male participant in focus group 4 said:

“Well, immunocastration as it is described here [...] I can imagine it quite easily. And if it’s indeed unproblematic [...] with regard to residues [...], I think it’s the ideal solution” (man, focus group 4, age 45 to 75).

Residues, usually of hormones but in a few cases also of antibodies, were participants’ main concern. In each focus group, immunocastration was assumed to be some kind of hormonal treatment, regardless of whether the word ‘hormone’ was used in the description of the alternative or not. In Variants 1 and 2 (minimal and full information, six focus groups) immunocastration was described as a vaccination avoiding any mentioning of hormones. In Variant 3 (full information incl. ‘hormone’, three focus groups) it was added that the vaccine is similar to a hormone produced naturally in the body and that the pig will develop antibodies against the vaccine and the hormone. It was stated (in all variants) that there would remain no residues in meat, however, it was not explicitly mentioned that immunocastration is not a hormonal treatment (see Appendix 3). In this case, focus group discussions may to some degree depict a public discussion. As soon as one participant linked immunocastration with hormones, the issue was taken up by others, regardless of whether it is a fact or not. A few participants (focus group 2 and 7) who received minimal or rather full information even pointed out that they could only assume that immunocastration is a hormonal treatment. In all focus groups, there were concerns that eating meat from immunocastrated animals could lead to negative health effects. A male participant expressed his concerns in a rather drastic way:

“And it would be absolutely negative, [...] if residues remain [...] so that, if you are eating it, you are slowly castrated by pork” (man, focus group 2, age 18 to 44).

Some participants also believed that there could be negative side effects of immunocastration for the pigs. A few participants discussed whether immunocastrated pigs might possibly excrete hormones which could eventually end up in (drinking) water. In three focus groups (4, 8, 9), comparisons were drawn with birth control pills, as regards negative health effects, as well as hormones in drinking water. Additionally, some participants feared as yet unknown and unexplored long-term effects of immunocastration on both humans and animals. There was a sense of underlying skepticism towards immunocastration and this was expressed in the following statement:

“Well, I dearly hope that the pig I’m eating had a nice life, at least. And this immunocastration is, in my eyes, the most agreeable among the methods presented here. However, at first glance the procedure appears just so reliable

that you think: Well, that's it. And precisely because it seems so simplistic and easy, I become suspicious, because I think that tomorrow I will get information which upsets everything, my whole assessment" (man, focus group 1, age 45 to 75).

Analogies between immunocastration and genetic engineering were also drawn with regard to the unnaturalness of the method and its alleged safety in spite of a lack of information on this issue. Immunocastration was perceived as a severe interference with nature and was, therefore, deemed inappropriate for organic farming.

Repeatedly, mistrust in the provided information about immunocastration, and particularly about the absence of residues in meat, became apparent. A person in focus group 7 (minimal information) suspected that the information given was deliberately misleading because hormones were not mentioned. Moreover, some participants (focus groups 5, 7) could not believe that immunocastration is indeed a vaccination. Other participants felt that there was not enough information to form a definite opinion on the alternative. More information was requested, particularly about the exact way that immunocastration works and about its effects on humans and animals.

Residues were also an important topic with regard to the willingness to eat pork from immunocastrated pigs. Participants who were willing to eat such pork named the absence of residues as a condition. Although they partially trusted the information about immunocastration, they also requested guarantees through tests and labels. Animal welfare was another reason for the willingness to eat pork from immunocastrated pigs (focus groups 1, 5, 7), while arguments against were mainly based on the perceived risk of (hormone) residues and their negative effects. Other participants indicated that the reason for rejecting consumption of pork from immunocastrated pigs was lack of information and understanding of the method.

6.4.2.3 Fattening of boars

Participants perceived fattening of boars as a natural means of pork production. This perception was based on the absence of surgical interventions and drugs. Here, animal welfare aspects combine with food safety issues. Aggressive behavior among boars was regarded as 'natural' by a few participants. They expected the level of aggression to be low, and thus unproblematic, because they assumed that the living conditions of organically-produced pigs would allow boars to interact peacefully. However, participants predominantly had a critical view of aggressive behavior among boars, because it may cause stress and injuries for the

animals. In focus group 3, possible aggression formed the main argument against fattening of boars; in focus group 5, by contrast, the topic was not mentioned negatively. The necessary separation of entire males and female pigs was discussed occasionally. Some participants saw no problem with this practice while others perceived the separation of males and females as unnatural and not animal-friendly.

Participants were of two minds about the risk of boar taint. Some participants regarded boar taint as only a minor problem, as long as the percentage of pork with taint was low and the meat could be used in an acceptable way. Others held the risk of boar taint in meat to be problematic. In focus groups 1 and 9, it was pointed out that consumers do expect a high quality of organic meat because they pay a relatively high price and the occurrence of boar taint would therefore not meet quality expectations. A few participants considered castration to be inevitable because of the problems with boar taint.

There was a strong demand for information about the potential for utilizing meat with boar taint and participants came up with some ideas. They suggested dog food, fish food, sausages (salami, bratwurst) and marketing as 'delicacy' as possible uses for tainted pork. Other participants doubted that the use of such meat would be acceptable because boar taint could not be masked. At the same time, sorting out large quantities of pork for dog food (often mentioned as an alternative use), or even as waste, was seen as unethical. Here, the question arose as to how many boars develop taint. During the discussions, it became obvious that only a few participants had experienced boar taint themselves (for example, with meat from wild pigs), although a few had heard about it (for example, from their grandparents). Others speculated as to whether an unusual or unpleasant flavor of pork, which they had experienced in the past, could be ascribed to boar taint. However, most of the participants who made remarks about boar taint during the discussion had no experience with tainted meat and had to rely on the information provided (see Appendix 3) and the remarks of other participants to form an opinion. Participants who had never experienced boar taint voiced doubts as to whether it could really be so unpleasant; comparisons were often drawn with meat from wild pigs or mutton. Participants' opinion about the boar taint problem was linked to their assumptions about its unpleasantness.

In contrast to the other alternatives, the fattening of boars was explicitly identified as appropriate for organic farming. A female participant expressed her opinion in the following way:

“Actually, I would say that’s the method where I say: “Organic farming”. They get no drugs. There are no interventions. They can just live” (woman, focus group 1, age 18 to 44).

Another important topic with regard to fattening of boars was the profitability of the method. Participants envisaged high production costs and consequently higher prices for pork due to the necessary sorting of carcasses and accompanying losses, as well as the higher requirements placed on animal husbandry.

There were many open questions regarding the actual implementation of this alternative, for example, in terms of housing conditions, separation of male and female pigs, workload, costs and the reduction of boar taint. Also with regard to their willingness to eat boar meat, participants held very different opinions. Several participants were willing to eat boar meat, however, mainly on condition that it tastes good; the level of willingness to at least try boar meat before making a final decision was high. Again, it has to be taken into account that most of the participants had no experience with boar taint and could only speculate about odor and flavor of tainted meat.

“Well, to answer this question point blank: If it tastes good, I would eat it! And maybe you have to get used to it a bit, but you can try it anyway” (man, focus group 7, age 45 to 75).

A few participants rejected the idea of eating boar meat out of hand because they assumed that it would not taste good. This was partly because they thought of themselves as very sensitive to smell, and partly because they had prior experiences with boar meat that had been unpleasant. Another argument against boar meat was that consumers of organic meat have high expectations about quality and taste and have to pay a relatively high price for organic pork.

6.4.3 Conflicting aspects of the alternatives

Consumers are faced with trade-offs between different aspects of the alternatives to piglet castration without anesthesia, for instance between animal welfare and taste or food safety. The results show that participants are aware of possible conflicts between these aspects, as exemplified by this remark of a female participant:

“[...] And I think at some point I have to make a decision: What’s more important to me? The animal or is it always about me?” (woman, focus group 8, age 45 to 75).

In many cases, it was noticeable that the same person might identify positive as well as negative aspects of an alternative; thus, the individual's decision about an alternative would depend on the personal significance ascribed to different aspects.

Good taste was quite important to most of the participants and often outweighed other aspects; for example one participant said about boar meat and taste:

“Well, that’s of course important. It has to taste good to me. And I really believe when meat tastes different - even if it’s maybe more natural that the piglet hasn’t been castrated - but if it tastes different I would think “Okay, that tastes strange somehow!” And [if] it doesn’t taste good to me, then I wouldn’t eat it anymore” (woman, focus group 1, age 18 to 44).

Obviously, taste was mainly an issue with fattening of boars and was hardly ever mentioned in connection with other alternatives. The discussion about food safety focused on the possible residues in meat caused by immunocastration. With regard to animal welfare, participants saw advantages in immunocastration, but many made clear that, most importantly, the meat must be free of any kind of residues. Very few participants expressed the strong preference for animal welfare voiced by this male participant of focus group 7:

“Well, since it's to do with happy animals generally, I would definitely do it [eat meat from immunocastrated pigs]. Anyway, I don't really know what hormones and other things are in other foods, whether it's vegetables or goodness knows what! So, I just want the animals to be happy” (man, focus group 7, age 45 to 75).

6.5 Discussion

The results revealed that consumers of organic pork had little knowledge of the issue of piglet castration without pain relief. Other studies found similarly low levels of awareness among Norwegian and Belgian consumers (Fredriksen et al. 2011; Vanhonacker et al. 2009). It became obvious that castration of piglets without anesthesia in organic farming does not meet consumers' expectations and images of animal husbandry in organic production. This carries the risk of disappointing consumers of organic pork if they learn that this is still common practice in organic animal husbandry.

There are only very few consumer studies about the acceptance of alternatives to castration without pain relief that include consumer attitudes towards piglet castration with anesthesia. Huber-Eicher and Spring (2008) found that, in Switzerland, rejection of piglet castration with anesthesia was not as strong as rejection of fattening of boars or immunocastration. Similarly,

Norwegian consumers had a high acceptance of local anesthesia, the main method of pain relief during castration in Norway (Fredriksen et al. 2011). These results are in accordance with the attitudes participants expressed in our study. In contrast, Vanhonacker and Verbeke (2011) found that consumers in France, Germany, the Netherlands and Belgium had a low preference for physical castration with anesthesia in comparison to immunocastration.

The food safety aspect, which was clearly focused on the risk of residues of substances used for immunocastration and their possible effects, was the predominant topic of the discussion about immunocastration. Apparently, this alternative was regarded with skepticism by participants. Even those participants who saw advantages in this method regularly qualified their positive statements by indicating possible problems (especially residues). In this respect, remarks that included positive and negative aspects at the same time were found most frequently in those focus groups which received minimal information (focus groups 1, 4, 7). This implies that these less-informed participants had more difficulties making up their mind about the alternative; thus, information on the pros and cons of immunocastration may lead to more definite opinions. However, the high proportion of negative remarks about this alternative suggests that a more definite opinion is not necessarily a positive one.

Norwegian consumers had very similar concerns with regard to immunocastration, compared to the consumers in our study. They associated the method with hormones and were apprehensive of the residues in meat and the, as yet unknown, long-term effects of immunocastration (Fredriksen et al. 2011). Skepticism towards immunocastration increased when more comprehensive information was given which characterized immunocastration as a medical treatment and stated that it is not a hormone. The authors noticed that the wording of the information provision was interpreted rather negatively (Fredriksen et al. 2011). These findings contradict the assumption of Huber-Eicher and Spring (2008) who found that Swiss consumers strongly rejected immunocastration, and hypothesized that more detailed information might lead to better acceptance. This was tested in a second study by Hofer and Kupper (2008) with more detailed information which resulted in distinctly higher acceptance of immunocastration. The results of this second study also showed that comprehensibility is important, as participants who stated that the method was comprehensible rated immunocastration more favorably (Hofer & Kupper 2008). Considering these different results, based on information about immunocastration, the (perceived) comprehension of the method may be more important than the amount of information given.

Vanhonacker et al. (2009) found that, overall, Flemish consumers preferred immunocastration over surgical castration without pain relief, particularly because of perceived animal welfare benefits. Nevertheless, the effect of this general acceptance on willingness-to-pay for the alternative was small. Price premiums exceeding five percent over the price of conventional pork led to a negative purchase probability. The authors argue that animal welfare is often traded-off against other product attributes which are held to be more significant, like price, taste, safety or healthiness. With regard to food safety and price, immunocastration was evaluated slightly more negatively than surgical castration and, according to the authors, this may explain the low level of willingness-to-pay, despite a favorable attitude towards immunocastration (Vanhonacker et al. 2009). Swedish consumers had a higher willingness-to-pay for immunocastration than for surgical castration without anesthesia. While surgical castration and immunocastration were evaluated similarly with regard to the risk of boar taint, consumers preferred pork from immunocastrated pigs because of improved animal welfare (Lagerkvist et al. 2006). A quantitative study in four European countries (France, Germany, Belgium, The Netherlands) found that a majority of the consumers (70%) favored immunocastration over surgical castration with anesthesia. Results differed slightly between countries with German consumers having by comparison the lowest preference for the vaccine method (60% Vanhonacker & Verbeke 2011).

It becomes obvious that recent studies about consumer attitudes towards immunocastration come to quite different results. Certainly, this may partly be explained by differences in the necessary information provision in consumer studies about alternatives to piglet castration without pain relief. A study by Tuytens et al. (2011) focusing on the effect of information provision on the attitude towards alternatives to piglet castration without pain relief concluded that the attitudes may be affected by how and how much information about alternative methods is provided. Especially complementary audio-visual information “increased the impact of information provisioning”. Within this study, immunocastration was the most preferred alternative to surgical castration without pain relief; however, the different information conditions influenced the preferences for this alternative the most (Tuytens et al. 2011).

Additionally, in our study the profile of the participants may partly explain the dominance of the food safety aspect in the discussion about immunocastration. The majority of the participants were frequent buyers of organic food. As organic food choice is strongly related to perceived consequences for human health (Magnusson et al. 2003) and fear of negative

health consequences from conventional meat drives the choice of organic meat (Verhoef 2005), it can be assumed that buyers of organic food react very sensitive to perceived food safety issues which they expect to negatively influence human health.

Naturalness, animal welfare, boar taint (taste) and costs could be identified as main aspects of the debate about the fattening of boars in organic farming. Participants held different opinions about these aspects. The perceived naturalness was seen quite clearly in a positive way and this topic combines aspects of animal welfare and food safety. Natural living conditions and the chance to engage in natural behavior are important aspects of consumers' perception of animal welfare (Lassen et al. 2006; Te Velde et al. 2002; Vanhonacker et al. 2008). The absence of interventions and drugs implies food safety because the risk of residues is reduced.

A good taste of pork, including boar meat, was important for many participants. Possible aggression among boars was mainly held to be problematic, not least because the keeping of entire males was regarded as more complex and expensive. Here, animal welfare issues and the profitability of the method are linked. Participants considered fattening of boars to be a costly method that could lead to higher pork prices because of the additional costs of sorting carcasses and the challenge of keeping boars. Although participants saw some problems with fattening of boars and boar taint, a degree of openness towards the method became obvious.

Other (quantitative) studies revealed rather negative attitudes towards the fattening of boars. Lagerkvist et al. (2006) found that Swedish consumers valued pork from surgically-castrated pigs (without anesthesia) higher than that of meat from uncastrated pigs. The authors concluded that, in the case of boar taint, food quality (that is, taste) is more important than animal welfare issues. Similarly, Liljenstolpe (2008) determined a lower willingness-to-pay (minus 15%) for the attribute "no castration" than for the base scenario "castration without anesthesia". Many Swiss consumers disagreed with the alternatives "no castration, sort out meat with boar taint and destroy it" (42%) and "no castration, sort out meat with boar taint and produce specific boar products" (40%) (Huber-Eicher & Spring 2008). The comparably more positive attitude of consumers in our study may be explained by the importance they placed on the naturalness of the method and the association of food safety and animal welfare with this aspect.

It is not surprising that animal welfare, food safety, taste and costs are the most important aspects that participants use to assess the alternatives to piglet castration without anesthesia, since most of these aspects are among the main reasons for buying organic products (Hughner et al. 2007). Considering the perceived conflicts between these aspects of the three

alternatives and how participants valued those aspects differently, the results of the focus groups reflect research results on consumer-decision making for animal-friendly products. Different studies show that in general requirements towards product attributes like food safety, quality, taste and price have to be fulfilled before additional ethical aspects like animal welfare are taken into account (Harper & Henson 2001; Ingenbleek & Immink 2011; Vanhonacker et al. 2010; Verbeke & Viaene 2000). However, consumer segments can be identified that place a higher importance on ethical aspects like animal welfare (Meuwissen et al. 2007; Vanhonacker et al. 2007; Vanhonacker et al. 2010).

6.6 Conclusions

With regard to consumer expectations of animal welfare in organic farming, the implementation of alternatives to piglet castration without pain relief is imperative for organic pork production. There is little awareness of this common practice in organic agriculture, and supposedly, if consumers learn about castration without pain relief in organic farming, their image of higher animal welfare standards in organic pork production may be compromised.

Producers and retailers of organic pork have to take consumers' attitudes into account when they decide upon which alternative(s) to implement in organic farming. From a consumers' point of view, acceptable alternatives would be those which fulfill the majority of consumers' requirements regarding crucial aspects like food safety, taste and animal welfare. Yet, in their current state of development, all of the considered alternatives have (perceived) drawbacks which force consumers to trade-off different aspects against each other, for example animal welfare and taste. The task of suppliers is to reduce the perceived discrepancies between those aspects through measures during the production process and adequate communication strategies, in order to increase acceptance of the alternatives.

Piglet castration with anesthesia and analgesia seemed to be the least controversial alternative within this study and would probably be acceptable to consumers of organic pork. Participants' appalled reactions to the information about castration without pain relief imply that anesthesia is expected for surgical interventions.

From the consumers' point of view, fattening of boars could also be an alternative for organic husbandry due to the perceived naturalness of this method. However, for successful implementation, suppliers would have to ensure good sensory meat quality so that consumers are not forced to trade-off taste against animal welfare concerns.

Although facts may contradict participants' perception of immunocastration as some kind of hormonal treatment and possible health risk (Clarke et al. 2008), it may be difficult to dispel organic consumers' concerns because the effects of given information are quite different and not easy to predict. This will be particularly true outside of the controlled setting of a consumer study, as consumers receive information through the media or the internet which are likely not neutral and may even contradict each other.

If different alternatives to piglet castration without pain relief are implemented in organic farming, there are opportunities for product differentiation, based on the issue, which have to be explored. Participants assessed both fattening of boars and castration with anesthesia and analgesia positively, indicating different advantages for each. A product differentiation strategy would require that the issue of piglet castration be crucial for consumers' buying decisions for organic pork and that sufficiently large market segments for each alternative exist. This has to be determined through further research.

Animal welfare concerns are the driving force behind efforts to implement alternatives to piglet castration without pain relief in organic farming. However, it can be hypothesized from the results that participants perceive only little differences in the levels of animal welfare for all the alternatives examined in our study. Stakeholders might take into consideration that, although animal welfare standards are important for consumers of organic pork, with regard to the castration issue other quality aspects like taste and food safety may be even more relevant for consumers' decisions at the point of sale, if they feel that their notion of animal welfare is fulfilled.

As animal welfare is one of the most important additional ethical attributes for consumers of organic food (Zander & Hamm 2010) and as it is also of high importance to consumers in general (TNS Opinion & Social 2007), the question can be raised whether it would be possible for the German organic sector to differentiate organic pork from conventional pork in terms of the castration issue. As long as the regulation for organic farming is the only statutory provision with regard to piglet castration in Germany, there is an advantage for the organic sector. In the long run, however, there will very likely also be regulations for conventional pork production in Germany and the same alternatives will be implemented in conventional pig production. Trying to differentiate would also require that consumers are informed about piglet castration. Further research is necessary to determine how to communicate the issue without discouraging consumers from buying (organic) pork as it is a rather unappetizing topic.

7 Animal welfare versus food quality: Factors influencing organic consumers' preferences for alternatives to piglet castration without anaesthesia

This chapter represents an article published by the author of this dissertation and Prof. Dr. Ulrich Hamm as a co-author. Any reference to this chapter should be cited as:

Heid, A. & Hamm, U. (2013): Animal welfare versus food quality: Factors influencing organic consumers' preferences for alternatives to piglet castration without anaesthesia. Meat Science 95(2), 203-211.

7.1 Abstract

Surgical piglet castration without pain relief has been banned in organic farming in the EU since the beginning of 2012. Alternative methods therefore need to be implemented that improve animal welfare and solve the underlying problem of boar taint. This paper explores German organic consumers' preferences for piglet castration without pain relief and three alternative methods. In an innovative approach using a multi-criteria decision making procedure, qualitative data from focus group discussions were compared with quantitative results from Vickrey auctions. Overall, participants preferred all alternatives to castration without pain relief. Different aspects influenced willingness-to-pay for the methods. Animal welfare was important for the evaluation of castration without pain relief and castration with anaesthesia. Food safety played a major role for willingness-to-pay for immunocastration, while taste and, to some extent, animal welfare were dominant factors for fattening of boars. These differences should be considered when communicating the alternatives.

7.2 Introduction

The surgical castration of piglets is a standard method used to prevent the occurrence of boar taint. Boar taint is an odour and flavour of pork which is perceived as unpleasant by many consumers (see for example Bañon et al. 2003b; Font i Furnols et al. 2003; Font i Furnols et al. 2008; Lunde et al. 2010). Surgical castration is usually conducted without pain relief, but this practice has been increasingly criticized over recent years. It is an extremely painful procedure and there is no scientific evidence that it is less painful for young piglets than it is for older pigs (European Food Safety Authority 2004), an argument which has been used to justify the practice. While regulations concerning piglet castration without pain relief in conventional pig production differ between European countries, there has been an EU-wide ban of piglet castration without pain relief in organic farming since the beginning of 2012.

Alternative methods therefore need to be implemented which improve animal welfare and also offer solutions to the boar taint issue. Three alternatives are likely to be relevant for future pig production. Firstly, castration can be conducted using anaesthesia and/or analgesia, with different options for sedating the piglets, for example, gas or injection (Prunier et al., 2006). Secondly, there is a vaccination against boar taint (immunocastration) which temporarily inhibits the sexual development of male pigs and thereby prevents the occurrence of boar taint. Thirdly, entire male pigs can be raised (fattening of boars), combined with measures to reduce and detect boar taint in meat (Giersing et al. 2006).

Each of these alternatives has different advantages and disadvantages for producers, processors, retailers and consumers, and these influence their respective preferences for alternatives. As it is the consumers who finally eat the pork that is produced, their preferences and willingness-to-pay may be a decisive factor in the successful implementation of alternatives to castration without pain relief. As animal welfare organisations played a major role in driving the recent debate and developments regarding piglet castration it can be expected that they will undertake efforts to inform consumers if they feel the need to do so. Therefore, consumers' preferences should not too easily be discounted by the pork sector on the ground that consumers do not seem to be aware of piglet castration without pain relief.

A number of studies shows that consumers indicate a higher willingness-to-pay for improved animal welfare (Andersen 2011; Carlsson et al. 2007; Dransfield et al. 2005; Lusk et al. 2007; Napolitano et al. 2008; TNS Opinion & Social 2005; Tonsor et al. 2009; Zander & Hamm 2010). However, there are also results that suggest that willingness-to-pay depends on specific animal welfare attributes, or species of animal, and that negative willingness-to-pay might occur (Carlsson et al. 2007; Lagerkvist et al. 2006; Liljenstolpe 2008). In particular, product attributes that have other dimensions besides animal welfare, such as food quality or safety, which is obviously true for some alternatives to piglet castration without pain relief, can lead to heterogeneous consumer preferences (Liljenstolpe 2008). Such heterogeneous consumer preferences might also explain why other studies examining consumers' attitudes and preferences regarding alternatives to piglet castration differ in their results (e.g. Huber-Eicher & Spring 2008; Vanhonacker & Verbeke 2011). Hence, consumers' preferences and willingness-to-pay for alternatives are likely to depend on how the different aspects or attributes of alternatives to piglet castration are perceived and weighted. Although animal welfare is very important to organic consumers, aspects of food safety and taste are also relevant when buying organic products (fischerAppelt relations 2012).

The objectives of this paper are to explore organic consumers' preferences and willingness-to-pay for the three alternatives to piglet castration without pain relief and to identify the factors that might possibly influence such preferences and willingness-to-pay. Participants' willingness-to-pay, which was measured using Vickrey auctions, is compared with findings from focus groups discussions exploring consumers' attitudes and opinions. Additionally, the influence of information about piglet castration and its effects on willingness-to-pay is examined.

7.3 Methods and study design

7.3.1 Data collection

The explorative study comprised nine focus group discussions combined with Vickrey auctions. Focus group discussions are moderated groups of six to twelve persons discussing a specific topic in order to gain information on participants' attitudes and opinions (Burns & Bush 2010). A qualitative approach was chosen because it could be assumed that consumers had hardly any prior knowledge about the issue of piglet castration, and very little was known about organic consumers' preferences for alternatives. The objective of the focus groups was to explore participants' opinions, attitudes and perceptions of piglet castration without pain relief, and the three alternative methods and which aspects were particularly important for consumers' acceptance of alternatives to piglet castration without pain relief.

At the commencement of each focus group, participants received standardised information about piglet castration as a basis for discussion because of the low level of public awareness of the issue⁶. Information provision varied between groups (Table 6). Three groups received information on the common practice of piglet castration without pain relief, the reasons for it and basic descriptions of castration with anaesthesia and/or analgesia, immunocastration and fattening of boars as alternative methods (Variant 1 = minimal information). For Variant 2, the descriptions of castration without pain relief and the three alternatives were extended into the pros and cons of each method (full information). In Variant 3, only the wording of the description of immunocastration changed. The term 'hormone' was included (full information incl. 'hormone'). The rationale for introducing Variant 3 was that European consumers seem

⁶ As an example for the wording of the information, the description of castration without pain relief is given: "For surgical castration, which is conducted in the first seven days of life, the farmer takes the piglet, cuts the skin above the testicles with a scalpel, extracts the testicles and cuts the spermatic cords. Afterwards, the wounds are disinfected, in order to prevent inflammation. The castration is very painful, the strongest pain occurs when the spermatic cords are cut. After the castration the piglets suffer from post-operative pain for several days." The following pros and cons were only added in Variant 2 and 3: "It is advantageous that there is no boar taint. It is a disadvantageous that the castration is very painful for the piglets and they suffer from post-operative pain." Information about the alternatives was structured accordingly.

to be very sensitive with regard to risks from residues in meat like antibiotics and hormones (TNS Opinion & Social 2006; Verbeke et al. 2007). So it was expected that explicitly mentioning the word ‘hormone’ would lead to more negative attitudes towards immunocastration, even though the information given did not state that hormones were used: “the vaccine is similar to a hormone produced naturally in the body. The pig generates antibodies against the vaccine and the hormone”. For castration without pain relief, castration with anaesthesia and analgesia, and fattening of boars, the information given in Variants 2 and 3 was the same.

Table 6: Variation of the given information across the focus groups

Information	Focus Group
Variant 1: Basic information about piglet castration and alternative methods (minimal information)	1
	4
	7
Variant 2: Variant 1 plus pros and cons of each alternative (full information)	2
	5
	8
Variant 3: Variant 2, description of immunocastration includes the word ‘hormone’ (full information incl. ‘hormone’)	3
	6
	9

After receiving information participants discussed castration without pain relief in organic farming and the three alternatives. The moderator prompted topics when necessary using a topic guide. Key questions were

- “What do you think about the fact that piglets are castrated without anaesthesia also in organic farming in order to avoid the occurrence of boar taint?”
- If you look at the information on (alternative): In your personal opinion, what are important reasons for or against the implementation of (alternative) in organic farming?
- Under which conditions would you be willing to eat meat produced with (alternative)?

Vickrey auctions were conducted at the end of each focus group discussion, thereby introducing a quantitative method to the study. In a Vickrey auction, all participants place their bids simultaneously and covertly. The highest bid ‘wins’ but the price payable is determined by the second highest bid (Lusk & Shogren 2007). Vickrey auctions are also known as “sealed-bid second-price auctions” (McAfee & McMillan 1987). As the price is not

directly set by the highest bid, Vickrey auctions are considered as ‘incentive compatible’, which means that the mechanism provides an incentive to the participants to reveal their true willingness-to-pay (Vickrey, 1961; Völckner, 2006). A weakness of this auction mechanism, however, is that the best bidding strategy is not always obvious to participants. Therefore, it is necessary to explain the best bidding strategy, indicating one’s true willingness-to-pay, with an example (Skiera & Revenstorff 1999). Hypothetical bias can be avoided if participants are required to actually pay the price determined by the Vickrey auction (Völckner 2006a). In contrast to other auction mechanisms, Vickrey auctions collect the willingness-to-pay measures of all participants (Skiera & Revenstorff 1999).

Consumers were asked to participate in a Vickrey auction of smoked organic salami. Initially, the moderator explained the procedure of the auction and illustrated the optimal bidding strategy with an example (following Skiera & Revenstorff 1999). It was emphasized that the ‘winner’ of an auction must buy the product. The respective price would be set off against the allowance for participating in the study. Each person could only obtain one package of salami. If one participant placed the highest bid in several auctions, one auction would be determined as binding by drawing lots. Then, the products were presented: four 80g packages of smoked organic salami. The only difference in the salamis was method of piglet castration or, alternatively, non-castration: castration without pain relief, castration with anaesthesia and analgesia, immunocastration and fattening of boars. Participants placed their bids simultaneously on a prepared form for all four salami variants.

7.3.2 Data analysis

Qualitative content analysis of the focus groups, following Gläser and Laudel (2006), revealed which aspects consumers used to evaluate the different methods. Gläser and Laudel (2006) modified the qualitative content analysis developed by Mayring with the openness of the category system being one of the main changes. This means that the category system which has been developed based on theoretical considerations can be adapted to the data during the extraction process by adding relevant categories if necessary. The initial category system in this study was based on the key questions of the topic guide and was refined during the extraction process. The transcribed data material was searched for relevant statements, which were then extracted, summarised and analysed. The detailed results of the content analysis are reported elsewhere (see Heid & Hamm 2012).

The Vickrey auctions were analysed using descriptive statistics (parameters of location and statistical dispersion, frequency distributions). As the main emphasis of the study design was

placed on the focus group discussions and the number of cases was small, no multivariate methods, which are typically used for analysing auctions (Lusk & Shogren 2007), were applied. In view of the fact that the primary focus was on consumers' relative preferences expressed by different bids, the alternatives were ranked at an individual level. Thus, the influence of different bidding levels between individuals and groups could be eliminated. Individual rankings were then summarized in order to obtain rankings at group level and overall.

As it is of interest, whether and how the attitudes and opinions expressed during the focus group discussions are reflected in the willingness-to-pay measures of the Vickrey auctions, we looked for a way to further analyse the focus group data in order to make them comparable with the results of the Vickrey auctions. As participants were faced with a decision between several alternatives with multiple attributes, applying and adapting decision making methods stood to reason. Hence, a scoring model was chosen, to further aggregate the data of the content analysis. Scoring models are counted among qualitative decision making methods and are often used in marketing practice (Benkenstein 2001). They allow for the assessment of alternatives, which can only be described by qualitative attributes, by allocating scores which are derived from the characteristics of an alternative regarding certain decision criteria (Adam 1996). There are several variants of scoring models as there are different ways to allocate, weigh and combine the scores (Adam 1996). A total score for each alternative can be computed by adding the weighted scores of the different decision criteria (Bouyssou et al. 2006). The weighted sum model (WSM) is a very common method in multi-criteria decision making (Triantaphyllou 2010). The total score of an alternative (WSM score) then expresses its subjective 'preferability' (Adam 1996). Here, in contrast to the usual multi-criteria decision process, the WSM was adapted to reproduce the evaluations of participants in the focus groups (at group level). So far, to our knowledge, this is a unique approach to combining qualitative and quantitative data. The appeal of the approach is that a WSM allows ranking alternatives according to their total scores. So, the results could be easily compared to the ranking of alternatives derived from the auction data. It has to be kept in mind that the WSM involves a high degree of subjectivity (Benkenstein, 2001). Therefore, the steps of analysis are presented as transparent as possible.

In marketing and management literature decision processes are formalized and divided into several steps (e.g. Adam 1996; Robbins & Coulter 2009). Adam (1996) distinguishes five steps of the decision making process which were adapted to the approach used in this study.

(I) Definition of adequate assessment criteria: As it was the objective to reproduce participants' evaluation of the four alternatives (at group level), the decision criteria used were based on the content of the focus groups and not, as is usual, on theoretical considerations. Content analysis revealed that participants regarded five aspects (criteria) as particularly relevant for their assessment of the alternatives: animal welfare, food safety, organic farming, taste and costs. The data set was then further analysed in order to identify "sub-criteria" for each of the main criteria. This resulted in different sets of sub-criteria for the different alternatives, which is a deviation from standard procedure. (II) Definition of weights for the criteria: Weights for the different criteria were determined on the basis of recent studies of consumers' reasons for buying organic products (FischerAppelt relations, 2012; Zander & Hamm, 2010). Animal welfare received the highest weight (0.3), followed by food safety (0.25), organic farming (0.2), taste (0.15) and costs (0.1). As there were different sets of sub-criteria for each criterion and alternative, it was only regarded as to whether the sub-criterion was a positive or negative aspect. The 'direction' of the respective sub-criteria was considered by using positive or negative algebraic signs for the weights. Stolz et al. (2009) evaluated the relevance of topics discussed in focus groups on the basis of the assumption that more relevant topics are addressed more frequently by a higher number of participants. Following this argument, we assumed that arguments appearing in several focus groups were of greater importance than others. Hence, those sub-criteria which appeared in at least six out of nine groups were assigned double weights. (III) Selection of possible characteristics of the criteria: The focus group data were analysed in terms of the selected criteria and it was determined as to whether the sub-criteria were discussed or not and how intense the discussion was in each group. (IV) Assessment of the alternatives by experts: The scores for each criterion were assigned according to variety of arguments and intensity of discussion (0=not discussed, 1=discussed, 2=discussed intensively). High scores for the criteria indicate an intensive discussion with many arguments, with the arguments (sub-criteria) being clearly discussed in a positive or negative 'direction'. Due to the positive and negative weights of the sub-criteria, positive and negative aspects could cancel each other out. Therefore, controversial discussions led to relatively lower scores for the criteria (for an exemplary calculation see Appendix 8). (V) Calculation of the total WSM score for each alternative and ranking the alternatives based on the scores.

7.3.3 Characterisation of the sample

Nine Vickrey auctions were conducted in three German cities in autumn 2009, each following an approximately one hour focus group discussion on alternatives to piglet castration without pain relief in organic farming. All participants were required to be at least occasional consumers of organic pork which was determined by a screening questionnaire. Additionally, quotas for gender and age were applied. As several studies have shown that women are predominantly responsible for grocery shopping in Germany, a share of 60-70% women within the focus groups was intended (Plaßmann & Hamm 2009; Spiller et al. 2004). According to the distribution of the German population, 50% of participants were supposed to be between 18 and 44 years old and 50% between 45 and 75 years (Statistisches Bundesamt 2008). Overall, 89 consumers of organic pork participated in the study. The number of people per focus group lay between seven and twelve. The quotas for gender and age were met, with a relatively high proportion of men (38%). For the analysis of auction data, 88 cases could be used.

In a brief questionnaire, which was filled in before the beginning of group discussions, participants stated their buying frequency with regard to six product groups in organic quality, and indicated their knowledge of the issue of piglet castration. From the buying frequency, an 'organic index' was established for each participant. This organic index ranged between values of 0 (hardly ever buying any of the product groups in organic quality) and 12 (almost always buying every product group in organic quality). Table 7 shows an overview of the average organic index for each focus group. It became obvious that most participants were buying organic products very frequently. This was not surprising, as only a relatively small group of dedicated consumers of organic food buys most of the organic pork in Germany (Buder et al. 2010). The very high average index values associated with Groups 4 and 5 were notable; Group 5, in particular, was comprised solely of dedicated consumers of organic food. The lowest average value emerged in Group 8, where the lowest individual index value of 4 was also found.

The question about knowledge of piglet castration was asked before the beginning of the focus group discussions. At this point, the participants had not received any information about the issue from the moderator. Consequently, the knowledge that piglets are castrated could not be equated with the knowledge that castration is usually performed without pain relief. This position was also confirmed by remarks made during the focus group discussions. Altogether, more than half of the participants did not know that male piglets are commonly castrated (Table 7). Knowledge about piglet castration differed between groups: the highest share of

participants who stated that they were informed about piglet castration was found in Group 5 (83%), while this share was lowest in Group 9 (27%).

Table 7: Organic index in the focus groups and knowledge about castration of piglets

Organic index ^a						Knowledge about castration ^b		
Group	N	Mean	Median	Min	Max	N	Yes (%)	No (%)
1	11	8.5	8	6	12	-	-	-
2	9	9.2	9	5	12	8	37.5	62.5
3	8	9.0	9 ^c	7	12	9	66.7	33.3
4	10	10.4	11 ^c	7	12	10	30.0	70.0
5	7	11.3	11	10	12	6	83.3	16.7
6	8	9.9	10 ^c	6	12	8	37.5	62.5
7	11	9.3	9	5	12	10	40.0	60.0
8	10	8.3	8,5 ^c	4	12	10	60.0	40.0
9	12	9.6	9,5 ^c	6	12	11	27.3	72.7
Total	86	9.4	9,5 ^c	4	12	72	45.8	54.2

^a Index based on the self-reported buying frequency of six product groups in organic quality: hardly ever (0); from time to time (1); almost always (2) in organic quality. Minimum index value = 0; maximum index value = 12

^b The question "Have you ever heard that male piglets are castrated for fattening?" (Answer: yes or no) was added after focus group 1 had been conducted

^c When the number of cases was even, the mean of the two middle values was taken as median

7.4 Results

7.4.1 Willingness-to-pay

Table 8 gives an overview of the Vickrey auction results. Overall, average willingness-to-pay was highest (2.17€) for the salami produced with meat from pigs castrated with anaesthesia and analgesia. The lowest average willingness-to-pay was found for castration without pain relief (1.19€). On average, willingness-to-pay for immunocastration was only slightly higher at 1.33€. For fattening of boars, participants were willing to pay 2.12€, which was only just below the average value for castration with pain relief.

By far the lowest average bids for each alternative were placed in Group 5. The highest average bids for each alternative were scattered over different groups. Participants in Group 9 placed the highest bid for castration without pain relief (1.83€). It is notable that, in this group, the average willingness-to-pay for the three alternatives was consistently lower than that for castration without pain relief. Group 6 had the highest average willingness-to-pay for castration with anaesthesia and analgesia (2.67€). The highest average bid for

immunocastration (2.69€) occurred in Group 3, while Group 4 was willing to pay the most (2.86€) for salami made with boar meat.

Table 8: Average willingness-to-pay per group

Group	Castration without pain relief	Castration with pain relief	Immunocastration	Fattening of boars
	€	€	€	€
1 (n=11)	1.08	2.01	1.98	1.63
2 (n=9)	1.80	2.55	2.08	2.60
3 (n=8)	1.50	2.54	2.69	1.94
4 (n=10)	1.69	2.25	0.71	2.86
5 (n=7)	0.07	1.64	0.14	0.86
6 (n=9)	0.72	2.67	1.26	2.57
7 (n=11)	0.71	2.08	1.52	2.63
8 (n=11)	0.99	2.16	0.84	2.40
9 (n=12)	1.83	1.79	0.79	1.31 ^a
Total (n=88)	1.19	2.17	1.33	2.12^b

^a n=11; ^b n=87

It can be shown that, with a few exceptions, the highest average bids within each group were either placed for castration with pain relief (Groups 1, 5 and 6) or for fattening of boars (Groups 2, 4, 7 and 8). The lowest average bids in each group were distributed solely between castration without pain relief (Groups 1, 2, 3, 5, 6 and 7) and immunocastration (Groups 4, 8 and 9). All in all, the relatively high standard deviations (which have not been shown here for the sake of clarity) revealed fairly heterogeneous bidding behaviour within the individual groups.

As the analysis of the auction data focuses on participants' relative preferences expressed by willingness-to-pay, an individual ranking of alternatives was conducted. Thus, it was possible to compensate for bias due to different levels of bidding. The 'points' allocated to individual rankings⁷ were summarized in order to arrive at a ranking for each group (Table 9). Participants' preference for castration with anaesthesia and analgesia was emphasized by the ranking, since this alternative was placed first or second in each group. Also, the fattening of

⁷ Rules for the individual ranking of the alternatives: Zero-bids always received 0 points; all other bids were ranked according to the following rules: highest bid = 4; second highest bid = 3; third highest bid = 2; fourth highest bid = 1; equal bids always received the same rank; points were allocated beginning from the top (4); if one rank was allocated several times, the following lower ranks were omitted.

boars was mostly ranked first or second, with exception of Groups 3 and 9, where it was ranked third. Immunocastration was given a third or fourth ranking with the exception of Groups 1 and 3. The lowest relative preference was identified for castration without pain relief, which was ranked last in six out of nine groups. The ranking of this alternative in Group 9 is noteworthy. It was ranked second, while the average willingness-to-pay was higher than for all other alternatives (Table 8). With the exception of one person, no participant in Group 9 expressed a preference for castration without pain relief by their bidding behaviour. Hence, preferences were described better by the ranking, than by the mean of the bids.

In order to analyse participants' preferences, a consideration of the share of zero-bids is also insightful (Table 9). Zero-bids show that participants were not willing to buy the product at all. Hence, a high share of zero-bids indicates strong rejection of an alternative. The highest rank of an alternative always corresponded to the lowest share of zero-bids (with exception of Group 9). Conversely, the lowest rank always coincided with the highest share of zero-bids. Particularly high shares of zero-bids could be found for castration without pain relief and immunocastration.

Table 9: Ranking of the alternatives and percentage of zero-bids per group

Group	Castration without pain relief		Castration with pain relief		Immunocastration		Fattening of boars	
	Rank ^a	Zero-Bids (%)	Rank ^a	Zero-Bids (%)	Rank ^a	Zero-Bids (%)	Rank ^a	Zero-Bids (%)
1 (n=11)	1	27.3	4	0.0	3	18.2	3	9.1
2 (n=9)	1	22.2	4	11.1	2	22.2	3	11.1
3 (n=8)	1	25.0	3	0.0	4	0.0	2	12.5
4 (n=10)	2	20.0	3	10.0	1	70.0	4	0.0
5 (n=7)	1	85.7	4	28.6	2	85.7	3	71.4
6 (n=9)	1	77.8	4	22.2	2	66.7	3	44.4
7 (n=11)	1	54.5	3	9.1	2	27.3	4	9.1
8 (n=11)	2	54.5	3	18.2	1	63.6	4	9.1
9 (n=12)	3	16.7	4	25.0	1	75.0	2	36.4 ^b
Total (n=88)	1	40.9	4	13.6	2	47.7	3	20.7^c

^a 4 = highest rank to 1 = lowest rank; ranking based on the sum of individual rankings of the alternatives with 4 = highest bid, 3 = second highest bid, 2 = third highest bid, 1 = fourth highest bid;

^b n=11; ^c n=87

In contrast, the shares were lowest for castration with pain relief. For the fattening of boars, the shares of zero-bids form a heterogeneous picture with both high and low shares. Overall, the share of zero-bids is highest for immunocastration with almost 50%, although the average willingness-to-pay and the ranking are higher than in the case of castration without pain relief.

7.4.2 Influencing factors

Since it was necessary to inform participants about the issue of piglet castration and alternative methods before the discussions and auctions, the influence of information on willingness-to-pay must be considered. Moreover, it can be assumed that both the process and content of focus group discussions affect participants' preferences for alternatives and, consequently, their willingness-to-pay. Hence, in the following section, results from the auctions are considered against the background of the focus group discussion. This should highlight those factors which are of particular relevance to consumers' preferences and willingness-to-pay.

7.4.2.1 Information

The ranking of alternatives according to the three information variants (Table 10) shows, more clearly than the average bids, that the influence of differences between the information variants on willingness-to-pay was negligible. Castration without pain relief and immunocastration do not change their ranking as the result of further information. Even with minimal information (Variant 1), castration without pain relief is ranked last; however, the share of zero-bids is higher with additional information (Variants 2 and 3) than with minimal information.

Table 10: Ranking of alternatives and percentages of zero bids within the three different information variants

Information Variant	Castration without pain relief		Castration with pain relief		Immuno-castration		Fattening of boars	
	Rank ^a	Zero-bids (%)	Rank ^a	Zero-bids (%)	Rank ^a	Zero-bids (%)	Rank ^a	Zero-bids (%)
Variant 1 (n=32)	1	34.4	3	6.3	2	37.5	4	6.3
Variant 2 (n=27)	1	51.9	4	18.5	2	55.6	3	25.9
Variant 3 (n=29)	1	37.9	4	17.2	2	51.7	3	32.1 ^b

^a 4 = highest rank to 1 = lowest rank; ranking based on the sum of individual rankings of the alternatives with 4 = highest bid, 3 = second highest bid, 2 = third highest bid, 1 = fourth highest bid; ^b n=28

Only in the case of immunocastration did the given information differ across all three variants, since the word 'hormone' was added in Variant 3. Here, a negative reaction among participants was expected. However, as participants in every focus group associated immunocastration with hormones in some way, no differences in the ranking of information variants could be found. With additional information, a change in position can be observed for castration with pain relief and fattening of boars. Fattening of boars moved down one position when participants received additional information on the pros and cons of methods. Overall, there were considerably more zero-bids in information Variants 2 and 3, and the highest shares could be found for immunocastration. It can be assumed that, especially for this alternative, more information leads to a polarisation of opinion. On the one hand, there were many zero-bids which show that participants did not want to buy the salami at all; on the other, some participants expressed a comparably high willingness-to-pay, with the result that immunocastration was still placed on the second lowest rank, instead of the lowest rank as the high shares of zero-bids would suggest. To a lesser degree, this polarisation due to more information can also be seen in the other alternatives.

7.4.2.2 Contents of the focus group discussions

The results of the multi-criteria decision process are depicted in (Table 11). For interpretation of the WSM scores, it should be borne in mind that intensity of discussion as well as diversity and 'direction' of arguments were incorporated into the model. A high score with a negative algebraic sign (for example, taste) means that this criterion was discussed intensely and predominantly negatively in the focus group. Positive and negative scores can offset each other due to addition. High negative or positive total WSM scores for an alternative indicate that the relevant criteria were discussed in-depth and relatively unambiguously in a positive or negative direction. If one aspect was not discussed at all, or if positive and negative arguments offset each other completely, the score would be zero. As it makes a difference whether a criterion was not discussed or discussed in a controversial way, the zero scores in Table 11 are explained in the following.

The total WSM scores for castration without pain relief and for immunocastration were consistently negative. For castration with pain relief and fattening of boars, both negative and positive WSM scores occurred. The criteria with particularly high scores, which contributed the most to the total WSM score, varied between the alternatives. For castration without pain relief, these criteria were animal welfare and to an extent organic farming (not appropriate for organic farming). The scores of Groups 2, 3, 6, 7 and 9 were particularly low (< -2): here,

animal welfare was discussed very negatively, with the exception of Group 6, where the organic farming aspect had the strongest contribution to the total WSM score. The highest WSM score (-1) for castration without pain relief could be found in Group 8, where animal welfare was not explicitly discussed. Food safety, taste (and in some groups costs) were not discussed with regard to castration without pain relief (zero scores).

Animal welfare was also a deciding criterion for castration with anaesthesia and analgesia; however, the arguments were mainly positive. In the three groups which had a negative WSM score for castration with pain relief (2, 5 and 7), this was the result of negative discussions about food safety. Only in Group 5 the animal welfare score was also slightly negative. Taste was not discussed in the context of castration with pain relief. Obviously, it was taken for granted that there would be no problems regarding this criterion. The supposedly high costs of this alternative were consistently evaluated as negative. Due to the relatively low weight given to this criterion (Zander & Hamm 2010), this had little influence on the overall WSM scores. The zero scores for food safety in Groups 1 and 8 resulted from positive and negative sub-criteria offsetting each other.

Food safety was an important criterion for the evaluation of immunocastration in all groups, while other criteria did not contribute much to the total WSM scores. Comparing the different groups, the results were quite homogenous. The animal welfare score was slightly negative in Groups 6, 7, 8 and 9 because the possible negative side effects of the vaccination on the pigs were discussed in more detail than in the other groups with positive scores. The zero scores for animal welfare in Groups 2 and 4 resulted from positive arguments (harmless intervention, low stress level) being offset by negative ones (negative side effects for the animals), while the criterion was not discussed in Group 5. Again, taste was not discussed at all in context of this alternative and the zero scores for costs and organic farming also show that the criterion was not discussed in these groups.

Regarding fattening of boars, however, taste was an important criterion in several groups. This criterion also included “open questions with regard to boar taint and use of tainted meat”, which were discussed intensively in most groups and had a negative influence on the taste score. Here, it became particularly obvious that due to the widespread practice of piglet castration most consumers had no experience with boar taint and no idea how it would affect them.

Table 11: Comparison of focus groups with regard to animal welfare, food security, organic farming, taste and cost (weighted sum model, WSM)

Alternatives and criteria	Weight	FG 1	FG 2	FG 3	FG 4	FG 5	FG 6	FG 7	FG 8	FG 9
Castration without pain relief										
Animal welfare	0.30	-0.90	-1.95	-1.20	-0.75	-0.60	-0.90	-2.10	0.00	-1.50
Food safety	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Organic farming	0.20	-0.40	-0.40	-1.00	-0.60	-0.60	-1.20	-0.20	-0.80	-0.60
Taste	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost	0.10	-0.40	-0.40	-0.20	-0.40	0.00	-0.20	0.00	-0.20	0.00
WSM score		-1.70	-2.75	-2.40	-1.75	-1.20	-2.30	-2.30	-1.00	-2.10
Rank within group^a		1	1	1	1	3	1	1	2	1
Castration with pain relief										
Animal welfare	0.30	0.90	0.30	1.20	0.60	-0.30	0.30	0.30	0.60	0.60
Food safety	0.25	0.00	-0.50	-0.50	0.25	-0.75	0.25	-0.50	0.00	-0.25
Organic farming	0.20	-0.60	-0.20	0.00	0.00	0.00	0.00	0.00	0.20	0.00
Taste	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost	0.10	-0.10	-0.20	-0.10	0.10	-0.20	0.00	-0.10	-0.05	-0.10
WSM score		0.20	-0.60	0.60	0.95	-1.25	0.55	-0.30	0.75	0.25
Rank within group^a		4	4	4	4	2	4	3	3	4
Immunocastration										
Animal welfare	0.30	0.60	0.00	0.30	0.00	0.00	-0.30	-0.60	-0.30	-0.30
Food safety	0.25	-1.75	-1.00	-1.25	-1.25	-1.50	-1.00	-1.25	-1.50	-1.25
Organic farming	0.20	-0.20	-0.20	-0.20	-0.20	0.00	0.00	-0.40	-0.20	0.00
Taste	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost	0.10	-0.10	0.00	0.00	-0.10	0.00	0.00	0.00	0.00	0.00
WSM score		-1.45	-1.20	-1.15	-1.55	-1.50	-1.30	-2.25	-2.00	-1.55
Rank within group^a		2	3	3	2	1	2	2	1	3
Fattening of boars										
Animal welfare	0.30	-0.30	-1.20	-1.50	-0.90	0.60	0.00	0.30	0.00	-0.90
Food safety	0.25	0.50	0.50	0.00	0.50	0.00	0.50	0.50	0.50	0.50
Organic farming	0.20	0.40	0.20	0.20	0.20	0.00	0.00	0.00	0.40	0.00
Taste	0.15	-0.90	-1.05	-1.05	-0.75	-1.05	-0.08	0.00	0.15	-0.98
Cost	0.10	-0.20	-0.20	0.00	-0.20	0.00	-0.30	-0.20	-0.20	-0.20
WSM score		-0.50	-1.75	-2.35	-1.15	-0.45	0.13	0.60	0.85	-1.58
Rank within group^a		3	2	2	3	4	3	4	4	2

^a 4 = highest rank to 1 = lowest rank. based on WSM scores for each alternative

FG = focus group

In some groups (2, 3, 4 and 9), the animal welfare criterion also had a negative impact on the total WSM score. The aggressive behaviour of boars played a major role in the animal welfare discussions of these groups. In those groups with low or zero scores for animal welfare this was due to controversial arguments. Hence, consumers' were not sure how to evaluate the animal welfare aspects of fattening of boars. If at all, the food safety aspect was regarded positively for fattening of boars because no drugs are used which was considered as natural. A positive WSM score was reached in Groups 6, 7 and 8, where animal welfare and taste were discussed positively, or only slightly negatively. The ranking of the alternatives based on total WSM scores (Table 11) matched the ranking based on auction data (Table 9) in 21 out of 36 positions (58%).

7.5 Discussion

So far, there are only a few studies on alternatives to piglet castration without pain relief that also include consumers' willingness-to-pay. Liljenstolpe (2005; 2008) examined willingness-to-pay for animal welfare among Swedish consumers, and castration was only one of several other animal welfare attributes. Willingness-to-pay for castration with anaesthesia was higher than for castration without pain relief (Liljenstolpe 2005), which is consistent with our results. In contrast, willingness-to-pay for 'no castration' was 15% lower than that for castration without pain relief (Liljenstolpe 2008). The author assumed that, besides animal welfare considerations, concerns about boar taint also influenced willingness-to-pay. Similar results were obtained by Lagerkvist et al. (2006) who found a 21% lower willingness-to-pay among Swedish consumers for 'no castration' compared with surgical castration. They concluded that, with regard to boar taint, food quality was more important to consumers than animal welfare. In our study, willingness-to-pay for fattening of boars was considerably higher than for castration without pain relief (78%).

The trade-off assumed by Liljenstolpe (2008) and Lagerkvist et al. (2006) between the risk of boar taint and animal welfare considerations could indeed be observed during our focus group discussions. Both topics were discussed intensively with regard to the fattening of boars and, in most focus groups, the animal welfare aspects were not seen as wholly positive due to the possible aggressive behaviour among boars. In spite of this criticism, however, willingness-to-pay for fattening of boars was relatively high, on average. It seems that participants regarded these animal welfare concerns as being less severe than those associated with castration without pain relief. Additionally, most participants had no personal experience of boar taint, and food safety (no drugs) was considered positively, particularly in comparison

with immunocastration. In order to reduce the perceived conflict between taste and animal welfare it may be helpful to offer samples of boar meat for tasting. Most consumers were unsure how boar meat might taste and expressed a high willingness to at least try it before making a final decision.

Willingness-to-pay for immunocastration was 21% higher than for surgical castration in the study of Lagerkvist et al. (2006). In our study, willingness-to-pay for immunocastration was also higher (12%) compared with castration without pain relief, yet it was considerably lower than the willingness-to-pay for both castration with pain relief and fattening of boars. Lagerkvist et al. (2006) assumed that immunocastration is a pareto-efficient option for consumers because there is no risk of boar taint and, at the same time, animal welfare is improved in comparison to surgical castration. Food safety concerns would thereby be secondary to improved animal welfare. Our focus group results suggest that these considerations may not have the same relevance for the participants of our study, who were predominantly dedicated consumers of organic products. Food safety considerations had the strongest (negative) contribution to the total WSM score for immunocastration in all our groups, while the highest average willingness-to-pay was found for castration with pain relief. This alternative also has no risk of boar taint and animal welfare is considerably improved. In addition, our participants rated castration with pain relief as less risky with regard to food safety than immunocastration. Castration with anaesthesia and analgesia was not included in the study of Lagerkvist et al. (2006). The selection of alternatives presented to consumers in different studies, therefore, explains to some extent different results regarding consumer acceptance.

Vanhonacker et al. (2009) examined Belgian consumers' willingness-to-pay for immunocastration in comparison to castration without pain relief. Despite very positive attitudes towards immunocastration, the price premium that was acceptable to consumers was still only 5%. In a further international study with consumers from France, Belgium, the Netherlands and Germany, willingness to pay a slight premium for meat from immunocastrated pigs was positive on a relatively low level in all countries. The overall favourable attitude towards immunocastration was least pronounced among German consumers. At the same time, willingness to pay a slight premium for castration with pain relief was negative in three out of four countries (France, Netherlands, Belgium); the only exception was Germany with a slightly positive willingness-to-pay (Vanhonacker & Verbeke 2011). There seem to be differences between countries regarding the acceptance of

alternatives to piglet castration without pain relief. Our results would support the assumption that German consumers appear to be more reluctant with regard to immunocastration than consumers of other countries. However, more cross-country studies are needed to examine this assumption more thoroughly.

Considerable shares of zero-bids were found for the alternatives castration without pain relief and immunocastration (Table 9). Zero-bids indicate that participants did not want to buy that particular product at all. Lusk (2011) argues that individuals who value animal welfare particularly highly often reduce or stop eating meat. Such sentiments were also expressed by participants during the focus group discussions when confronted with the practice of castration without pain relief. Hence, high shares of zero-bids for this alternative are not surprising, as animal welfare was the most important factor in its evaluation. Similarly, it can be argued that participants who were particularly concerned about food safety issues, and perceived the risks of residues as relatively high, were likely to place a zero-bid for immunocastration. Although there is scientific evidence that immunocastration bears no risk to human health arising from residues in meat (Clarke et al., 2008), some participants expressed strong concerns about food safety. It is a general problem in the communication of risk that experts' risk assessment may differ considerably from lay perceptions, due to differing perspectives and values (Scherer & Juanillo 1992). If these differences in risk perception result in many consumers being not willing to buy a product at all, food retailers will likely not offer such a product which has consequences for producers and the implementation of alternatives to piglet castration without pain relief in organic farming. Indeed, a survey among stakeholders of the pig sector in Germany showed that slaughterhouses and processors do not accept immunocastrated pigs on the ground of lacking consumer acceptance (Steinmann et al. 2012). The high shares of zero-bids for immunocastration support this reasoning at least for consumers of organic meat.

The results of the Vickrey auctions emphasize the minimal influence of differences in information provision on participants' evaluation of the alternatives. It can be assumed that the three information variants were not distinct enough from each other to achieve a more pronounced effect. Due to the strong association of immunocastration with hormones, the attempt to examine the effect of using or avoiding this term was mainly unsuccessful. In the case of the other alternatives, the information given in Variants 2 and 3 were the same.

Recent studies of the alternatives to castration without pain relief established a relationship between consumers' preferences for certain alternatives and the information given (Hofer &

Kupper, 2008; Huber-Eicher & Spring, 2008; Huber-Eicher, 2008; Tuytens et al., 2011). Vanhonacker et al. (2009) did not find a significant difference in the acceptance of immunocastration for different information variants. In the study of Tuytens et al. (2011) the effect of different information on consumers' opinions was significant when additional audio-visual material was provided. Under these conditions, all the alternatives were more strongly preferred in comparison to surgical castration without pain relief. Other studies including ours only provided information in textual form which was read by the participants themselves or read out loud by the researcher. Obviously, the way information is provided (audiovisual, textual) influences consumers' attitudes and may even have a stronger effect than slight differences concerning contents. Fredriksen et al. (2011) suggest that individual interpretations of given information play an important role in the acceptance of alternatives. In the focus group studies undertaken by Fredriksen et al. (2011), information provided on immunocastration was interpreted by some participants in a very negative way. In a study on perception of pork labelling, consumers used the "no" labelling (no antibiotics, no hormones, no chemicals, etc.) to identify potential health and animal welfare risks (Abrams et al. 2010). Such effects may also occur when information on alternatives to piglet castration are given, and may explain the decrease in rank of fattening of boars and the increased share of zero-bids for all alternatives when more information was provided. More information may point out aspects to consumers which they did not think of by themselves (for example with regard to animal welfare issues of fattening of boars) and which may alter their opinions and preferences.

Altogether, no clear picture emerges with regard to the effect of information on preferences and willingness-to-pay. Furthermore, the results in literature are rather ambiguous. It is obvious, however, that there is lack of knowledge about the issue of piglet castration among consumers and this must be considered in communication efforts regarding the alternatives. An individual who does not know that piglets are castrated (without pain relief) may not be able to understand and interpret information appropriately as regards alternative methods.

7.6 Conclusions

Overall, the auction data show that organic consumers preferred all three alternative methods to castration without pain relief. Castration with anaesthesia and analgesia was preferred most strongly followed by fattening of boars and immunocastration. Other studies have focused mainly on immunocastration, and found a higher acceptance or willingness-to-pay for this alternative. So far, no other study has compared willingness-to-pay for all four relevant

alternatives directly. Obviously, the consumer preferences that are determined will depend on the selection of alternatives tested. Hence, comparability of studies testing different sets of alternatives is limited. Furthermore, there seem to be country specific differences and effects of how and which information is provided.

The comparison of the auction data with results from focus groups showed that certain criteria were more relevant than others in the assessment of different alternatives. Thus, food safety was of particular importance in the evaluation of immunocastration while, for fattening of boars, the focus lay on taste and the potential for using tainted meat. Consequently, communication measures have to be adapted accordingly. Critical and important aspects of the alternatives need to be addressed specifically. Additionally, a quantitative study might examine whether different alternatives to piglet castration without pain relief appeal to different consumer segments, including consumers in general, as well as organic consumers. The polarization of opinions observed with regard to immunocastration indicates that this might be the case.

The analysis also revealed controversial aspects, e.g. animal welfare for fattening of boars, and could confirm that consumers feel the need to trade off attributes which they feel to be incompatible in some alternatives (e.g. taste and animal welfare). Therefore, efforts in the development of the alternatives as well as communication should be undertaken to reduce consumers' perceived "conflicts" between important product attributes.

With the adaptation of the scoring model we tried a new way of analysing and combining qualitative and quantitative data. The method allowed us to reduce the complexity of the focus group data. Thereby, a comparison between the different focus groups was possible and the rankings from scoring model and auction results could be compared. At the same time, however, the procedure implies an information reduction and some subjective decisions and the total WSM score is an abstract number which can hardly be interpreted. Therefore, transparency of the procedure is crucial and maybe the insights won within the particular steps of the analysis are more meaningful than the resulting scores.

8 Organic consumers' willingness-to-pay for boar meat products before and after tasting product samples

This chapter represents an article published by the author of this dissertation and Prof. Dr. Ulrich Hamm as a co-author. Any reference to this chapter should be cited as:

Heid, A. & Hamm, U. (2013): Organic consumers' willingness-to-pay for boar meat products before and after tasting product samples. Organic Agriculture, DOI <http://dx.doi.org/10.1007/s13165-013-0047-x>

8.1 Abstract

This paper examines organic consumers' willingness-to-pay for a boar meat product (salami) before and after tasting product samples. Boar meat products are unfamiliar to consumers in many European countries. Offering samples for tasting is a frequently used marketing tool for new products and could also be of interest for introducing organic boar meat products. Ratings for odour and flavour as well as stated preferences were compared with results from Vickrey auctions before and after tasting samples of organic salami produced with and without meat from uncastrated male pigs. Overall, offering product samples for tasting had a significant negative effect on willingness-to-pay for boar salami. Considering consumers preferences for the tasted products, it became clear that consumers preferring the boar salami significantly increased their willingness-to-pay (20%). However, the negative effect of a negative evaluation of the boar salami on willingness-to-pay was considerably stronger (50%). The paper shows that hedonic experiences strongly influence willingness-to-pay. Therefore, product tastings can be very useful in introducing meat from uncastrated male pigs. However, the pork either needs to be closely screened for boar taint and/or the tastings have to be accompanied by communication measures to explain characteristics of boar meat.

8.2 Introduction

Animal welfare and taste are two of the reasons named most frequently by German consumers for buying organic food (fischerAppelt relations 2012). However, sometimes it is difficult to meet consumers' requirements for both attributes simultaneously. For example, with regard to the issue of piglet castration, consumers and producers of pork are faced with a dilemma: the common practice of castration without pain relief ensures good product quality (taste) through preventing the occurrence of boar taint, but presents a major animal welfare problem as it is a very painful procedure for the animals. Abandoning piglet castration in favour of improved

animal welfare, however, may lead to reduced consumer acceptance of pork due to the risk of boar taint.

Boar taint is the unpleasant odour and flavour of pork which may occur in meat from uncastrated (also called 'entire') male pigs and is often "described as 'animal', 'urine', 'fecal' and/or 'sweat' like in character" (European Food Safety Authority 2004). Consumer perception and acceptance of boar meat/taint have been widely studied in the past and the results are ambiguous. While consumers in some studies found boar meat products not acceptable (e.g. Babol et al. 2002; Bañon et al. 2003b; Bañon et al. 2004; Font i Furnols et al. 2008) other studies could not determine significant differences between consumers' assessment of boar meat and comparison samples, or found only a low proportion of evaluations that were negative (e.g. Gullett et al. 1993; Kempster et al. 1986; Nold et al. 1997; Pearson et al. 1971; Rhodes 1971; Rhodes 1972). Generally, the awareness of piglet castration and boar taint is relatively low among consumers (Heid & Hamm 2012; Huber-Eicher & Spring 2008; Vanhonacker et al. 2009; Vanhonacker & Verbeke 2011).

An obvious solution to the dilemma would be to castrate piglets with appropriate pain relief. However, it is also suggested that surgical castration should be avoided completely. In the "European declaration of alternatives to surgical castration of pigs", representatives of farmers, the meat industry, retailers, scientists, veterinarians and animal welfare organisations agreed that surgical castration of piglets should be abandoned from 2018 in order to harmonise the alternatives applied within the European Union (EU). Currently, several different alternatives are used which could cause problems for trade in pork (European Commission 2010). In a transition period, surgical castration should only be performed with analgesia and/or anaesthesia and efforts should be undertaken to facilitate the end of surgical castration (European Commission 2010).

In contrast to the rather tentative agreement for conventional farming, surgical castration without adequate anaesthesia and/or analgesia has been banned from organic farming since the beginning of 2012 (Commission Regulation (EC) No 889/2008). Principally, this does not mean a total abandonment of surgical castration, as it can still be performed with adequate pain relief in order to maintain product quality. However, considering the declaration of intent by the conventional sector, it is doubtful as to whether the organic pig sector can afford to lag behind. Additionally, consumers of organic pork have high quality expectations of meat with regard to both animal welfare standards and taste (fischerAppelt relations 2012; Heid & Hamm 2012; Hughner et al. 2007; Pleon 2008; Pleon 2010).

Information on consumer reactions and willingness-to-pay are crucial for the successful marketing of boar meat products. Heid and Hamm (2010) showed that research results with regard to acceptance of boar meat were ambiguous as some studies found that boar meat was mainly rejected while other concluded that it was acceptable for most consumers. In addition, consumer awareness of the issue is limited due to the long tradition of piglet castration. Hence, boar meat products can be regarded as new and unfamiliar products for consumers. It is likely that there would be some misconceptions and uncertainty in terms of quality and taste. For retailers, one way of dealing with this problem is to offer samples to consumers. Organic sausages produced without nitrite curing salt, for example, seemed unacceptable to consumers due to the grey colour of the final product. However, a store test in several German supermarkets showed that samples for tasting were a particularly good way of introducing the unfamiliar organic sausages, which were readily accepted by consumers of both organic and conventional sausages, and gained a market share of 17% during the test period (Hamm 2007). In combination with other communication measures, giving free samples to consumers is a widely used marketing tool when launching new products (Armstrong & Kotler 2009). Consumers receiving free samples are more likely to make an initial trial purchase and also to be repeat purchasers (Blackwell et al. 2006). In this context, the aim of this paper is to explore organic consumers' preferences and willingness-to-pay for products containing boar meat and the effect of offering samples for tasting on willingness-to-pay.

8.3 Methods

Nine Vickrey auctions were conducted in combination with product tastings, in order to examine consumers' willingness-to-pay for boar salami before and after offering samples for tasting.

8.3.1 Vickrey auction

Vickrey auctions are also known as sealed-bid second-price auctions (McAfee & McMillan 1987). Bidders simultaneously place sealed bids. The highest bid wins, yet the product price is determined by the second highest bid or, rather, the first rejected bid (Vickrey 1961). As the price to be paid is not dependent on the persons' own bid, second-price auctions are incentive compatible, meaning that the optimal strategy for bidders is to reveal the real value they place on the product (Lusk & Shogren 2007; Vickrey 1961). The optimal bidding strategy of a Vickrey auction is not necessarily obvious to participants and, therefore, it is useful to illustrate the bidding mechanism and strategy with an appropriate example (Skiera & Revenstorff 1999). A hypothetical bias that is, overbidding due to lack of real economic

consequences can be avoided when participants are required to purchase the auctioned product (Völckner 2006a). Additionally, Vickrey auctions elicit the willingness-to-pay of all participants because bids are collected simultaneously (Skiera & Revenstorff 1999).

8.3.2 Offering product samples for tasting

In this study, the aim of tasting a boar meat product was not to evaluate odour or flavour attributes, or the consumer perceptions of boar taint, but primarily to explore the effect of such a promotion measure on preferences and willingness-to-pay. Thus, the tasting of samples can be seen as a marketing tool that is of interest to retailers when offering unfamiliar products to consumers, as is the case for boar meat products in Germany. With regard to boar meat, one can assume that there is some uncertainty about taste which might discourage consumers from buying such products. Product tastings may, therefore, help to reduce consumers' lack of knowledge and aid their decision making (Blackwell et al. 2006).

8.4 Study design and description of sample

8.4.1 Study design

In autumn 2009, nine Vickrey auctions were conducted with two rounds of bidding for organic smoked salami produced with meat from uncastrated male pigs. The auctions were embedded in an explorative study about consumer perceptions of alternatives to piglet castration without pain relief in organic farming applying focus group discussions. In this context, participants received standardised information on the issue of piglet castration without pain relief and alternative methods, including fattening of entire males, which can be summarised as follows:

- Piglet castration without anaesthesia and analgesia is common in conventional and organic farming; however, there will be a ban of the practice in EU organic farming from the beginning of 2012 due to animal welfare considerations (painful for the piglets).
- The most important reasons for castration are prevention of boar taint and generating less aggressive animals.
- Basically, there are three alternatives to castration without pain relief: castration with anaesthesia and/or analgesia, immunocastration, or the fattening of boars (brief description of each alternative).

At the end of each of the nine focus groups, consumers were asked to participate in an experiment. Subsequently, the auction mechanism was explained and the optimal bidding

strategy was illustrated using an example (following Skiera & Revenstorff 1999; see Appendix 4). After the presentation of the product (organic smoked salami containing meat from uncastrated male pigs), all participants placed their sealed bids simultaneously. The auctions were conducted in a non-hypothetical setting. It was emphasised that the person with the highest bid would have to buy the acquired salami for the price determined by the second highest bid. The price would be deducted from the allowance consumers received for their participation in the study.

After the first round of bidding for the salami with meat from uncastrated male pigs, all participants received samples of salami for tasting. Salami was chosen as the test product because it is a popular sausage in Germany and its production includes measures which are helpful in masking tainted meat. Smoking, seasoning and the cold consumption of a pork product can reduce the perception of boar taint (Desmoulin et al. 1982; Diestre et al. 1990; Lunde et al. 2008; Pearson et al. 1971; Stolzenbach et al. 2009). In addition, tainted and untainted meat can be mixed during production of sausages like salami, in order to achieve a diluting effect and to further reduce the perception of boar taint. Consequently, salami production offers an opportunity to process even tainted meat from uncastrated male pigs. During the product tasting, two salamis were presented for comparison which had a similar recipe and were commercially available. An expert panel assisted in the choice of product and the specific brands used for the tasting. One of the salamis was produced with meat from uncastrated male pigs (boar salami) and the other with the usual meat from female or castrated pigs ('standard' salami).

To gain background information for the analysis, participants were asked to rate the odour and flavour of each of the salamis on a seven point scale, and to indicate which of them they preferred and which they assumed to be the boar salami. The products were handed to participants one after another, and the order in which they were presented was changed between groups⁸. The samples were only indicated by the letters A and B. Between samples, participants were requested to drink some water and eat a piece of white bread (following Buchecker 2008). After tasting, the product that contained meat from uncastrated male pigs was revealed, and another round of bidding for the boar salami was conducted. The highest bidders and prices of both rounds were only announced after the second bidding.

⁸ Note that the auctions were part of an explorative study with focus group discussions, which entailed some limitations with regard to the change of product presentation order, the number of participants and the time frame for the auctions and tasting.

8.4.2 Description of sample

In total, 88 consumers of organic pork participated in the study. They were recruited by trained student assistants in front of retail stores which offered organic meat. Screening questions were used to identify consumers who buy organic pork and processed products containing organic pork, at least occasionally, and also eat salami. In addition, quotas for gender and age were applied. The proportion of male participants in the study was determined to be only 30-40%, as women are still mainly responsible for grocery shopping in Germany (Platzmann & Hamm 2009; Spiller et al. 2004). The quota for age was chosen according to the distribution in the German population at the time of the study: half of those participating should be 18 to 44 years old and the other half, aged between 45 to 75 years (Statistisches Bundesamt 2008). Quotas were fulfilled, with a relatively high proportion of men (39%; Table 12). The creation of an 'organic index', based on buying frequencies for several product groups in organic quality⁹, revealed that most of the study participants were dedicated organic consumers (80%). With a few exceptions participants had no personal experience with meat from uncastrated male pigs and boar taint.

Table 12: Description of the sample

		Sample
		n = 88
Gender	Female	61.4%
	Male	38.6%
Age	18 to 44 years	51.1%
	45 to 75 years	48.9%
Organic index^a (n=86)	Mean	9.4
	0 to 3	0.0%
	4 to 7	19.9%
	8 to 11	52.3%
	12	27.9%

^a Aggregated buying frequency for six product groups in organic quality: 0=all product groups hardly ever in organic quality; 12=all product groups almost always in organic quality

⁹ Consumers indicated their buying frequency (0=hardly ever, 1=sometimes, 2=almost always) of six product groups in organic quality (fruits; vegetables; eggs; milk and milk products; bread, pasta, flour and cereal products; meat and meat products). The single frequencies were added to generate the organic index with values between 0=all product groups hardly ever in organic quality and 12=all product groups almost always in organic quality.

8.5 Willingness-to-pay for boar salami before and after tasting of samples

Before tasting, average willingness-to-pay for boar salami was 2.12€, compared to a 16% lower willingness-to-pay after tasting (Table 13). Although both men and women reduced their average willingness-to-pay after tasting, this was less pronounced for men, who bid 7% less on average, in comparison with women, who bid 21% less.

Also, the increase in zero bids after tasting, which indicated that a bidder did not want to buy the boar salami at all, was considerably higher for women than for men (Table 13). Overall, the share of zero-bids increased from 21% to 28% after tasting. Regarding the two age groups, the share of zero-bids increased from 13% to almost 30% in the younger group (18 to 44 years), while it decreased from 29% to 26% in the older age group. Still, the average bid of the older participants was slightly lower after tasting. In the younger age group the reduction of the bids after tasting was significant.

Table 13: Average willingness-to-pay for smoked organic salami produced with boar meat (80g) and share of zero-bids before and after tasting

		Mean willingness-to-pay in Euro			Share of zero-bids (%)	
		Before	After	T-Value	Before	After
Gender	Male (n=33)	2.21	2.06	0.878	12.1	15.2
	Female (n=54)	2.06	1.63	2.064**	25.9	35.2
Age (years)	18 to 44 (n=45)	2.19	1.72	2.702**	13.3	29.5
	45 to 75 (n=43)	2.04	1.87	0.772	28.6	25.6
Total	(n=87)	2.12	1.79	2.239**	20.7	27.6

**p<0.05

In order to determine as to whether the tasting of the samples influenced bidding behaviour, consumers' indicated preferences for the salamis and their ratings for odour and flavour were considered. Participants rated odour and flavour of the tasted salamis on a scale from 1 = "don't like it" to 7 = "like it". On average, ratings for both odour and flavour lay close to the middle of the scale (Table 14) and absolute differences were low. In total, boar salami was rated slightly better for odour, while the rating for flavour was lower than that of the standard salami; however, overall ratings did not differ significantly between the tasted salamis. Women and consumers aged 18 to 44 years differed significantly between the two salamis with regard to flavour. Both rated the flavour of the standard product higher than that of the boar salami. In the younger age group odour of the standard salami was rated highest (5.0) in

comparison to the other groups. Notably, in both salamis, the ratings given by women for odour and flavour were lower than those given by the male participants. Consumers aged 45 to 75 rated the odour of boar salami significantly higher than that of the standard salami and also their rating of flavour was slightly in favour of the boar salami.

Table 14: Average rating of the tasted organic salamis for odour and flavour

			Boar salami	Standard Salami	T-Value
Gender	Women	Odour (n=54)	4.4 (1.7)	4.3 (1.9)	0.375
		Flavour (n=53)	3.7 (1.9)	4.2 (1.8)	1.716*
	Men	Odour (n=34)	4.8 (1.4)	4.5 (1.8)	0.663
		Flavour (n=34)	4.3 (1.6)	4.4 (1.7)	0.141
Age (years)	18 to 44	Odour (n=45)	4.6 (1.6)	5.0 (1.7)	1.102
		Flavour (n=45)	4.0 (1.7)	4.8 (1.7)	2.420**
	45 to 75	Odour (n=43)	4.5 (1.6)	3.8 (1.8)	2.424**
		Flavour (n=42)	3.9 (1.9)	3.7 (1.6)	0.676
Total	Odour (n=88)		4.6 (1.6)	4.4 (1.8)	0.719
	Flavour (n=87)		3.9 (1.8)	4.3 (1.7)	1.350

Rating on a scale from 1 = "don't like it" to 7 = "like it"
 Values in parentheses: standard deviation
 *p<0.1; **p<0.05; ***p<0.01

Expectedly, the stated preferences for either the boar or the standard salami reflected the results from the ratings of odour and flavour. Table 15 shows that in total 43% of participants preferred the salami produced with meat from uncastrated male pigs and 47% preferred the standard product. Again differences were relatively low. In contrast, a notable difference between men and women could be observed with 53% of men preferring boar salami and only 37% of women doing so. The differences between the age groups were not as pronounced and both groups predominantly preferred the standard salami. In the younger age group more than half of the participants preferred the standard product which fits well with the particularly positive ratings for flavour and odour of the standard salami.

Table 15: Indication of the preferred organic salami

			Preferred Salami (%)		
			Boar	Standard	No difference
Gender	Men	(n=34)	52.9	38.2	8.8
	Women	(n=54)	37.0	51.9	11.1
Age (years)	18 to 44	(n=45)	37.8	53.3	8.9
	45 to 75	(n=43)	39.5	48.8	11.6
Total		(n=88)	43.2	46.6	10.2

Question: Which salami do you prefer? Answers: Salami A, Salami B, no difference

Subsequently, participants were grouped according to their preferences regarding the tasted salami and the bidding behaviour of these groups was analysed (Table 16). The average bids of the three groups did not differ significantly before the tasting of the salamis, yet after tasting participants preferring the boar salami had a significantly higher willingness-to-pay for boar salami (2.63€) than consumers preferring the standard salami (1.01€).

Table 16: Average willingness-to-pay for smoked organic salami with boar meat (80g) and share of zero-bids before and after tasting depending on the preference for boar or standard salami

Preferred salami		Mean willingness-to-pay in Euro			Share of zero-bids (%)	
		Before	After ^a	T-Value	Before	After
Boar	(n=36)	2.19	2.63 _a	3.511**	18.9 ^b	8.1 ^b
Standard	(n=41)	2.09	1.01 _b	5.592***	17.1	43.9
No difference	(n=9)	1.84	1.98 _{ab}	0.260	44.4	33.3

^a Mean values with different lowercase letters differ significantly between preference groups (p<0.05); ANOVA: F=13.333, p=0.000
^b n=37
 *p<0.05; **p<0.01; ***p<0.001

Comparing the bids before and after tasting within each group (Table 16), it became apparent that participants preferring boar salami on average significantly increased their bids by 20%. At the same time the share of zero-bids dropped from 19% to 8% which means a number of consumers who did not want to buy the boar salami before tasting changed their mind. Tasting the product samples had a very strong effect on willingness-to-pay of participants preferring the standard salami. On average they reduced their bid for boar salami by 52% after tasting. A considerable proportion of consumers even reduced their bid to zero so that the share of zero-bids increased from 17% to 44% after tasting. Participants who did not prefer

one of the salamis over the other had a lower willingness-to-pay than the other groups before the tasting and a very high share of zero-bids. After tasting, willingness-to-pay increased slightly.

After the blind tastings, participants were asked to identify the salami produced with boar meat and, overall, 61% of participants did so correctly (Table 18). Among the female participants, however, this share was above average (67%, not significant), whereas only 50% of the men identified boar salami correctly. Younger participants correctly identified the boar salami significantly more often (73%) than did consumers in the older age group (49%; $p < 0.05$, z-test). A comparative analysis of the preferred salami and the identification of boar salami showed that 78% of the participants who preferred the standard product also identified boar salami correctly, while only 42% of the participants who preferred the boar salami identified it correctly.

Table 17: Identification of the boar salami after tasting

Identification of boar salami	Gender (%)		
	Men (n=28)	Women (n=46)	
Correct	50.0 _a	67.4 _a	
Incorrect	50.0 _a	32.6 _a	
Age group (%)			
	18 to 44 (n=37)	45 to 75 (n=37)	
	Correct	73.0 _a	48.6 _b
Incorrect	27.0 _a	51.4 _b	
Preferred Salami (%)			
	Boar (n=36)	Standard (n=32)	No difference (n=6)
	Correct	41.7 _a	78.1 _b
Incorrect	58.3 _a	21.9 _b	83.3 _{a,b}
Total (%)			
	(n=74)		
Correct	60.8		
Incorrect	39.2		

Values within one row with different lowercase letters differ significantly with $p < 0.05$

8.6 Discussion and conclusions

Before tasting the organic salamis consumers could form their preferences for boar meat products mainly based on information received during the focus group discussions as most of the participants had never experienced boar taint before and many weren't even aware of the issue. Therefore, high uncertainty regarding taste of products from uncastrated male pigs could be expected. Offering products samples for tasting is a commonly used way to reduce uncertainty about a new product. The results show that tasting product samples had a significant effect on willingness-to-pay for boar salami. However, overall the effect was negative as particularly women and younger participants significantly reduced their bids for boar salami after tasting the product samples.

In accordance with their bidding behaviour, women and younger participants (18 to 44 years) rated odour and flavour of the boar salami less favourable than the standard product and predominantly preferred the standard salami over the boar salami. The observed differences between men and women are in accordance with results from literature regarding consumer reactions to boar meat (de Kock et al. 2001b; Griffiths & Patterson 1970; Matthews et al. 2000). At the same time, salami in general seemed to be rather preferred by men, as women rated both salamis slightly lower than did the male participants. Willingness-to-pay differed considerably between genders, with women having a lower willingness-to-pay both before and after tasting, and reducing their bids to a larger extent than men after trying the salamis. The share of zero-bids among women was also considerably higher before and after tasting. As women are still predominantly responsible for grocery shopping in Germany (Plaßmann & Hamm 2009; Spiller et al. 2004), these results are not encouraging for marketing efforts for boar meat at the point of sale.

With regard to age, Matthews et al. (2000) found that older consumers rated boar meat less critically than younger people. In our study, ratings for boar salami across the two age groups were quite similar; however, they differed in the ratings of standard salami. Younger consumers rated the standard salami more highly than the boar salami and reduced their willingness-to-pay for boar salami significantly after tasting, while their share of zero-bids increased considerably. In contrast, older consumers rated the standard product lower than the boar salami. They reduced their average bid for boar salami after tasting as well, but their share of zero-bids was lower than before. As regards the latter, it seems that older participants were initially more sceptical towards boar meat than the younger ones, but at least some changed their minds after tasting.

Overall, the average ratings for odour and flavour of both organic salamis were only mediocre, even though ratings varied considerably between participants. For both salamis, only about one third (odour) and one quarter (flavour) of participants assigned ratings of 6 or 7 ("like it"). The organic consumers in our test were informed that one of the samples would contain boar meat. In addition, they were not only aware of the boar taint issue but also informed about animal welfare problems associated with castration without pain relief. As information, labelling and attitudes can have an effect on the sensory perception of a product (e.g. Liem et al. 2012; Oude Ophuis 1994; Shepherd et al. 1991; Wansink 2003; Wansink et al. 2005), the awareness of these issues may have had a negative impact on the perception of odour and flavour. This effect may be particularly strong for consumers of organic meat because of the considerable importance of animal welfare in this consumer group. In a sensory test of three types of meat involving tainted boar meat, untainted boar meat and gilt meat, Lundström et al. (1982) informed one consumer group that the product might be boar meat, which could produce a "characteristic smell". This group appeared to be more critical of both boar and gilt meat. The authors discussed that information about boar meat could lead to a critical attitude towards pork in general; consequently, exactly which information is provided would be important (Lundström et al. 1982).

External information may influence consumers' liking and willingness-to-pay of a product by creating expectations. If expectations and actual product attributes or performance do not match, positive (better than expected) or negative (worse than expected) disconfirmation occurs (Cardello & Sawyer 1992). Information on organic beef increased the liking of the meat in a study by Napolitano et al. (2010). Consumers moved their acceptability of organic beef in direction of expected liking (assimilation of discrepancies between expected and actual product performance). The authors concluded that the provided information markedly affected liking of organic beef as it addressed important consumer concerns like animal welfare, food safety and environmental benefits. At the same time, eating quality of the tasted beef was good which possibly facilitated the assimilation. For some products like champagne which was tested in the study by Lange et al. (2002) the impact of external information may even be stronger than the impact of sensory attributes. Lange et al. (2002) found "that a great brand has a positive impact on the product perception". The evaluation of boar meat products may also be influenced by disconfirmation of expectations. External information received during the focus group discussions was very likely to create expectations regarding liking of boar salami and thereby affect the ratings and willingness-to-pay. Assimilation processes could be assumed which would lead to low hedonic ratings due to low expectations. This

could partly explain the mediocre hedonic ratings of the tasted products and reduced willingness-to-pay after tasting. In contrast, there seemed to be some participants (particularly in the older age group) whose low expectations were disconfirmed during the tasting and who increased their willingness-to-pay afterwards. This would suggest that the assimilation-contrast model may be helpful in predicting consumers' reactions to disconfirmed expectations regarding boar meat products. The assimilation-contrast model "maintains that there are zones or latitudes of acceptance and rejection in consumer perceptions" (Anderson 1973). If there is only a small discrepancy between expectations and product performance which falls into the zone of acceptance, consumers may assimilate the difference towards their expectations. Yet, if the discrepancy is too large and falls into the zone of rejection, consumers may magnify the perceived disparity between expectations and actual attributes (contrast effect) (Anderson 1973). Generally, boar meat products have the potential for strong disconfirmation of expectations both in a positive and a negative way. Consumers could either form negative expectations due to information on the risk of boar taint and then be confronted with a boar meat product which tastes good or they believe that boar taint cannot be that bad (due to lack of experience and positive associations of fattening of boars with animal welfare) and then encounter a boar meat product which tastes unpleasant. Within this study, probably both forms of disconfirmation occurred.

Notably, altogether ratings of odour and flavour of the two salamis offered for tasting did not differ significantly. Still, most consumers identified one of the salamis as their preferred product and the preferences were reflected in the bids after tasting which differed significantly between groups with different preferences. Lusk and Shogren (2007) gave an overview on studies examining the link between preferences from taste tests and auction bids and showed that auction bids were indeed related to different measures of meat palatability. The authors also summarized several studies comparing hedonic ratings of varying products with auction bids and demonstrated that with few exceptions "these studies imply strong convergent validity between preferences expressed through auction bids and preferences expressed through hedonic ratings and other "survey" measures of preference" (Lusk & Shogren 2007, 257). In our study, participants preferring the boar salami increased their willingness-to-pay by 20%. Hence, a positive tasting experience may reduce consumers' uncertainty and concerns with regard to an organic product from uncastrated male pigs and even generate higher willingness-to-pay. However, participants not liking the boar salami reduced their bids on average by more than 50%. So, negative experiences obviously have a much stronger effect on willingness-to-pay than positive ones. Nevertheless, there may be reasons for

offering samples of organic boar meat products in spite of the risk due to individual differences in the perception and liking of boar meat. Tasting activities which are accompanied by trained staff offer the opportunity to explain the special characteristics of organic boar meat and to give further information, for example on animal welfare. This may avoid that organic consumers get a negative impression of pork in general after they had an unpleasant experience with boar meat products at home.

A limitation of the study is the fact that no standardized salami samples were used but commercially available products. Therefore a generalization of the product evaluation with regard to consumers' perception of odour and flavour of boar meat products is not possible (and was not intended). The focus of this analysis was on the effect a tasting of product samples may have on willingness-to-pay by comparing hedonic ratings and auction bids. In this regard, we could show that offering product samples for tasting has a strong effect on willingness-to-pay and that preferences and auction bids were related. Overall, the effect was negative for our particular products; however, consumers were clearly willing to pay more if boar salami was their preferred product. Therefore, this marketing activity is a useful measure for the introduction of products from uncastrated male pigs, particularly if it is combined with information on product quality and attributes like animal welfare.

9 Consumers' opinions towards labelling of alternatives

Towards the end of each focus group discussion participants should voice their opinions on labelling alternatives to piglet castration without pain relief. Participants of all groups mentioned both reasons for and against labelling. Transparency and freedom of decision were important arguments in favour of labelling.

*Well, if it's labelled, everyone can decide for themselves: "Will I buy it or not?"
(woman, focus group 9, age 18-44)*

*Well, the question is: Do I think it [labelling] is a good idea, or do I think it's not?
Anyway, speaking for myself, I would say: "Yes, maximum transparency". [...]
(man, focus group 1, age 18-44)*

Moreover, some participants believed that labelling could create more public awareness for the issue of piglet castration. Further arguments in favour of labelling were encouragement of trust, the wish for information about production processes of food products and the need to know why one should be willing to pay premium prices for a product. For example, two participants summarized several arguments for labelling in their statements:

*[...] I would expect it to be labelled; I'm a responsible citizen and if I have to pay more already for organic meat, then I also want to know what I get; and I don't want to be thrown into the same pot with those masses that buy just everything. I really want to know it and if I don't like it [...] then I surly won't buy it [...]
(woman, focus group 6, age 45-75)*

[...] if I want to buy a certain product, I want that the background circumstances have been examined [...]. And then I am willing to pay for it. Well, and everybody has certain principles what they can accept and what they can eat, and that's only possible if they get the information (man, focus group 3, age 18-44)

Yet, participants also argued against labelling the alternatives because it might discourage consumers without any previous knowledge from buying organic meat, particularly when information about castration is only available on organic meat. Wording like castration, immunocastration or fattening of boars could also deter buyers. Some participants were against yet another label which might further confound consumers. Interestingly, for some participants labelling was not very important because they would just ask their trusted butcher and expect correct and detailed responses.

Well, [...] I have a trusted butcher and I think that I will still go to this woman and if she tells me: "We used this because...", then I will still believe her, because she knows more about animals than I do and because she knows more about these different methods [...] than I will ever get to know; and to be completely honest, if she tells me: "You can still buy this without any problems, there are no negative effects for the animals", then I will believe it because I trust this woman [...]
(woman, focus group 4, age 18-44)

With regard to the actual implementation opinions were divided. One suggestion was to integrate piglet castration as one aspect into the existing organic label (or another label with animal welfare criteria). The label could stand for one or several alternatives or could just guarantee that piglets are not castrated without pain relief. Others would like a specific label for the alternatives to piglet castration without pain relief because they wanted to know exactly which method was used. Participants agreed that any labelling should be easy to understand. It was also assumed that labelling alone would not suffice and that further information via the media would be needed. Otherwise, consumers might not understand and accept the label.

10 Discussion

The following chapter discusses the findings of the dissertation against the background of consumer research on alternatives to piglet castration without pain relief as well as animal welfare in general. The first section elaborates on consumers' awareness and knowledge of the piglet castration issue. Then, consumers' attitudes, opinions and willingness-to-pay of each of the alternatives are discussed. The effects of information provision are considered across all alternatives in a further section.

10.1 Awareness of and attitudes towards piglet castration

10.1.1 Awareness of and knowledge about piglet castration

The first aim of this dissertation was the assessment of consumers' knowledge and awareness of piglet castration. It became obvious that awareness was rather low. More than half (54%) of the participants did not know that piglets are castrated at all. Additionally, it became obvious during the discussions that most of those participants who knew that piglets are castrated were not aware that castration is performed without anaesthesia. These results are in accordance with other studies in Norway and Belgium that found similarly low levels of awareness among consumers (Fredriksen et al. 2011, 354; Vanhonacker et al. 2009, 374). The reasons for castration consumers named were also consistent across studies. The authors of both studies report that consumers related castration to meat quality, fattening traits and behaviour of the animals which was also the case in this dissertation. Consumers seem to know that castration is linked with meat quality, yet, the term boar taint for this off-odour or flavour was only mentioned by one participant in the present study. Similarly, Norwegian consumers also did not commonly use the word boar taint (Fredriksen et al. 2011, 354), while 12% of Belgian consumers explicitly mentioned boar taint (Vanhonacker et al. 2009, 374). Vanhonacker et al. (2009, 374) found that about 40% of their sample were aware of piglet castration and the correct reason (boar taint). The relatively low level of consumer awareness for boar taint can easily be explained by the long lasting practice of piglet castration. Castration prevents the occurrence of boar taint; hence, the majority of consumers have never tasted boar tainted meat.

Overall, knowledge and awareness of the issue of piglet castration were relatively low among consumers. This is in accordance with findings of a Special Eurobarometer Survey conducted in 2007, which indicate that consumers' knowledge about animal husbandry in general and farm animal welfare is rather limited. Only 12% of European consumers felt that they knew a

lot about the conditions under which animals are farmed. 57% stated they knew a little about animal farming and 28% said they knew nothing at all. In Germany, the shares differed only slightly from the European average (TNS Opinion & Social 2007). Results from focus group discussions within the EU Project Welfare Quality revealed that consumers' knowledge about farm animal welfare was - in contrast to scientific knowledge – “multiple, fragmentary and made up of a patchwork of different understandings and concerns that were drawn from different sources and that could either re-enforce or contradict each other” (Evans & Miele 2008, 28). However, consumers' limited or fragmented knowledge should not mislead into assuming that they are not concerned about animal welfare issues. In the Eurobarometer Survey European consumers placed a high importance on farm animal welfare (TNS Opinion & Social 2007) and also in the Welfare Quality Project participants expressed great concerns about the animal welfare issues they knew about (Evans & Miele 2008, 21ff).

10.1.2 Attitudes towards castration without pain relief in organic farming

Considering participants' low awareness of piglet castration in general and of the fact that it is usually performed without pain relief, the negative reactions (disappointment, shock) to the given information are hardly surprising. Consumers of organic meat products expect high animal welfare standards and often have rather idealistic images of organic animal husbandry. Receiving information about a practice in organic farming that is clearly perceived as a cruelty towards animals may disappoint organic consumers. Dissatisfaction with an animal-friendly product, whether with its intrinsic attributes or with the level of animal welfare, may be transferred to other animal-friendly products and create purchase barriers (Ingenbleek & Immink 2011, 17). So, disappointment caused by learning about piglet castration without pain relief in organic farming may negatively affect the image of organic animal husbandry and consumers' willingness-to-pay for organic animal based products. As negative information about animal welfare is absorbed rather easily and has a stronger effect on purchase intentions (Ingenbleek & Immink 2011, 13), there is a considerable risk of disappointing and discouraging (potential) organic consumers due to discrepancies between their expectations and actual organic animal husbandry practices.

Overall, average willingness-to-pay for the salami produced with meat from pigs castrated without pain relief was lowest and 41% of the participants did not want to buy the salami at all (zero-bids). This is definitely in accordance with the negative attitudes and opinions expressed during the focus group discussions. Nevertheless, it is interesting that almost 60% of the participants still placed a bid above zero, even though it was often the lowest in

comparison to the other alternatives. This may suggest that during the discussions mainly those participants with a strong negative opinion expressed their views and that there was an effect of social desirability bias.

10.2 Alternatives to piglet castration without anaesthesia and analgesia

10.2.1 Castration with anaesthesia and analgesia in organic farming

Castration with anaesthesia and analgesia seemed to be the least controversial alternative. Consumers expressed predominantly positive attitudes and opinions in the focus group discussions and average willingness-to-pay was highest (2.17€) for this alternative while the share of zero-bids was lowest (14%). Attitudes, opinions and bidding behaviour were well matched. From a consumer perspective, castration with anaesthesia and analgesia solves the problem of pain during surgical castration while the advantage of good sensory meat quality remains. Food safety concerns due to residues were minor in comparison to those regarding immunocastration. It can be assumed that, in comparison with the other alternatives, castration with anaesthesia and analgesia causes the least cognitive dissonance and is, therefore, preferred by many consumers. Decision making becomes easier, if important product attributes like taste, animal welfare and food safety do not conflict with each other and meet consumers' product requirements.

Castration with anaesthesia and analgesia has only been included in a few consumer studies, so far (see Section 6.5). Consumers in Switzerland and Norway also preferred castration with pain relief to other alternatives (Fredriksen et al. 2011; Huber-Eicher & Spring 2008), while consumers in France, Germany, the Netherlands and Belgium had a low preference for physical castration with anaesthesia in comparison to immunocastration (Vanhonacker & Verbeke 2011).

With regard to organic farming, however, it should be considered that consumers rejected the use of drugs. At the same time, there are declarations of intent to completely abandon surgical castration in the EU (European Commission 2010), which cannot be ignored by the organic sector. Therefore, castration with anaesthesia and analgesia could be seen as a well accepted transitional solution until other alternatives have been proven to be ready for implementation. While our results show that consumer acceptance is relatively good, there are other factors, like high (investment) costs, the need for a veterinarian and possible losses of piglets (Steinmann et al. 2012, 152), that may make this alternative quite unattractive for farmers, particularly if it is only an interim solution.

10.2.2 Immunocastration

Immunocastration as an alternative to surgical castration in organic farming provoked a much more intensive and controversial discussion than castration with pain relief. A focus of this discussion was on residues in meat which might have negative effects on human health. Animal welfare was considered as positive by many participants; however, food safety concerns often offset this impression. This supports the assumption that basic requirements like food safety, good taste and affordable price have to be fulfilled before ethical issues like animal welfare become relevant (Ingenbleek & Immink 2011, 12). The strong scepticism towards a method that was associated with hormones in all focus groups is also in line with findings of Eurobarometer Surveys regarding food related risks. European consumers are increasingly concerned about residues like antibiotics and hormones in meat. 27% of respondents were very worried about risks from residues in meat and 41% were fairly worried in 2005. The proportion of very worried respondents increased to 30% in 2010 (40% fairly worried). Overall, German consumers were even more concerned about hormone or antibiotic residues in meat with 36% being very worried and 37% fairly worried in 2010 (TNS Opinion & Social 2006, 20; TNS Opinion & Social 2010, 22). At the same time a majority of consumers in Europe (58%) does not feel confident that they will personally be able to take steps to avoid the possible risk from chemical contamination of food. This share was even higher in Germany with 66% feeling not confident. In comparison, only 23% of European consumers and 20% of German consumers are not confident that they will be able to avoid health risks from their diet, for example high fat intake and heart disease (TNS Opinion & Social 2010, 38ff).

Consumers' risk perception largely depends on whether the risk is related to technology or to peoples' lifestyle. While risks from lifestyle choices, which include diet, are often underestimated, risk from technologies applied to food production, for example genetic modification, prophylactic use of veterinary drugs and growth hormones, are often perceived as quiet serious. Personal knowledge about such risks is considered as low and technology related risks are perceived as being out of control, unnatural or artificial and "somehow adding to the already existing risk environment" (Verbeke et al. 2007, 5). Immunocastration was deemed as unnatural by many consumers. Before the focus group discussions the method was widely unknown to participants and in some cases the perceived risks from this alternative were compared with risks perceived from genetic modification (unknown long time effects). Hence, obviously participants regarded potential risks from immunocastration

as technology-related. How information and trust may influence consumers' perception of immunocastration is discussed in Section 10.3.

Despite the dominant role of food safety issues in the discussion about immunocastration, it can be assumed that there may be consumer segments that prefer this alternative due to animal welfare benefits. Particularly willingness-to-pay results indicated a polarisation of opinions regarding immunocastration. The alternative had the highest share of zero-bids but that did not correspond with the lowest average willingness-to-pay. Hence, comparably high bids must have compensated the zero-bids to some extent (see Section 0). An explanation for this may be found in the focus group data. Some participants were willing to eat meat from immunocastrated pigs because of improved animal welfare while others rejected consumption of such meat because of food safety concerns. However, due to the qualitative nature of the study, it is not possible to quantify potential consumer segments. Yet, other studies found consumer segments with a high concern for animal welfare which offer chances for product differentiation based on animal welfare (Meuwissen et al. 2007; Vanhonacker et al. 2007; Verbeke et al. 2010).

Most of the few consumer studies, which deal with attitudes towards or willingness-to-pay for alternatives to piglet castration without pain relief, include immunocastration or even focus on this alternative. In comparison with the relatively strong rejection of immunocastration found in this dissertation, other studies come to more favourable results. For a detailed discussion of the literature and considerations on why results from different studies vary see Sections 6.5 and 0.

10.2.3 Fattening of boars

Similarly to immunocastration, consumers were also uncertain about some aspects of the fattening of boars. This pertained particularly to taste, as only very few participants had experienced boar tainted pork before, as well as animal welfare aspects due to potentially aggressive behaviour of the animals. Besides, questions about the utilization of boar tainted meat were raised which could not be resolved during the discussions. Regarding participants' lack of knowledge and degree of uncertainty concerning some important issues, the fattening of boars was indeed comparable to immunocastration. Nevertheless, willingness-to-pay results indicated a considerably higher acceptance for fattening of boars than for immunocastration. Again, this may be explained by consumers' risk perception. In contrast to immunocastration, fattening of boars was considered to be a natural method because no surgical intervention is conducted and no drugs or hormones are used. Hence, the strong risk

perception, which can occur for technological risks, did not apply here. On the contrary, one could even call it a “naturalness bonus”. As discussed before (see Section 6.5), naturalness implies animal welfare and food safety. Composition of focus groups comprising mainly frequent buyers of organic food may have contributed to the relevance of naturalness. Organic consumers often use terms like natural or naturalness with regard to organic farming (Verhoog et al. 2003, 37). Naturalness is associated with positive concepts like simple, pure, non-artificial, unspoilt and fair (Verhoog et al. 2003, 38). With that said, the relatively good evaluation of fattening of boars in comparison to immunocastration in spite of some concerns regarding animal welfare and uncertainty regarding taste and utilization of boar tainted pork becomes comprehensible. Acceptance of fattening of boars was also better than in other studies. Swedish consumers had a lower willingness-to-pay for fattening of boars than for other alternatives (Lagerkvist et al. 2006; Liljenstolpe 2008) and also Swiss consumers rejected fattening of boars (Huber-Eicher and Spring 2008).

A trade-off between animal welfare and the risk of boar taint was assumed by Lagerkvist et al. (2006) and Liljenstolpe (2008). This assumption could be confirmed in the focus group discussions. Boar taint or taste respectively and animal welfare were discussed intensively. For participants the question arose as to whether they were willing to accept a possible loss of sensory quality for improved animal welfare. Besides animal welfare, good taste of meat is also an important aspect for organic consumers (e.g. Fischer-Appelt relations 2012). As odour and flavour of boar tainted meat were unfamiliar for most participants, it was difficult for them to form a definite opinion on the fattening of boars. Tasting boar meat products could facilitate consumers’ decision making. The tasting of product samples after the focus group discussions did indeed show that willingness-to-pay was strongly influenced by the sensory evaluation (for a detailed discussion see Section 8.5). A positive sensory experience of boar meat eliminates perceived conflicts between taste and animal welfare. However, the majority of participants preferred the standard salami over the boar salami which had an overall negative effect on willingness-to-pay for boar salami after tasting. The share of zero-bids increased drastically for participants who liked the standard salami better (17% before tasting to 44% after, Table 16). This indicates that negative sensory experiences not only lead to reduced willingness-to-pay but may even have the effect that consumers do not want to buy the product at all. Studies on perception of boar taint show that a considerable proportion of consumers is very sensitive to androstenone, one of the components of boar taint (e.g. Font i Furnols et al. 2003; Weiler et al. 2000). Hence, negative sensory experiences of pork seem to be unavoidable, if boar meat is marketed, even when boar taint levels are very low due to

sorting of carcasses. A negative experience also reduces consumers' uncertainty about taste of boar meat, however, in a less desirable way from a producers or retailers point of view. It can be assumed that a single negative experience with boar tainted meat may have a long lasting effect on acceptance of fattening of boars (or even liking of pork in general). Then, animal welfare considerations probably become secondary for most consumers.

10.3 Effects of information

One aim of this dissertation was to determine effects of different information on consumers' attitudes and willingness-to-pay. However, the observable effects were minimal which may be ascribed to differences in information conditions being not distinct enough (see Section 6.5 and 7.5 for details). Other studies suggest an influence of information on acceptance of alternatives, particularly of immunocastration (Hofer & Kupper 2008; Huber-Eicher & Spring 2008). Considering the differences in results across recent consumer studies on acceptance of alternatives to piglet castration, an influence of information provision seems plausible even though not all studies (including the present) comparing different informational treatments could find significant effects (e.g. Vanhonacker et al. 2009). As consumers had hardly any previous knowledge about the alternatives to piglet castration without pain relief, it has to be assumed that their opinions strongly depend on the provided information. Interestingly, attitudes and preferences for immunocastration seem to be influenced the most by different information conditions (Tuytens et al. 2011).

There is little doubt that information influences consumers' choices and attitudes. How information is processed and how it becomes effective depends on a number of personal and environmental factors, for example type and content of messages, involvement, trust in information sources or the perceived benefit from searching and using information (Verbeke 2008).

Trust in information sources became apparent as an issue during the focus group discussions. Some participants doubted the given information (particularly on immunocastration) while others trusted the information which was linked with a willingness to eat pork from for example immunocastrated pigs. The information provided in consumer studies on the alternatives to piglet castration without pain relief is usually neutral and conclusive. However, in everyday life consumers are faced with information from different sources which is likely not neutral and might even be contradictory. Trust in information sources is crucial for the processing of information. Information from untrustworthy sources may be ignored; even positive information may lead to negative effects if it comes from sources with low levels of

trustworthiness (Verbeke 2008). Regarding food-related risks, many German consumers are relatively confident to receive accurate information from consumer organisations and scientists with confidence in consumer organisations being considerably higher and in scientists lower than the EU average (Table 18).

Table 18: Consumers’ trust in different sources of information on food related risks

Information source		Confidence to receive accurate information about food related risks	
		Confident ^a (%)	Not confident ^b (%)
Consumer organisations	EU 27	76	20
	Germany	83	14
Scientists	EU 27	73	23
	Germany	65	31
National Government	EU 27	47	50
	Germany	47	50
Food manufacturers	EU 27	35	62
	Germany	22	76
Supermarkets and shops	EU 27	36	61
	Germany	27	71
Farmers	EU 27	58	38
	Germany	41	55
Media	EU 27	48	49
	Germany	67	31
Internet	EU 27	41	43
	Germany	49	36

Source: TNS Opinion & Social 2010; Question: Suppose a serious food risk were found in a food you eat regularly such as fish, chicken or salad. How much confidence would you have in the following sources to give you accurate information about this risk?

^a Confident = sum of very and fairly confident

^b Not confident = sum of not very and not at all confident

Category “don’t know” was omitted in this table, therefore the values do not add up to 100%

Trust in the German government is much lower than in the latter information sources. Regarding the food supply chain, German consumers feel even less confident to receive accurate information on food risks from food manufacturers and retailers. Trustworthiness of farmers is considered to be slightly better by German consumers (41%) but the level of confidence is still much lower than on average in the EU member states (58%). Confidence in the media (TV, newspaper, radio) to publish accurate information on food risks is above the EU average in Germany (67%) and considerable higher than the confidence in actors of the supply chain. Similarly, confidence in information from the internet is above average in Germany though on a lower level than in the traditional media (TNS Opinion & Social 2010). While distrust in information sources was indeed present in the focus group discussions, some participants also expressed high levels of confidence in information from their “trusted

butcher". Also, labelling of alternatives to piglet castration was seen as a means to build trust by offering transparency of the production process and thereby allowing for informed purchase decisions.

Unfortunately, unfavourable information has a much stronger effect than favourable information; hence, it is not surprising that negative press impacts consumers' attitudes and behaviour towards meat much stronger than advertising (Verbeke 2008; Verbeke & Ward 2001). Participants of the focus group discussions argued that with regard to an unpleasant topic like piglet castration even labelling (which is supposed to provide an incentive for buying a product) may have a negative effect on consumers' willingness to purchase organic pork. This indicates that it might be expedient to communicate the issue of piglet castration as part of a general animal welfare strategy. Then, a label could stand for high animal welfare standards without bringing up detailed information about piglet castration at the point of sale. Besides this aspect of the effect of unfavourable information, possible negative reports about piglet castration without pain relief or any other animal welfare issue in organic farming are surely the more important issue. Participants' negative reactions to learning that piglets are castrated without pain relief in organic farming indicated just how easily the image of high animal welfare standards in organic farming may be compromised. Rebuilding consumers' trust with positive information would take a lot of effort.

It has to be considered, that at the time of the data collection (2009) castration without anaesthesia and analgesia was still legal in organic farming. In January 2012 the transition period set by the EU regulation ended and anaesthesia and/or analgesia is now required for piglet castration. Most German organic associations have amended their directions according to the EU regulation. Hence, piglet castration rather serves as an example for consumers' reactions to information about animal welfare issues in organic farming. Besides piglet castration, there are other issues in organic farming which may be regarded critically by consumers, like tethering and dehorning of cattle, which are practiced with exception permits in organic farming, or culling of male chicks. These practices are also very common in conventional farming. Nevertheless, as the organic sector emphasises its high animal welfare standards, consumers' expectations are also higher in this regard and there is more potential for disappointing their expectations. Additionally, the issue of piglet castration may not be resolved completely, yet. The EU regulation and the corresponding directions of organic associations can be read to the effect that the use of analgesia against post-operative pain suffices to comply with legal requirements. There is no current data available to what extent

castration is performed with analgesia in organic farming and to what extent analgesia and anaesthesia are combined. So far, only one organic farming association (Bioland e.V.) requires anaesthesia and analgesia for castration. Regarding animal welfare, using only analgesia must be considered to be a partial solution as pain during castration is not eliminated and it is a debatable point whether this practice is acceptable to consumers. However, anaesthesia also involves health risks for the piglets (see Section 2.3) which has to be taken into consideration. Here it becomes obvious, that the implementation of alternatives to piglet castration requires balancing the needs of animals, farmers, retailers and consumers and that there seems to be no ideal solution yet.

11 Conclusions

In this chapter conclusions from the results and discussion of this dissertation are drawn. The first section deals with implications for the organic meat sector regarding the implementation of alternatives to piglet castration without pain relief. Then, the merits and limitations of the research conducted are outlined.

11.1 Implications for organic meat production and marketing

Since January 2012 piglet castration without anaesthesia and/or analgesia is banned in organic farming. So far, the process of implementing alternative methods has not been completed, yet. This process involves assessing and balancing requirements of farmers, processors, retailers and consumers in order to find solutions which are acceptable for all stakeholders. In the following implications for production and marketing of organic meat are presented from a consumer point of view.

Although there is limited awareness of piglet castration without pain relief in organic farming, participants shocked and disappointed reactions to learning about this practice should be taken seriously. Admittedly, the issue of piglet castration is mostly resolved by changes in regulations, but it serves as an example for other animal welfare issues which might pertain to organic farming. As consumers have high expectations regarding animal welfare standards in organic farming there is also a high potential of disappointment. Culling of male chicks is already discussed as another ethical issue in organic farming. Similarly to piglet castration, organic farming cannot differentiate itself from conventional farming in this issue and culling of male chicks is a problem inherent to the system and not an individual case of cruelty towards animals on a specific farm. Therefore, a self-critical and straightforward assessment of weaknesses regarding animal welfare in organic farming and the development of a strategy to resolve these issues is advisable. At the same time, consumer communication measures should avoid creating overly idealised images of organic animal husbandry.

Regarding the implementation of alternative methods, the results show that, overall, organic consumers preferred all three alternatives to piglet castration without anaesthesia. Castration with anaesthesia and analgesia was preferred most strongly, followed by fattening of boars and immunocastration. Piglet castration with anaesthesia and analgesia seemed to be the least controversial alternative within this study and would probably be acceptable to consumers of organic pork. Participants' appalled reactions to the information about castration without pain relief imply that anaesthesia is expected for surgical interventions. Using only analgesia to

reduce post-operative pain, as it can legally be done in accordance with EU regulation for organic farming, can only be seen as a very short term interim-solution. From the consumers' point of view, fattening of boars could also be an alternative for organic husbandry due to the perceived naturalness of this method. However, for successful implementation, suppliers would have to ensure good sensory meat quality so that consumers are not forced to trade-off taste against animal welfare concerns. Furthermore, the question has to be resolved as to how boar tainted meat can be utilized. Against the background of a societal debate on wasting of food, the disposal of large quantities of pork due to sensory impairments cannot be acceptable, particularly not if this can be easily avoided by castrating male pigs. Although facts may contradict participants' perception of immunocastration as some kind of hormonal treatment and possible health risk (Clarke et al. 2008), it may be difficult to dispel organic consumers' concerns because risks from food-related technologies are often overestimated and risk perception of lay persons may deviate considerably from expert views.

In their current state of development, all alternatives have (perceived) drawbacks which force consumers to trade-off attributes which they feel to be incompatible in some alternatives (e.g. taste and animal welfare). As these conflicting attributes are among the most important motives for buying organic products, like animal welfare, taste, food safety, it is crucial to reduce the (perceived) discrepancies through both measures during production and processing, and adequate communication strategies. This could improve acceptance of the alternatives and facilitate consumer decision making.

Animal welfare concerns are the driving force behind efforts to implement alternatives to piglet castration without pain relief in organic farming. However, it can be hypothesized from the results that participants perceive only minor differences in the levels of animal welfare for all the alternatives examined in our study. Stakeholders might take into consideration that, although animal welfare standards are important for consumers of organic pork, with regard to the castration issue other quality aspects like taste and food safety may be even more relevant for consumers' decisions at the point of sale, if they feel that their notion of animal welfare is fulfilled.

When communicating the alternatives or other animal welfare topics, it may be helpful to take the citizen-consumer duality into account. At the point of sale, many consumers do not want to be reminded of the fact that meat comes from living animals. Information on castration and alternatives would do just that and is in addition quite unappetizing. Therefore, it would be more promising to inform 'citizen' away from the point of sale in order to influence their

attitudes and preferences. Ideally, it would be possible to build trust in a brand or label which is then associated with high animal welfare standards. This would allow activating attitudes towards animal welfare at the point of sale, which could then become relevant for consumers' decision making, thereby bridging the attitude-behaviour-gap (Grunert 2006, 157).

With regard to the issue of boar taint, it can be stated that offering boar meat samples can help to overcome consumers' uncertainty about taste and enable better informed product choices. However, particularly if tainted meat is used for production there will very likely be some consumers who do not like the product. Additionally, sensory perception can be influenced by information and attitudes. Therefore, the use of free samples as a marketing tool to introduce boar meat has to be embedded in a carefully planned communication strategy which also considers possible differences in liking of boar meat due to gender or age. Unappetizing information on piglet castration and boar taint should be avoided at the point of sale. Communication of improved animal welfare, which is an important attribute for consumers of organic food, and positive product attributes like leanness of boar meat (health aspect), may help to improve organic consumers' perception of such products.

If different alternatives to piglet castration without pain relief are implemented in organic farming, there may be opportunities for product differentiation, based on the issue, which have to be explored. Participants assessed both fattening of boars and castration with anaesthesia and analgesia positively, indicating different advantages for each. The comparison of the auction data with results from focus groups showed that certain criteria were more relevant than others in the assessment of different alternatives. Thus, food safety was of particular importance in the evaluation of immunocastration while, for fattening of boars, the focus lay on taste and the potential for using tainted meat. Additionally, the polarisation of opinions observed with regard to immunocastration indicates that different alternatives may appeal to different consumer segments. Consequently, communication measures have to be adapted accordingly. Critical and important aspects of the alternatives need to be addressed specifically. A product differentiation strategy, however, would require the existence of sufficiently large market segments for each alternative, for which the issue of piglet castration is crucial for their buying decision for organic pork. This has to be determined through further research.

11.2 Research implications

Due to its mainly qualitative approach, this dissertation could generate a substantial database on German consumers' attitudes, perspectives and preferences regarding alternatives to piglet castration without pain relief. At the same time it could be shown that attitudes and preferences were reflected in the willingness-to-pay measures and factors influencing willingness-to-pay could be identified from the focus group data. However, a quantification of the findings would be a task for further research.

So far, the use of a decision making model (scoring model) to analyse focus group data in order to compare them with quantitative data from auctions was a unique approach. The method proved to be useful and may be promising for the analysis of focus group data dealing with decision processes or comparing several alternatives (products). The process allows a systematic analysis of the focus group data and a comparison of different groups. Yet, transparency of every step is essential because it involves some rather subjective decisions of the researcher regarding the selection, weight and evaluation of the criteria. The resulting score is an aggregated expression of the assessment of each alternative with regard to the selected criteria. It serves the purpose of ranking the alternatives, but does not allow for further interpretation as regards content. Hence, the insights won within the particular steps of the analysis have to be taken into consideration when looking at the ranking of the alternatives.

The procedure could be improved if it would be conducted on an individual level instead of group level. This would require the allocation of statements to each participant, which would involve significant additional efforts regarding data collection and analysis. Possibly, several cameras would be needed for a meticulous video recording of the group discussions. In this dissertation, the allocation of statements to individual participants was not always feasible due to awkward camera angles. Additionally, data analysis on an individual level would be complex and time-consuming, which would restrict the volume of data that could be analysed. A comparison of analyses on an individual and on group level could shed light on the question as to whether results differ considerably. This could be an interesting question for further research.

12 Summary

12.1 Summary

In Germany and other European countries piglets are routinely castrated in order to avoid the occurrence of boar taint. Boar taint is an off-flavour and off-odour of pork which is mainly caused by the accumulation of androstenone and skatole in fat and meat of uncastrated male pigs and is associated with terms like urine, manure and sweat. Not all uncastrated male pigs develop boar taint but only a proportion of them. Sensory perception of boar taint varies; however, it is regarded as very unpleasant by many people. Due to its repugnant character, there is a strong interest in avoiding the occurrence of boar taint in pork. Surgical castration is an effective means against boar taint, as its occurrence is linked with the sexual development of male pigs.

Surgical castration has been performed without anaesthesia or analgesia by the farmer within the piglets' first seven days of life. There have been no differences between conventional and organic farming. Piglet castration without anaesthesia has been heavily criticised, as the assumption that young piglets perceive less pain than older animals cannot be supported by scientific evidence. Consequently, voluntary agreements and legal regulations regarding piglet castration have been implemented in several European countries. In contrast to conventional farming where no internationally uniform regulation exists, surgical castration is only allowed with anaesthesia and/or analgesia in organic farming throughout the European Union since January 2012.

Abandoning piglet castration without pain relief requires the implementation of alternative methods which improve animal welfare while maintaining sensory meat quality. Both in conventional and organic farming, there are three relevant alternatives: castration with anaesthesia and/or analgesia to reduce pain, a vaccination against boar taint (immunocastration) and the fattening of uncastrated male pigs (fattening of boars) combined with measures to reduce and detect boar taint in meat. These alternatives have different advantages and disadvantages for farmers, processors, retailers and consumers. Consumers' attitudes and opinions regarding the alternatives are an important factor, as they are finally supposed to buy the meat. Acceptance of the alternatives by consumers of organic food is of particular interest, because there is a legal regulation pertaining to piglet castration in organic

farming¹⁰ and organic consumers particularly value attributes like animal welfare as well as good taste and food safety. Regarding piglet castration and the alternative methods, there may be conflicts between these attributes. For instance castration without anaesthesia and analgesia ensures sensory meat quality but also presents a major animal welfare problem. In contrast, the fattening of boars improves animal welfare but bears the risk of boar taint in meat.

Therefore, the objectives of this dissertation included the question as to whether organic consumers are aware of piglet castration and how they react to the information that piglets are castrated without pain relief in organic farming. Furthermore, organic consumers' attitudes, opinions, preferences and willingness-to-pay regarding the three alternatives should be explored. Important aspects for the evaluation of the alternatives and factors influencing preferences and willingness-to-pay should also be identified. Additionally, it was of interest how different levels of information on piglet castration without pain relief and alternative methods would affect organic consumers' attitudes, preferences and willingness-to-pay. Besides information, taste is an important factor for marketing boar meat. Hence, the influence of sensory evaluations of a boar meat product on willingness-to-pay should be examined.

In autumn 2009 nine focus group discussions combined with Vickrey auctions were conducted. Overall, 89 consumers of organic pork participated in the study. Focus group discussions were applied in order to explore consumers' attitudes and opinions. Subsequently, willingness-to-pay for the alternatives was measured with Vickrey auctions. The effect of tasting product samples on willingness-to-pay for boar meat was tested by offering boar salami to participants. Information on piglet castration and alternatives was provided as a basis for discussion. There were three information variants in order to determine effects of different information levels. Variant 1 provided basic information on piglet castration without pain relief and alternative methods. In Variant 2 advantages and disadvantages of the methods were added. Variant 3 only differed from Variant 2 in the description of immunocastration which included the word 'hormone' and would supposedly trigger negative associations. The focus group data were analysed using qualitative content analysis. In order to compare the focus group results with those from the auctions, an adapted scoring model was applied to further analyse the data set.

¹⁰ Note that at the time of data collection (2009) the ban of piglet castration without anaesthesia and analgesia was already scheduled in the EU regulation for organic farming with a transition period that ended on 31.12.2011.

The majority of participants were not aware that piglets are castrated without anaesthesia in organic farming. They reacted shocked and disappointed on learning about this practice which did not fit into their image of animal welfare standards in organic farming. Consequently, willingness-to-pay for salami produced with meat from pigs castrated without anaesthesia and analgesia was the lowest (1.19€ for 80g of smoked organic salami).

Analysis of the focus group data revealed that animal welfare, food safety, taste, organic farming and costs were important aspects for consumers' evaluation of the alternatives. The relevance of these aspects varied between alternatives. Castration with anaesthesia and analgesia was mainly evaluated positively regarding animal welfare. Possible residues of the drugs used were discussed as a food safety issue; however, many participants believed that such residues would not be present any more at the time of slaughter. Using drugs was seen as inappropriate for organic farming, though. Costs of castration with pain relief were considered to be high and increasing meat prices were expected. Willingness-to-pay for salami from pigs castrated with anaesthesia and analgesia was overall the highest (2.17€). The percentage of participants who placed a bid of zero Euros, which indicated that they did not want to buy the product at all, was the lowest with 14%.

The discussions on immunocastration were dominated by food safety concerns. The alternative was strongly associated with hormones regardless of the information provided. Participants feared residues in meat which could have negative health effects. Regarding animal welfare, immunocastration was mainly seen as positive. However, the use of immunocastration in organic farming was deemed inappropriate due to its perceived unnaturalness. Willingness-to-pay was with 1.33€ slightly higher than for castration without pain relief. At the same time, the share of zero-bids was the highest of all alternatives (48%; castration without pain relief 41%). This suggests a polarisation of opinions, as to some degree the high share of zero-bids was obviously compensated by relatively high bids.

Regarding the fattening of boars, taste played an important role in the discussion. Most participants had no personal experience with boar taint. Therefore, they had difficulties in forming a definite opinion. Furthermore the questions were raised as to how many male pigs develop boar taint and how boar tainted meat could be utilized. Wasting large amounts of pork was regarded as unethical. Animal welfare was considered to be rather positive, yet there were also concerns about increased aggressive behaviour of the boars. The fattening of boars was regarded as a natural method because there are no drugs or surgical interventions. Willingness-to-pay for the fattening of boars was 2.12€ with a share of 21% zero-bids. After

tasting boar salami and a standard product for comparison, willingness-to-pay was significantly reduced to 1.79€ and the share of zero-bids increased to 28%. It could be demonstrated that sensory evaluations had a significant effect on willingness-to-pay for boar salami. Participants preferring boar salami significantly increased their willingness-to-pay after tasting (20%), while participants preferring the standard salami reduced their bids for boar salami significantly (52%).

The effect of differences in information provision was minor. Due to the strong association of immunocastration with hormones, no differences in acceptance could be determined between information variants. It could be observed, however, that the share of zero-bids increased when more information was provided (Variants 2 and 3). Possibly, more information draws consumers' attention to aspects they did not think of before.

Overall, the results show, that for consumers of organic pork castration with anaesthesia and analgesia as well as the fattening of boars may be acceptable alternatives in organic farming. Considering the strong food safety concerns regarding immunocastration, acceptance of this alternative may be questioned. Communication regarding alternatives to piglet castration without anaesthesia and analgesia should take into account that the relevance of the aspects animal welfare, food safety, taste and costs differs between alternatives. Furthermore, it seems advisable not to address an unappetizing topic like piglet castration directly at the point of sale so as not to deter consumers from buying organic pork. The issue of piglet castration demonstrates exemplarily that it is important for the organic sector to implement and maintain high animal welfare standards and communicate them in an appropriate way, thereby trying to prevent strong discrepancies between consumers' expectations regarding animal husbandry in organic farming and actual conditions. So, disappointment of consumers and a loss of image due to negative reports of animal welfare issues can be avoided.

12.2 Zusammenfassung

In Deutschland und anderen europäischen Ländern werden in der Schweinemast männliche Ferkel routinemäßig kastriert, um das Auftreten von sogenanntem Ebergeruch zu verhindern. Ebergeruch ist eine Veränderung in Geruch und Geschmack von Schweinefleisch, die vor allem auf die Anreicherung von Androstenon und Skatol im Fett und Fleisch von unkastrierten männlichen Schweinen zurückzuführen ist. Dies ist nur bei einem gewissen Anteil der Schweine der Fall. Bei sensorischen Bewertungen wird Ebergeruch mit Begriffen wie Urin, Fäkalien oder Schweiß in Verbindung gebracht. Ebergeruch wird von vielen Menschen als sehr unangenehm empfunden, wobei es Unterschiede in der Wahrnehmung gibt, da insbesondere Androstenon von einem Teil der Bevölkerung überhaupt nicht wahrgenommen wird, während andere Menschen äußerst empfindlich darauf reagieren. Aufgrund des abstoßenden Charakters von Ebergeruch besteht ein großes Interesse daran das Auftreten zu verhindern. Da die Entstehung von Ebergeruch mit der sexuellen Entwicklung der männlichen Schweine im Zusammenhang steht, stellt die chirurgische Kastration der Ferkel ein effektives Mittel dagegen dar.

Die Kastration wurde von den Landwirten üblicherweise in der ersten Lebenswoche der Ferkel ohne Betäubung oder Schmerzbehandlung durchgeführt. Dabei gab es keine Unterschiede zwischen der konventionellen und der ökologischen Schweinehaltung. In den letzten Jahren wurde die betäubungslose Kastration zunehmend als tierschutzwidrig kritisiert, da die Annahme, dass junge Ferkel weniger Schmerzen empfinden als ältere Tiere, wissenschaftlich nicht haltbar ist. Als Reaktion auf diese Kritik wurden in verschiedenen europäischen Ländern freiwillige Vereinbarungen zum Verzicht auf die betäubungslose Kastration getroffen und teilweise auch gesetzliche Regelungen geschaffen. Im Gegensatz zur konventionellen Schweinehaltung, wo es bisher keine international einheitliche Vorschriften gibt, ist im ökologischen Landbau in der gesamten Europäischen Union die chirurgische Kastration von Ferkeln seit Januar 2012 nur noch unter der Verwendung von Betäubungs- und/oder Schmerzmitteln möglich.

Der Verzicht auf die betäubungslose Kastration bringt die Notwendigkeit mit sich alternative Methoden einzusetzen, die einerseits den Tierschutz verbessern, andererseits aber auch die sensorische Fleischqualität sicherstellen. Sowohl für die konventionelle als auch für die ökologische Schweinehaltung gibt es drei relevante Alternativen. Erstens kann die chirurgische Kastration unter Einsatz von Betäubungs- und/oder Schmerzmitteln durchgeführt werden. Die Betäubung soll den akuten Schmerz während der Kastration ausschalten, wobei

eine Allgemeinanästhesie oder eine lokale Betäubung möglich sind. Für eine Allgemeinanästhesie können die Betäubungsmittel injiziert oder gasförmig über eine Maske verabreicht werden. Schmerzmittel dienen hauptsächlich der Reduzierung von Wundschmerzen nach der Kastration. Zweitens besteht die Möglichkeit Ebergeruch durch eine Impfung der Schweine zu verhindern (Immunokastration). Die Impfung löst eine Immunreaktion aus, die die sexuelle Entwicklung der Schweine hemmt und somit das Auftreten von Ebergeruch verhindert. Drittens können die männlichen Schweine unkastriert gemästet werden (Ebermast). Die Ebermast birgt das Risiko des Auftretens von Ebergeruch bei einem Teil der Tiere, weshalb Maßnahmen zur Reduzierung und Erkennung von Ebergeruch im Fleisch entwickelt und umgesetzt werden müssen.

Die alternativen Methoden haben verschiedene Vor- und Nachteile für Landwirte, Verarbeiter, Händler und Verbraucher, die bei der Umsetzung berücksichtigt werden sollten, um eine breite Akzeptanz zu erreichen. Dabei stellen die Einstellungen und Präferenzen der Verbraucher einen wichtigen Faktor dar, da die Kunden letztendlich bereit sein müssen das Schweinefleisch zu kaufen. Die Akzeptanz der Alternativen durch Käufer von Öko-Lebensmitteln ist von besonderem Interesse, weil zum einen im Öko-Landbau eine gesetzliche Regelung der Ferkelkastration vorhanden ist¹¹ und zum anderen Öko-Verbraucher besonderen Wert auf Tierschutz sowie auf guten Geschmack und Lebensmittelsicherheit legen. Im Zusammenhang mit der Ferkelkastration und den alternativen Methoden bestehen zum Teil Zielkonflikte zwischen diesen Attributen. So wird zum Beispiel die sensorische Fleischqualität durch die betäubungslose Kastration sichergestellt, aber es besteht ein Tierschutzproblem. Umgekehrt wird durch den Verzicht auf die Kastration bei der Ebermast der Tierschutz verbessert, aber es kann zum Auftreten von Ebergeruch im Fleisch kommen.

Die Zielsetzung dieser Dissertation war daher erstens zu untersuchen, inwieweit Öko-Verbraucher über die Ferkelkastration Bescheid wissen und wie sie auf die Information reagieren, dass Ferkel im Öko-Landbau betäubungslos kastriert werden. Zweitens sollten Einstellungen, Meinungen, Präferenzen sowie die Zahlungsbereitschaft der Öko-Verbraucher für die drei Alternativen zur betäubungslosen Ferkelkastration ermittelt und zudem untersucht werden, welche Aspekte für Verbraucher dabei besonders wichtig sind und welche Faktoren auf Präferenzen und Zahlungsbereitschaft wirken. Drittens war es von Interesse, inwieweit unterschiedliche Informationen über die betäubungslose Ferkelkastration und alternative

¹¹ Zum Zeitpunkt der Datenerhebung (2009) war das Verbot der betäubungslosen Kastration in der EU-Öko-Verordnung bereits vorgesehen, es galt aber noch Übergangsregelung, die die betäubungslose Kastration bis zum 31.12.2011 erlaubte.

Methoden die Einstellungen und Präferenzen sowie die Zahlungsbereitschaft der Öko-Verbraucher beeinflussen. Neben Informationen spielt der Geschmack insbesondere bei der Vermarktung von Eberfleisch eine Rolle. Daher sollte untersucht werden, welchen Einfluss die sensorische Beurteilung von Eberfleischprodukten durch Verbraucher auf die Zahlungsbereitschaft hat.

Die Datenerhebung fand im Herbst 2009 statt und erfolgte mit einer Kombination aus qualitativen und quantitativen Methoden. Die Einstellungen und Meinungen zur betäubungslosen Ferkelkastration und den Alternativen wurden in neun Fokusgruppendifkussionen mit insgesamt 89 Öko-Verbrauchern, die auch Öko-Schweinefleischprodukte kaufen, erhoben. Im Anschluss an die Fokusgruppendifkussionen wurde jeweils mittels Vickrey-Auktionen die Zahlungsbereitschaft ermittelt. Um die Wirkung von Verkostungen als verkaufsfördernde Maßnahmen auf die Zahlungsbereitschaft zu testen, konnten die Teilnehmer im Rahmen der Auktionen ein Eberfleischprodukt (Salami) probieren. Um eine Grundlage für die Diskussionen zu schaffen, erhielten die Teilnehmer Informationen über die betäubungslose Ferkelkastration und alternative Methoden, wobei es drei verschiedene Varianten gab. Alle Gruppen erhielten Hintergrundinformationen zur betäubungslosen Ferkelkastration (bevorstehendes Verbot im Öko-Landbau, Gründe für die Kastration). In der ersten Informationsvariante folgte dann eine kurze Beschreibung der betäubungslosen Ferkelkastration und der drei Alternativen (minimale Information). In einer zweiten Variante wurden die Beschreibungen durch Vor- und Nachteile der Methoden ergänzt (volle Informationen). Die dritte Variante unterschied sich von der zweiten nur in der Beschreibung der Immunkastration. Hier wurde gezielt das Wort „Hormon“ verwendet, was in den anderen Varianten vermieden wurde (volle Information inkl. Hormon). Da der Einsatz von Hormonen in der Landwirtschaft von Verbrauchern überwiegend kritisch gesehen wird, wurden negative Reaktionen auf diese Informationsvariante erwartet. Die Auswertung der Fokusgruppen erfolgte mittels qualitativer Inhaltsanalyse. Um die Erkenntnisse mit den Ergebnissen der deskriptiven Analyse der Auktionsdaten zu vergleichen, wurden die Fokusgruppendaten zusätzlich mit einer angepassten Nutzwertanalyse (Scoring-Modell) ausgewertet.

Die Tatsache, dass Ferkel auch in der ökologischen Landwirtschaft ohne Betäubung kastriert werden, war unter den Teilnehmern weitgehend unbekannt. Die Reaktionen auf diese Information waren überwiegend negativ. Viele Teilnehmer waren schockiert und enttäuscht, da diese Praxis nicht in ihr Bild von der artgerechten Tierhaltung im ökologischen Landbau

passte. Entsprechend war die Zahlungsbereitschaft für Salami von betäubungslos kastrierten Schweinen insgesamt am niedrigsten (1,19€ für 80g geräucherte Öko-Salami).

Die Auswertung der Fokusgruppendifkussionen zeigte, dass insbesondere Tierschutz, Lebensmittelsicherheit, Geschmack, ökologischer Landbau und Kosten wichtige Aspekte für die Bewertung der Alternativen durch die Teilnehmer waren. Dabei war die Bedeutung der einzelnen Aspekte bei den einzelnen Alternativen unterschiedlich. Die Kastration mit Betäubung und Schmerzbehandlung wurde hinsichtlich des Tierschutzes mehrheitlich positiv bewertet. Aufgrund möglicher Rückstände der Medikamente im Fleisch gab es teilweise Bedenken bezüglich der Lebensmittelsicherheit, wobei viele Teilnehmer davon ausgingen, dass Rückstände von Betäubungsmitteln bis zur Schlachtung abgebaut sein würden. Der Einsatz von Medikamenten wurde allerdings als wenig passend zum Öko-Landbau betrachtet. Die Kosten dieser Alternative wurden als hoch eingeschätzt, so dass steigende Fleischpreise befürchtet wurden. Die Zahlungsbereitschaft für Salami von mit Betäubung und Schmerzbehandlung kastrierten Schweinen war insgesamt am höchsten (2,17€). Der Anteil der Teilnehmer, die ein Null-Euro-Gebot abgaben und damit deutlich machten, dass sie das Produkt nicht kaufen würden, war mit knapp 14% am geringsten.

Bei der Immunokastration dominierte das Thema Rückstände und Lebensmittelsicherheit klar die Diskussion. Die Methode wurde in allen Gruppen mit Hormonen in Verbindung gebracht, unabhängig von der Informationsvariante. Negative gesundheitliche Auswirkungen auf Menschen durch Rückstände im Fleisch wurden befürchtet. In Bezug auf den Tierschutz wurde diese Alternative überwiegend positiv gesehen. Allerdings wurde ihr Einsatz im Öko-Landbau aufgrund der empfundenen Unnatürlichkeit der Methode als nicht passend betrachtet. Die Zahlungsbereitschaft lag mit 1,33€ leicht über der für die betäubungslose Kastration. Der Anteil der Null-Euro-Gebote war sogar insgesamt der höchste (48%; betäubungslose Kastration 41%), was auf eine gewisse Polarisierung der Meinungen schließen lässt, da dieser hohe Anteil offenbar zu einem gewissen Grad durch vergleichsweise hohe Gebote kompensiert wurde.

Bei der Ebermast spielte das Thema Geschmack eine wichtige Rolle. Die meisten Teilnehmer hatten keine eigenen Erfahrungen mit Ebergeruch, so dass bezüglich des Grades der Unappetitlichkeit Unsicherheit herrschte. Außerdem wurde thematisiert, wie viele männliche Mastschweine Ebergeruch aufweisen und wie geruchsbelastetes Fleisch sinnvoll verwendet werden könnte. Das Wegwerfen von größeren Mengen an Fleisch wurde klar als unethisch betrachtet. Der Tierschutzaspekt wurde eher positiv bewertet, es gab aber auch Bedenken

wegen der höheren Aggressivität der Tiere. Aufgrund des Verzichts auf Eingriffe am Tier und Medikamente wurde die Ebermast als natürliches Verfahren angesehen, was positiv bewertet wurde. Als einzige Alternative wurde die Ebermast als passend zum Öko-Landbau eingestuft. Die Zahlungsbereitschaft für Ebersalami lag bei 2,12€ mit einem Anteil von 21% Null-Euro-Geboten. Nach der Verkostung von Ebersalami und einer Standardsalami zum Vergleich, reduzierte sich die Zahlungsbereitschaft signifikant auf 1,79€ und der Anteil an Teilnehmern, die keine Ebersalami kaufen wollten, stieg auf 28%. Es konnte gezeigt werden, dass die sensorische Bewertung einen signifikanten Effekt auf die Zahlungsbereitschaft für Ebersalami hatte. Teilnehmer, die die Ebersalami bei der Verkostung bevorzugten, erhöhten ihre Zahlungsbereitschaft signifikant (20%), während Teilnehmer, die das Vergleichsprodukt präferierten, ihre Zahlungsbereitschaft für Ebersalami signifikant reduzierten (52%).

Die Wirkung der unterschiedlichen Informationsvarianten war minimal. Aufgrund der starken Assoziation der Immunokastration mit Hormonen konnten hier keine signifikanten Unterschiede festgestellt werden. Es konnte beobachtet werden, dass der Anteil der Null-Euro-Gebote mit mehr Informationen (Varianten 2 und 3) höher war. Möglicherweise führten mehr Informationen dazu, dass die Teilnehmer erst auf bestimmte Aspekte aufmerksam wurden.

Insgesamt zeigen die Ergebnisse, dass die Kastration mit Betäubung und Schmerzbehandlung sowie die Ebermast akzeptable Alternativen für Käufer von Öko-Schweinefleisch darstellen könnten. Aufgrund der geäußerten Bedenken bezüglich der Lebensmittelsicherheit bei der Immunokastration ist die Akzeptanz dieser Alternative fraglich. Bei der Kommunikation zu den Alternativen zur betäubungslosen Ferkelkastration sollte die unterschiedliche Bedeutung der Aspekte Tierschutz, Lebensmittelsicherheit, Geschmack und Kosten für die Bewertung der Alternativen berücksichtigt werden. Zudem erscheint es sinnvoll ein so wenig appetitliches Thema wie die Ferkelkastration nicht direkt am Einkaufsort zu thematisieren, um Verbraucher nicht vom Kauf von Öko-Schweinefleisch abzuschrecken. Am Beispiel der Ferkelkastration lässt sich zeigen, dass es für die ökologische Landwirtschaft wichtig ist, durch die konsequente Umsetzung von hohen Tierschutzstandards und entsprechende Kommunikationsmaßnahmen dafür zu sorgen, dass die Erwartungen der Verbraucher an die Tierhaltung nicht zu stark von den tatsächlichen Gegebenheiten abweichen. Damit ließen sich Enttäuschungen bei Verbrauchern und ein Imageverlust durch das Bekanntwerden von (systemimmanenten) Tierschutzproblemen vermeiden.

Literature

- Aaker, D. A., Kumar, V., Day, G. S., & Leone, R. P. (2010). *Marketing Research*. (10th ed.) Chichester: Wiley.
- Abrams, K., Meyers, C., & Irani, T. (2010). Naturally confused: consumers' perceptions of all-natural and organic pork products. *Agriculture and Human Values*, 27, 365-374.
- Adam, D. (1996). *Planung und Entscheidung. Modelle - Ziele - Methoden*. (4th ed.) Wiesbaden: Gabler.
- AMI (2011). Schlachttiere. *Markt Woche Ökolandbau*, 34/2011, 1-2.
- AMI (2012). *Strukturdaten im Ökologischen Landbau in Deutschland 2011 - Bodennutzung, Tierhaltung, Verkaufserlöse - AMI Markt Studie im Auftrag der BLE*. Bonn: Bundesanstalt für Landwirtschaft und Ernährung.
- Andersen, L. M. (2011). Animal Welfare and Eggs - Cheap Talk or Money on the Counter? *Journal of Agricultural Economics*, 62, 565-584.
- Anderson, R. E. (1973). Consumer dissatisfaction: The effect of disconfirmed expectancy on perceived product performance. *Journal of Marketing Research*, 10, 38-44.
- Andresen, Ø. (2006). Boar taint related compounds: Androstenone/skatole/other substances. *Acta Veterinaria Scandinavica*, 48, 5-8.
- Annor-Frempong, I. E., Nute, G. R., Whittington, F. W., & Wood, J. D. (1997a). The problem of taint in pork: 1. Detection thresholds and odour profiles of androstenone and skatole in a model system. *Meat Science*, 46, 45-55.
- Annor-Frempong, I. E., Nute, G. R., Whittington, F. W., & Wood, J. D. (1997b). The problem of taint in pork: II. The influence of skatole, androstenone and indole, presented individually and in combination in a model lipid base, on odour perception. *Meat Science*, 47, 49-61.
- Anwander Phan-Huy, S. & Badertscher Fawaz, R. (2003). Swiss Market for Meat from Animal-Friendly Production - Responses of Public and Private Actors in Switzerland. *Journal of Agricultural and Environmental Ethics*, 16, 119-136.
- Armstrong, G. & Kotler, P. (2009). *Marketing - An introduction*. (9th ed.) Upper Saddle River, New Jersey: Pearson Education.
- Babol, J. & Squires, E. J. (1995). Quality of meat from entire male pigs. *Food Research International*, 28, 201-212.
- Babol, J., Squires, E. J., & Gullett, E. A. (1996). Investigation of factors responsible for the development of boar taint. *Food Research International*, 28, 573-581.
- Babol, J., Squires, E. J., & Gullett, E. A. (2002). Factors affecting the level of boar taint in entire male pigs as assessed by consumer sensory panel. *Meat Science*, 61, 33-40.
- Bañon, S., Andreu, C., Laencina, J., & Garrido, M. D. (2004). Fresh and eating pork quality from entire versus castrate heavy males. *Food Quality and Preference*, 15, 293-300.
- Bañon, S., Costa, E., Gil, M. D., & Garrido, M. D. (2003a). A comparative study of boar taint in cooked and dry-cured meat. *Meat Science*, 63, 381-388.

- Bañon, S., Gil, M. D., & Garrido, M. D. (2003b). The effects of castration on the eating quality of dry-cured ham. *Meat Science*, *65*, 1031-1037.
- Baumgartner, J., Binder, R., Hagmuller, W., Hofbauer, P., Iben, C., Scala, U. S., & Winckler, C. (2004). Aktuelle Aspekte der Kastration männlicher Ferkel. 2. Mitteilung: Alternativmethoden zur chirurgischen Kastration und zusammenfassende Bewertung. *Wiener Tierärztliche Monatsschrift*, *91*, 198-209.
- Benkenstein, M. (2001). *Entscheidungsorientiertes Marketing*. Wiesbaden: Gabler.
- Bernués, A., Olaizola, A., & Corcoran, K. (2003). Extrinsic attributes of red meat as indicators of quality in Europe: an application for market segmentation. *Food Quality and Preference*, *14*, 265-276.
- Biokreis e.V. (2011). Richtlinien landwirtschaftliche Erzeugung. Retrieved January 18, 2013, from http://www.biokreis.de/pic_download/29.pdf.
- Bioland e.V. (2013). Bioland Richtlinien - Fassung vom 27. November 2012. Retrieved January 18, 2013, from http://www.bioland.de/fileadmin/bioland/file/bioland/qualitaet_richtlinien/Bioland_Richtlinien_27_Nov_2012.pdf.
- Blackwell, R. D., Miniard, P. W., & Engel, J. F. (2006). *Consumer behavior*. (10th ed.) Mason, Ohio: Thomson South-Western.
- Blank, R. (2007). Gruppendiskussionsverfahren. In G. Naderer & E. Balzer (Eds.), *Qualitative Marktforschung in Theorie und Praxis - Grundlagen, Methoden und Anwendungen* (1st ed., pp. 279-301). Wiesbaden: Gabler.
- Bonneau, M., Kempster, A. J., Claus, R., Claudi-Magnussen, C., Diestre, A., Tornberg, E., Walstra, P., Chevillon, P., Weiler, U., & Cook, G. L. (2000a). An international study on the importance of androstenone and skatole for boar taint: I. Presentation of the programme and measurement of boar taint compounds with different analytical procedures. *Meat Science*, *54*, 251-259.
- Bonneau, M., Walstra, P., Claudi-Magnussen, C., Kempster, A. J., Tornberg, E., Fischer, K., Diestre, A., Siret, F., Chevillon, P., Claus, R., Dijksterhuis, G., Punter, P., Matthews, K. R., Agerhem, H., Beague, M. P., Oliver, M. A., Gispert, M., Weiler, U., von Seth, G., Leask, H., Font i Furnols, M., Homer, D. B., & Cook, G. L. (2000b). An international study on the importance of androstenone and skatole for boar taint: IV. Simulation studies on consumer dissatisfaction with entire male pork and the effect of sorting carcasses on the slaughter line, main conclusions and recommendations. *Meat Science*, *54*, 285-295.
- Bouyssou, D., Marchant, T., Pirlot, M., Tsoukiàs, A., & Vincke, P. (2006). *Evaluation and decision models with multiple criteria*. New York: Springer.
- Branscheid, W. (2009). Attraktive Mast, fragwürdige Qualität. *DGS Magazin*, *36*, 44-47.
- Breidert, C., Hahsler, M., & Reutterer, T. (2006). A review of methods for measuring willingness-to-pay. *Innovative Marketing*, *2*, 8-32.
- Brenninkmeyer, C., Heid, A., Hamm, U., & Knierim, U. (2010). Alternativen zur betäubungslosen Ferkelkastration – Erfahrungen im europäischen Ökolandbau und Wünsche deutscher Bio-Konsumenten. In Forschungsanstalt Agroscope Reckenholz-Tänikon (Ed.), *24. IGN Conference, 03.-05.06., Tänikon/Switzerland* (pp. 10-14).

- Bryman, A. (2006). Integrating quantitative and qualitative research: how is it done? *Qualitative Research*, 6, 97-113.
- Bryman, A. (2008). *Social Research Methods*. (3rd ed.) Oxford: Oxford University Press.
- Buchecker, K. (2008). *Sensorik: Fragen und Antworten*. Hamburg: Behr's Verlag.
- Buder, F., Hamm, U., Bickel, M., & Bien, B. (2010). Dynamik des Kaufverhaltens im Bio-Sortiment. <http://orgprints.org/16983>.
- Bundesregierung (2012). Bundesregierung verbessert Tierschutz. Retrieved January 18, 2013, from <http://www.bundesregierung.de/Content/DE/Artikel/2012/05/2012-05-23-novelle-tierschutzgesetz.html>.
- Burns, A. C. & Bush, R. F. (2010). *Marketing Research*. (6th ed.) Upper Saddle River, New Jersey: Pearson Education.
- Cardello, A. V. & Sawyer, F. M. (1992). Effects of disconfirmed consumer expectations on food acceptability. *Journal of Sensory Studies*, 7, 253-277.
- Carlsson, F., Frykblom, P., & Lagerkvist, C. J. (2007). Consumer willingness to pay for farm animal welfare: mobile abattoirs versus transportation to slaughter. *European Review of Agricultural Economics*, 34, 321-344.
- Clarke, L., Walker, J., Hennessy, D., Kreeger, J., Nappier, J., & Crane, J. (2008). Inherent food safety of a synthetic gonadotropin-releasing factor (GnRF) vaccine for the control of boar taint in entire male pigs. *International Journal of Applied Research in Veterinary Medicine*, 6, 7-14.
- Claus, R., Weiler, U., & Herzog, A. (1994). Physiological aspects of androstenone and skatole formation in the boar - A review with experimental data. *Meat Science*, 38, 289-305.
- Claus, R. (1993). Die unendliche Geschichte der Ebermast. Eine historisch-physiologische Analyse. *Fleischwirtschaft*, 73, 499-453.
- Commission Regulation (EC) No 889/2008. (2008a). Commission Regulation (EC) No 889/2008 of 5 September 2008 laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control.
- Council Directive 2008/120/EC. (2008). Council Directive 2008/120/EC of December 2008 laying down minimum standards for the protection of pigs.
- de Kock, H. L., Heinze, P. H., Potgieter, C. M., Dijksterhuis, G. B., & Minnaar, A. (2001a). Temporal aspects related to the perception of skatole and androstenone, the major boar odour compounds. *Meat Science*, 57, 61-70.
- de Kock, H. L., van Heerden, S. M., Heinze, P. H., Dijksterhuis, G. B., & Minnaar, A. (2001b). Reaction to boar odour by different South African consumer groups. *Meat Science*, 59, 353-362.
- Deimel, I., Franz, A., Frentrup, M., von Meyer, M., Spiller, A., & Theuvsen, L. (2010). Perspektiven für ein Europäisches Tierschutzlabel. Retrieved January 18, 2013 from <http://www.uni-goettingen.de/de/190209.html>.

- Demeter e.V. (2012). Richtlinien für die Zertifizierung der Demeter-Qualität - Erzeugung (Stand Dezember 2012). Retrieved January 18, 2013, from http://www.demeter.de/sites/default/files/public/pdf/Rili_ERZEUGUNG_2013.pdf.
- Desmoulin, B., Bonneau, M., Frouin, A., & Bidard, J. P. (1982). Consumer testing of pork and processed meat from boars: The influence of fat androstenone level. *Livestock Production Science*, *9*, 707-715.
- Diestre, A., Oliver, M. A., Gispert, M., Arpa, I., & Arnau, J. (1990). Consumer responses to fresh meat and meat products from barrows and boars with different levels of boar taint. *Animal Production*, *50*, 519-530.
- Dijksterhuis, G. B., Engel, B., Walstra, P., Font i Furnols, M., Agerhem, H., Fischer, K., Oliver, M. A., Claudi-Magnussen, C., Siret, F., Beague, M. P., Homer, D. B., & Bonneau, M. (2000). An international study on the importance of androstenone and skatole for boar taint: II. Sensory evaluation by trained panels in seven European countries. *Meat Science*, *54*, 261-269.
- Dransfield, E., Ngapo, T. M., Nielsen, N. A., Bredahl, L., Sjødén, 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*, *69*, 61-70.
- European Commission (2010). European declaration on alternatives to surgical castration of pigs. Retrieved June 19, 2012a, from http://ec.europa.eu/food/animal/welfare/farm/docs/castration_pigs_declaration_en.pdf.
- European Food Safety Authority (2004a). Welfare aspects of the castration of piglets - Opinion and scientific report of the scientific Panel for Animal Health and Welfare on a request of the Commission related to welfare aspects of the castration of piglets. Retrieved September 14, 2011a, from <http://www.efsa.europa.eu/en/efsajournal/doc/91.pdf>.
- Evans, A. & Miele, M. (2008). *Consumers' views about farm animal welfare. Part II: European comparative report based on focus group research*. Welfare Quality Reports No. 5.
- FAO (2012). FAOSTAT. Retrieved August 10, 2012, from <http://faostat.fao.org/site/569/DesktopDefault.aspx?PageID=569#ancor>.
- Finch, H. & Lewis, J. (2006). Focus Groups. In J. Ritchie & J. Lewis (Eds.), *Qualitative Research Practice* (pp. 170-198). London: Sage Publ.
- Fischer, K. & Weiler, U. (1995). Aspekte der sensorischen Qualität von Eberfleisch. In Bundesministerium für Ernährung Landwirtschaft und Forsten (Ed.), *Die Ebermast - Fragen und Konsequenzen bei der Produktion von Schweinefleisch* (Heft 449, pp. 46-54). Münster: Landwirtschaftsverlag.
- fischerAppelt relations (2012). Ökobarometer 2012 - Repräsentative Bevölkerungsbefragung im Auftrag des Bundesministeriums für Ernährung, Landwirtschaft und Verbraucherschutz (BMELV). Retrieved February 29, 2012, from http://www.oekolandbau.de/fileadmin/redaktion/dokumente/journalisten/Oekobarometer2012_Sheets_BA.pdf.
- Font i Furnols, M., Gispert, M., Diestre, A., & Oliver, M. A. (2003). Acceptability of boar meat by consumers depending on their age, gender, culinary habits, and sensitivity and appreciation of androstenone odour. *Meat Science*, *64*, 433-440.

- Font i Furnols, M., Gispert, M., Guerrero, L., Velarde, A., Tibau, J., Soler, J., Hortós, M., García-Regueiro, J. A., Pérez, J., Suárez, P., & Oliver, M. A. (2008). Consumers' sensory acceptability of pork from immunocastrated male pigs. *Meat Science*, *80*, 1013-1018.
- Fredriksen, B., Font i Furnols, M., Lundström, K., Migdal, W., Prunier, A., Tuytens, F. A. M., & Bonneau, M. (2009). Practice on castration of piglets in Europe. *Animal*, *3*, 1480-1487.
- Fredriksen, B., Johnsen, A. M. S., & Skuterud, E. (2011). Consumer attitudes towards castration of piglets and alternatives to surgical castration. *Research in Veterinary Science*, *90*, 352-357.
- Frewer, L. J., Kole, A., Kroon, S. M. A. V., & Lauwere, C. d. (2005). Consumer Attitudes Towards the Development of Animal-Friendly Husbandry Systems. *Journal of Agricultural and Environmental Ethics*, *18*, 345-367.
- Gää e.V. (2010). Gää Richtlinien Erzeugung (Stand 11/2010). Retrieved January 18, 2013, from <http://www.gaea.de/userfiles/file/Richtlinien/10-12-01%20G%C3%A4a-Richtlinien%20Erzeugung%20Stand%2011-2010.pdf>.
- Giersing, M., Ladewig, J., & Forkman, B. (2006). Animal welfare aspects of preventing boar taint. *Acta Veterinaria Scandinavica*, *48*, 1-3.
- Gilbert, A. N. & Wysocki, C. J. (1987). The smell survey results. *National Geographic*, *172*, 514-525.
- Gläser, J. & Laudel, G. (2006). *Experteninterviews und qualitative Inhaltsanalyse*. (2nd ed.) Wiesbaden: VS Verlag für Sozialwissenschaften.
- Godt, J., Kristensen, K., Poulsen, C. S., Juhl, H. J., & Bech, A. C. (1996). Verbraucherstudie zum Thema dänische männliche, nicht kastrierte Schweine. *Fleischwirtschaft*, *76*, 378-380.
- Gower, D. B. (1972). 16-Unsaturated C₁₉ steroids - a review of their chemistry, biochemistry and possible physiological role. *Journal of Steroid Biochemistry*, *3*, 45-103.
- Griffiths, N. M. & Patterson, R. L. S. (1970). Human olfactory responses to 5 α -androst-16-ene-3-one - principal component of boar taint. *Journal of the Science of Food and Agriculture*, *21*, 4-6.
- Grunert, K. G. (2006). Future trends and consumer lifestyles with regard to meat consumption. *Meat Science*, *74*, 149-160.
- Gullett, E. A., Partlow, G. D., Fisher, K. R. S., Halina, W. G., & Squires, E. J. (1993). Effect of pig sex on consumer ratings for pork chops and bacon. *Food Quality and Preference*, *4*, 201-205.
- Hamm, U. (2007). Verbraucherakzeptanz von Öko-Fleischwaren ohne Nitritpökelsalz. *Fleischwirtschaft*, *2007*, 126-130.
- Harper, G. C. & Henson, S. (2001). Consumer concerns about animal welfare and the impact on food choice (EU FAIR CT98-3678) - Final Report. Retrieved September 14, 2011, from http://ec.europa.eu/food/animal/welfare/eu_fair_project_en.pdf.
- Harper, G. C. & Makatouni, A. (2002). Consumer perception of organic food production and farm animal welfare. *British Food Journal*, *104*, 287-299.
- Heid, A. & Hamm, U. (2010). Determinants of consumer acceptance of alternatives to piglet castration without anaesthesia - a review. *Fleischwirtschaft International*, *2*, 122-126.

- Heid, A. & Hamm, U. (2012). Consumer attitudes towards alternatives to piglet castration without pain relief in organic farming: Qualitative results from Germany. *Journal of Agricultural and Environmental Ethics*, 25, 687-706.
- Hofer, S. & Kupper, T. (2008). Alternative Methoden zur konventionellen Ferkelkastration ohne Schmerzausschaltung. Umfrage zur Akzeptanz der Impfung gegen Ebergeruch (Bericht 3). Retrieved September 14, 2011, from http://www.shl.bfh.ch/fileadmin/docs/Forschung/KompetenzenTeams/NutztierUmweltInteraktion/ProSchwein/Synthesebericht/B14_Umfrage_zur_Akzeptanz_der_Impfung_20080331.pdf.
- Huber-Eicher, B. (2008). Alternative Methoden zur konventionellen Ferkelkastration ohne Schmerzausschaltung. Umfrageergebnisse der repräsentativen Imagestudie Schweizerfleisch (Bericht 2). Retrieved March 3, 2010, from http://www.shl.bfh.ch/fileadmin/docs/Forschung/KompetenzenTeams/NutztierUmweltInteraktion/ProSchwein/Synthesebericht/B13_Umfrageergebnisse_der_repr_sentativen_Imagestudie_20080331.pdf.
- Huber-Eicher, B. & Spring, P. (2008). Attitudes of Swiss consumers towards meat from entire or immunocastrated boars: A representative survey. *Research in Veterinary Science*, 85, 625-627.
- Hughner, R. S., McDonagh, P., Prothero, A., Shultz II, C. J., & Stanton, J. (2007). Who are organic food consumers? A compilation and review of why people purchase organic food. *Journal of Consumer Behaviour*, 6, 94-110.
- Ingenbleek, P. T. M. & Immink, V. M. (2011). Consumer decision-making for animal-friendly products: synthesis and implications. *Animal Welfare*, 20, 11-19.
- Jeremiah, L. E., Squires, E. J., & Sather, A. P. (1999). Gender and diet influences on pork palatability and consumer acceptance. II. Sex taint compounds and their relationship to sensory properties. *Journal of Muscle Foods*, 10, 317-331.
- Kaas, K. P. & Ruprecht, H. (2006). Are the Vickrey auction and the BDM Mechanism really incentive compatible? Empirical results and optimal bidding strategies in cases of uncertain willingness-to-pay. *Schmalenbach Business Review (SBR)*, 58, 37-55.
- Kempster, A. J., Dilworth, A. W., Evans, D. G., & Fisher, K. D. (1986). The effects of fat thickness and sex on pig meat quality with special reference to the problems associated with overleanness. 1. Butcher and consumer panel results. *Animal Production*, 43, 517-533.
- Kjærnes, U., Bock, B., Roe, E., & Roex, J. (2009). *Consumption, distribution and production of farm animal welfare. Opinions and practices within the supply chain*. Welfare Quality Reports No 7.
- Lange, C., Martin, C., Chabanet, C., Combris, P., & Issanchou, S. (2002). Impact of the information provided to consumers on their willingness to pay for Champagne: comparison with hedonic scores. *Food Quality and Preference*, 13, 597-608.
- Lagerkvist, C. J., Carlsson, F., & Viske, D. (2006). Swedish consumer preferences for animal welfare and biotech: A choice experiment. *AgBioForum*, 9, 51-58.
- Lassen, J., Sandøe, P., & Forkman, B. (2006). Happy pigs are dirty! - conflicting perspectives on animal welfare. *Livestock Science*, 103, 221-230.
- Lesser, D., Baron, P. J., & Robb, J. D. (1977). Boar bacon: A consumer survey. *Journal of the Science of Food and Agriculture*, 28, 1120-1131.

- Liem, D. G., Toraman Aydin, N., & Zandstra, E. H. (2012). Effects of health labels on expected and actual taste perception of soup. *Food Quality and Preference*, *25*, 192-197.
- Liljenstolpe, C. (2005). Valuing animal welfare with choice experiments: An application to Swedish pig production. Paper prepared for presentation at the 11th Congress of the EAAE (European Association of Agricultural Economists), KVL Copenhagen, Denmark, August 24-27, 2005. Retrieved June 19, 2012, from <http://ageconsearch.umn.edu/bitstream/24503/1/cp05li01.pdf>.
- Liljenstolpe, C. (2008). Evaluating animal welfare with choice experiments: An application to Swedish pig production. *Agribusiness*, *24*, 67-84.
- Lunde, K., Egelanddal, B., Choinski, J., Mielnik, M., Flåtten, A., & Kubberød, E. (2008). Marinating as a technology to shift sensory thresholds in ready-to-eat entire male pork meat. *Meat Science*, *80*, 1264-1272.
- Lunde, K., Skuterud, E., Hersleth, M., & Egelanddal, B. (2010). Norwegian consumers' acceptability of boar tainted meat with different levels of androstenone or skatole as related to their androstenone sensitivity. *Meat Science*, *86*, 706-711.
- Lundström, K., Malmfors, B., Fjelkner-Modig, S., & Szatek, A. (1982). Consumer testing of boar meat in Sweden. *Swedish Journal of Agricultural Research*, *13*, 39-46.
- Lusk, J. L. (2011). The market for animal welfare. *Agriculture and Human Values*, *28*, 561-575.
- Lusk, J. L., Nilsson, T., & Foster, K. (2007). Public preferences and private choices: Effect of altruism and free riding on demand for environmentally certified pork. *Environmental and Resource Economics*, *36*, 499-521.
- Lusk, J. L. & Norwood, F. (2010). Direct Versus Indirect Questioning: An Application to the Well-Being of Farm Animals. *Social Indicators Research*, *96*, 551-565.
- Lusk, J. L. & Shogren, J. F. (2007). *Experimental Auctions - Methods and applications in economic and marketing research*. Cambridge: Cambridge University Press.
- Magnusson, M. K., Arvola, A., Hursti, U. K. K., Åberg, L., & Sjöden, P.-O. (2003). Choice of organic foods is related to perceived consequences for human health and to environmentally friendly behaviour. *Appetite*, *40*, 109-117.
- Malmfors, B. & Lundström, K. (1983). Consumer reactions to boar meat - A review. *Livestock Production Science*, *10*, 187-196.
- Matthews, K. R., Homer, D. B., Punter, P., Beague, M. P., Gispert, M., Kempster, A. J., Agerhem, H., Claudi-Magnussen, C., Fischer, K., Siret, F., Leask, H., Font i Furnols, M., & Bonneau, M. (2000). An international study on the importance of androstenone and skatole for boar taint: III. Consumer survey in seven European countries. *Meat Science*, *54*, 271-283.
- Mayerhofer, W. (2007). Das Fokusgruppeninterview. In R. Buber & H. H. Holzmüller (Eds.), *Qualitative Marktforschung - Konzepte -Methoden - Analysen* (1st ed., pp. 477-490). Wiesbaden: Gabler.
- Mayfield, L. E., Bennett, R. M., Tranter, R. B., & Woolridge, M. J. (2007). Consumption of welfare-friendly food products in Great Britain, Italy and Sweden, and how it may be influenced by consumers attitudes to, and behaviour towards, animal welfare attributes. *International Journal of Sociology of Agriculture and Food*, *15*, 59-73.

- Mayring, P. (2010). *Qualitative Inhaltsanalyse - Grundlagen und Techniken*. (11th ed.) Weinheim: Beltz Verlag.
- McAfee, R. P. & McMillan, J. (1987). Auctions and Bidding. *Journal of Economic Literature*, 25, 699-738.
- McDaniel, C. D. & Gates, R. H. (1998). *Marketing Research Essentials*. Cincinnati, Ohio: South-Western College Pub.
- McEachern, M. G. & Schröder, M. J. A. (2002). The role of livestock production ethics in consumer values towards meat. *Journal of Agricultural and Environmental Ethics*, 15, 221-237.
- Meuwissen, M. P. M., Van der Lans, I. A., & Huirne, R. B. M. (2007). Consumer preferences for pork supply chain attributes. *NJAS - Wageningen Journal of Life Sciences*, 54, 293-312.
- Mørkbak, M. R., Christensen, T., & Gyrd-Hansen, D. (2010). Consumer preferences for safety characteristics in pork. *British Food Journal*, 112, 775-791.
- Mühlbauer, I. C. (2009). *Untersuchungen zur Belastung bei der Kastration von Saugferkeln unter CO₂ Narkose*. Inaugural-Dissertation zur Erlangung der tiermedizinischen Doktorwürde der Tierärztlichen Fakultät der Ludwig-Maximilians-Universität, München.
- Napolitano, F., Braghieri, A., Piasentier, E., Favotto, S., Naspetti, S., & Zanolini, R. (2010). Effect of information about organic production on beef liking and consumer willingness to pay. *Food Quality and Preference*, 21, 207-212.
- Napolitano, F., Pacelli, C., Girolami, A., & Braghieri, A. (2008). Effect of information about animal welfare on consumer willingness to pay for yogurt. *Journal of Dairy Science*, 91, 910-917.
- Naturland e.V. (2012). Naturland Richtlinien Erzeugung - Stand 05/2012. Retrieved January 18, 2013, from http://www.naturland.de/fileadmin/MDB/documents/Richtlinien_deutsch/Naturland-Richtlinien_Erzeugung.pdf.
- Ngapo, T. M., Dransfield, E., Martin, J.-F., Magnusson, M., Bredahl, L., & Nute, G. R. (2004). Consumer perceptions: pork and pig production. Insights from France, England, Sweden and Denmark. *Meat Science*, 66, 125-134.
- Nold, R. A., Romans, J. R., Costello, W. J., Henson, J. A., & Libal, G. W. (1997). Sensory characteristics and carcass traits of boars, barrows, and gilts fed high- or adequate-protein diets and slaughtered at 100 or 110 kilograms. *Journal of Animal Science*, 75, 2641-2651.
- Norwood, F. B. & Lusk, J. L. (2011). A calibrated auction-conjoint valuation method: Valuing pork and eggs produced under differing animal welfare conditions. *Journal of Environmental Economics and Management*, 62, 80-94.
- Noussair, C., Robin, S., & Ruffieux, B. (2004). Revealing consumers' willingness-to-pay: A comparison of the BDM mechanism and the Vickrey auction. *Journal of Economic Psychology*, 25, 725-741.
- Oude Ophuis, P. A. M. (1994). Sensory evaluation of 'free range' and regular pork meat under different conditions of experience and awareness. *Food Quality and Preference*, 5, 173-178.
- Papaoikonomou, E., Ryan, G., & Ginieis, M. (2011). Towards a holistic approach of the attitude behaviour gap in ethical consumer behaviours: Empirical evidence from Spain. *International Advances in Economic Research*, 17, 77-88.

- Pearson, A. M., Ngoddy, S., Price, J. F., & Larzelere, H. E. (1971). Panel acceptability of products containing boar meat. *Journal of Animal Science*, 33, 26-29.
- Platzmann, S. & Hamm, U. (2009). Kaufbarriere Preis? - Analyse von Zahlungsbereitschaft und Kaufverhalten bei Öko-Lebensmitteln. <http://orgprints.org/15745>.
- Pleon (2007). Öko-Barometer 2007 - Repräsentative Bevölkerungsbefragung im Auftrag des Bundesministeriums für Ernährung, Landwirtschaft und Verbraucherschutz (BMELV). Retrieved December 10, 2010, from http://www.oekolandbau.de/fileadmin/redaktion/dokumente/journalisten/publikationen/OEko_barometer_07.pdf.
- Pleon (2008). Öko-Barometer 2008 - Repräsentative Bevölkerungsbefragung im Auftrag des Bundesministeriums für Ernährung, Landwirtschaft und Verbraucherschutz (BMELV). Retrieved November 16, 2008, from http://www.oekolandbau.de/fileadmin/redaktion/dokumente/journalisten/publikationen/OEko_barometer_Ergebnisse_2008_barrierearm.pdf.
- Pleon (2010). Öko-Barometer 2010 - Repräsentative Bevölkerungsbefragung im Auftrag des Bundesministeriums für Ernährung, Landwirtschaft und Verbraucherschutz (BMELV). Retrieved December 17, 2010, from http://www.oekolandbau.de/fileadmin/redaktion/dokumente/journalisten/publikationen/OEko_barometer_Bericht_2010.pdf.
- Prunier, A., Bonneau, M., von Borell, E. H., Cinotti, S., Gunn, M., Fredriksen, B., Giersing, M., Morton, D. B., Tuytens, F. A. M., & Velarde, A. (2006). A review of the welfare consequences of surgical castration in piglets and the evaluation of non-surgical methods. *Animal Welfare*, 15, 277-289.
- QS Qualität und Sicherheit GmbH (2009). Schmerzmitteleinsatz bei der Ferkelkastration. Retrieved January 18, 2013 from http://animal-health-online.de/kastrat/doc/qs_29_01_29_schmerzmitteleinsatz_bei_der_ferkelkastration.pdf.
- QS Qualität und Sicherheit GmbH (2013). Homepage of the QS-System. Retrieved January 18, 2013, from http://www.q-s.de/fleisch_landwirtschaft.html.
- Rault, J.-L., Lay, D. C. Jr., & Marchant-Forde, J. N. (2011). Castration induced pain in pigs and other livestock. *Applied Animal Behaviour Science*, 135, 214-225.
- Rhodes, D. N. (1971). Consumer testing of bacon from boar and gilt pigs. *Journal of the Science of Food and Agriculture*, 22, 485-490.
- Rhodes, D. N. (1972). Consumer testing of pork from boar and gilt pigs. *Journal of the Science of Food and Agriculture*, 23, 1483-1491.
- Robbins, S. P. & Coulter, M. (2009). *Management*. (10th ed.) Upper Saddle River, New Jersey: Pearson Education.
- Roex, J. & Miele, M. (2005). *Farm animal welfare concerns - consumers, retailers and producers*. Welfare Quality Reports No 1.
- Rutstrom, E. E. (1998). Home-Grown Values and Incentive Compatible Auction Design. *International Journal of Game Theory*, 27, 427-441.
- Sandelowski, M. (2000). Combining Qualitative and Quantitative Sampling, Data Collection, and Analysis Techniques in Mixed-Method Studies. *Research in Nursing & Health*, 23, 246-255.

- Schaack, D., Illert, S., & Würtenberger, E. (2010). *AMI-Marktbilanz Öko-Landbau 2010*. Bonn: AMI GmbH.
- Schaack, D., Rampold, C., Illert, S., Held, G., & Schockemöhle, U. (2012). *AMI Markt Bilanz Ökolandbau 2012*. Bonn: AMI.
- Scherer, C. & Juanillo, N. (1992). Communicating food safety: Ethical issues in risk communication. *Agriculture and Human Values*, 9, 17-26.
- Schröder, M. J. A. & McEachern, M. G. (2004). Consumer value conflicts surrounding ethical food purchase decisions: a focus on animal welfare. *International Journal of Consumer Studies*, 28, 168-177.
- Shepherd, R., Sparks, P., Bellier, S., & Raats, M. M. (1991). The effects of information on sensory ratings and preferences: The importance of attitudes. *Food Quality and Preference*, 3, 147-155.
- Skarstad, G. A., Terragni, L., & Torjusen, H. (2007). Animal welfare according to Norwegian consumers and producers: Definitions and implications. *International Journal of Sociology of Agriculture and Food*, 15, 74-90.
- Skiera, B. & Revenstorff, I. (1999). Auktionen als Instrument zur Erhebung von Zahlungsbereitschaften. *Zeitschrift für betriebswirtschaftliche Forschung*, 3, 224-241.
- Smith, W. C., Ellis, M., Clark, J. B. K., & Innes, N. (1983). A comparison of boars, gilts and castrates for bacon manufacture. 3. Consumer reaction to bacon from boars and castrates and an economic evaluation of a non-castration policy for bacon manufacture. *Animal Production*, 37, 17-23.
- Snape, D. & Spencer, L. (2006). The foundations of qualitative research. In J. Ritchie & J. Lewis (Eds.), *Qualitative research practice* (pp. 1-23). London: Sage Publications.
- Solgaard, H. S. & Yang, Y. (2011). Consumers' perception of farmed fish and willingness to pay for fish welfare. *British Food Journal*, 113, 997-1010.
- Spiller, A., Lüth, M., & Enneking, U. (2004). Analyse des Kaufverhaltens von Selten- und Gelegenheitskäufern und ihrer Bestimmungsgründe für/gegen den Kauf von Öko-Produkten. <http://orgprints.org/4201>.
- Statistisches Bundesamt (2008). Statistisches Jahrbuch 2008 für die Bundesrepublik Deutschland. Retrieved June 19, 2012, from https://www.destatis.de/DE/Publikationen/StatistischesJahrbuch/Jahrbuch2008.pdf?__blob=publicationFile.
- Steinmann, M., Schulze-Geisthövel, S., Tillkorn, T., Brings, A. D., Trenkel, H., & Berg, E. (2012). Ökonomische Bewertung alternativer Verfahren zur betäubungslosen Ferkelkastration unter Berücksichtigung ethischer und gesellschaftlicher Anforderungen. In *Veredelungsstandort Deutschland - Herausforderungen von Gesellschaft, Politik und Märkten* (pp. 138-171). Frankfurt am Main: Landwirtschaftliche Rentenbank.
- Stolz, H., Bodini, A., Stolze, M., Hamm, U., & Richter, T. (2009). Lebensmittelqualität aus der Verbraucherperspektive – eine Synthese qualitativer Studien zur Wahrnehmung und Beurteilung verschiedener Qualitätskriterien bei Öko-Produkten. *Berichte über Landwirtschaft*, 87, 153-182.

- Stolzenbach, S., Lindahl, G., Lundström, K., Chen, G., & Byrne, D. V. (2009). Perceptual masking of boar taint in Swedish fermented sausages. *Meat Science*, *81*, 580-588.
- Te Velde, H., Aarts, N., & Van Woerkum, C. (2002). Dealing with Ambivalence: Farmers' and Consumers' Perceptions of Animal Welfare in Livestock Breeding. *Journal of Agricultural and Environmental Ethics*, *15*, 203-219.
- Tierschutzgesetz. (2006). Tierschutzgesetz in der Fassung der Bekanntmachung vom 18 Mai 2006 (BGBl. I S. 1206, 1313), das zuletzt durch Artikel 20 des Gesetzes vom 9. Dezember 2010 (BGBl. I S. 1934) geändert worden ist.
- TNS Opinion & Social (2005). Attitudes of consumers towards the welfare of farmed animals. *Special Eurobarometer*, *229*.
- TNS Opinion & Social (2006). Risk issues. *Special Eurobarometer*, *238*.
- TNS Opinion & Social (2007). Attitudes of EU citizens towards animal welfare. *Special Eurobarometer*, *270*.
- TNS Opinion & Social (2010). Food-related risks. *Special Eurobarometer*, *354*.
- Toma, L., Stott, A. W., Revoredo-Giha, C., & Kupiec-Teahan, B. (2012). Consumers and animal welfare. A comparison between European Union countries. *Appetite*, *58*, 597-607.
- Tonsor, G. T., Olynk, N. J., & Wolf, C. A. (2009). Consumer preferences for animal welfare attributes: The case of gestation crates. *Journal of Agricultural and Applied Economics*, *41*, 714-730.
- Triantaphyllou, E. (2010). *Multi-criteria decision making methods: a comparative study*. Dordrecht: Kluwer Academic Publishers.
- Tuytens, F. A. M., Vanhonacker, F., Langendries, K., Aluwé, M., Millet, S., Bekaert, K., & Verbeke, W. (2011). Effect of information provisioning on attitude toward surgical castration of male piglets and alternative strategies for avoiding boar taint. *Research in Veterinary Science*, *91*, 327-332.
- Vanhonacker, F., Van Poucke, E., Tuytens, F., & Verbeke, W. (2010). Citizens' Views on Farm Animal Welfare and Related Information Provision: Exploratory Insights from Flanders, Belgium. *Journal of Agricultural and Environmental Ethics*, *23*, 551-569.
- Vanhonacker, F. & Verbeke, W. (2011). Consumer response to the possible use of a vaccine method to control boar taint v. physical piglet castration with anaesthesia: a quantitative study in four European countries. *Animal*, *5*, 1107-1118.
- Vanhonacker, F., Verbeke, W., & Tuytens, F. A. M. (2009). Belgian consumers' attitude towards surgical castration and immunocastration of piglets. *Animal Welfare*, *18*, 371-380.
- Vanhonacker, F., Verbeke, W., Van Poucke, E., & Tuytens, F. A. M. (2007). Segmentation Based on Consumers' Perceived Importance and Attitude toward Farm Animal Welfare. *International Journal of Sociology of Agriculture and Food*, *15*, 91-107.
- Vanhonacker, F., Verbeke, W., Van Poucke, E., & Tuytens, F. A. M. (2008). Do citizens and farmers interpret the concept of farm animal welfare differently? *Livestock Science*, *116*, 126-136.
- Verbeke, W. (2008). Impact of communication on consumers' food choices. *Proceedings of the Nutrition Society*, *67*, 281-288.

- Verbeke, W. (2009). Stakeholder, citizen and consumer interests in farm animal welfare. *Animal Welfare*, 18, 325-333.
- Verbeke, W., Frewer, L. J., Scholderer, J., & De Brabander, H. F. (2007). Why consumers behave as they do with respect to food safety and risk information. *Analytica Chimica Acta*, 586, 2-7.
- Verbeke, W., Pérez-Cueto, F. J. A., Barcellos, M. D., Krystallis, A., & Grunert, K. G. (2010). European citizen and consumer attitudes and preferences regarding beef and pork. *Meat Science*, 84, 284-292.
- Verbeke, W. & Viaene, J. (2000). Ethical Challenges for Livestock Production: Meeting Consumer Concerns about Meat Safety and Animal Welfare. *Journal of Agricultural and Environmental Ethics*, 12, 141-151.
- Verbeke, W. & Ward, R. W. (2001). A fresh meat almost ideal demand system incorporating negative TV press and advertising impact. *Agricultural Economics*, 25, 359-374.
- Verhoef, P. C. (2005). Explaining purchases of organic meat by Dutch consumers. *European Review of Agricultural Economics*, 32, 245-267.
- Verhoog, H., Matze, M., van Bueren, E., & Baars, T. (2003). The role of the concept of the natural (naturalness) in organic farming. *Journal of Agricultural and Environmental Ethics*, 16, 29-49.
- Vickrey, W. (1961). Counterspeculation, auctions, and competitive sealed tenders. *Journal of Finance*, 16, 8-37.
- Völckner, F. (2006a). An empirical comparison of methods for measuring consumers' willingness to pay. *Market Letters*, 17, 137-149.
- Völckner, F. (2006b). Methoden zur Messung individueller Zahlungsbereitschaften: Ein Überblick zum State of the Art. *Journal für Betriebswirtschaft*, 56, 33-60.
- von Borell, E., Oliver, M., Fredriksen, B., Edwards, S., & Bonneau, M. (2008). Standpunkte, Praktiken und Kenntnisstand zur Ferkelkastration in Europa (PIGCAS) - Projektziele und erste Ergebnisse. *Journal für Verbraucherschutz und Lebensmittelsicherheit*, 3, 216-220.
- Walstra, P. (1974). Fattening of young boars: Quantification of negative and positive aspects. *Livestock Production Science*, 1, 187-196.
- Walstra, P., Claudi-Magnussen, C., Chevillon, P., von Seth, G., Diestre, A., Matthews, K. R., Homer, D. B., & Bonneau, M. (1999). An international study on the importance of androstenone and skatole for boar taint: Levels of androstenone and skatole by country and season. *Livestock Production Science*, 62, 15-28.
- Walstra, P. & Moerman, P. C. (1981). Ist es gerechtfertigt, Eber zu mästen, und was sind die Perspektiven? *Der Tierzüchter*, 33, 465-467.
- Wansink, B. (2003). Overcoming the Taste Stigma of Soy. *Journal of Food Science*, 68, 2604-2606.
- Wansink, B., van Ittersum, K., & Painter, J. E. (2005). How descriptive food names bias sensory perceptions in restaurants. *Food Quality and Preference*, 16, 393-400.
- Weiler, U., Fischer, K., Kemmer, H., Dobrowolski, A., & Claus, R. (1997). Influence of androstenone sensitivity on consumer reactions to boar meat. In M. Bonneau, K. Lundström, & B. Malmfors (Eds.), *Boar taint in entire male pigs. Proceedings of a meeting of the EAAP working group*

- "Production and utilisation of meat from entire male pigs". *EAAP Publication 92* (pp. 147-151). Stockholm, Schweden: Wageningen Pers.
- Weiler, U., Font i Furnols, M., Fischer, K., Kemmer, H., Oliver, M. A., Gispert, M., Dobrowolski, A., & Claus, R. (2000). Influence of differences in sensitivity of Spanish and German consumers to perceive androstenone on the acceptance of boar meat differing in skatole and androstenone concentrations. *Meat Science*, 54, 297-304.
- Weiß, D. & Kohlmüller, M. (2010). *AMI-Marktbilanz Vieh und Fleisch 2010*. Bonn: AMI GmbH.
- Wiid, J. & Diggins, C. (2009). *Marketing Research*. Cape Town, South Africa: Juta and Company.
- Wysocki, C. J. & Beauchamp, G. K. (1984). Ability to smell androstenone is genetically determined. *Proceedings of the National Academy of Sciences of the United States of America*, 81, 4899-4902.
- Wysocki, C. J., Dorries, K. M., & Beauchamp, G. K. (1989). Ability to perceive androstenone can be acquired by ostensibly anosmic people. *Proceedings of the National Academy of Sciences of the United States of America*, 86, 7976-7978.
- Zander, K. & Hamm, U. (2009). Consumers' preferences for ethical values of organic food. In E. Millar, P. H. West, & B. Nerlich (Eds.), *Ethical futures: bioscience and food horizons* (pp. 400-405). Wageningen, Netherlands.
- Zander, K. & Hamm, U. (2010). Consumer preferences for additional ethical attributes of organic food. *Food Quality and Preference*, 21, 495-503.
- Zepeda, L. & Deal, D. (2009). Organic and local food consumer behaviour: Alphabet Theory. *International Journal of Consumer Studies*, 33, 697-705.

Appendix

Appendix 1: Screening Questionnaire 137

Appendix 2: Questionnaire Organic Index and Knowledge..... 139

Appendix 3: Information provision 140

Appendix 4: Topic guide for focus group discussions and auctions: „Alternatives to piglet castration without pain relief in organic farming” 142

Appendix 5: Bidding form for Auction I..... 146

Appendix 6: Questionnaire for sensory evaluation 147

Appendix 7: Bidding form for Auction II 148

Appendix 8: Example for the step IV “Assessment of the criteria by experts” (for the criterion animal welfare) in the scoring model..... 149

Appendix 1: Screening Questionnaire

Directions in italics are not to be read out loud!

“Good morning/afternoon, my name is [...] and I’m from the University of Kassel. We’re conducting a consumer study, which is financially supported within the Federal Programme for Organic Agriculture. In this study, consumer attitudes towards quality of organic meat are examined. For this purpose, I would like to ask you some questions. This will only take about two minutes.

1. Your answers will be analysed anonymously, only used for research purposes and not passed on to third parties. May I start with the brief survey?
 Yes No → *Thank respondent and close interview*
2. Are you mainly responsible for buying food in your household?
 Yes No → *Thank respondent and close interview*
3. Do you live on a farm?
 Yes → *Thank respondent and close interview* No
4. Do you or a person in your household work in agriculture?
 Yes → *Thank respondent and close interview* No
5. Do you or a person in your household work in the food processing sector?
 Yes → *Thank respondent and close interview* No
6. Do you or a person in your household work in marketing research?
 Yes → *Thank respondent and close interview* No
7. Do you or a person in your household work or study at the University of Göttingen¹² at the Faculty of Agricultural Sciences?
 Yes → *Thank respondent and close interview* No
8. Do you eat pork?
 Yes No → *Thank respondent and close interview*
9. Do you eat salami?
 Yes No → *Thank respondent and close interview*
10. Do you occasionally buy pork and meat products produced with pork **in organic quality**?
 Yes No → *Thank respondent and close interview*
11. Which of the following age groups do you belong to?
18 to 44 years
45 to 75 years
None of the above → *Thank respondent and close interview*
12. *Fill in without asking:* female male

Thank you very much for your answers!

¹² In Kassel the question referred to the University of Kassel, Faculty of Organic Agricultural Sciences. In Stuttgart the question referred to the University of Hohenheim, Faculty of Agricultural Sciences (or related studies).

Appendix

For our research project we are looking for participants for a two hour group discussion with 10 to 12 consumers. For your participation you would receive an allowance of 30€. We assure you that all data will be analysed anonymously and will not be passed on to third parties. Are you willing to participate in such a group discussion with other consumers here in Göttingen?

Yes No → *Thank respondent and close interview*

The group discussion will take place in [location]

If the respondent is willing to participate, check which date is available according to the quotas!

Name possible dates: [dates, time]

Note **date**, name and phone number.

The **phone number** is important in case the group discussion has to be rescheduled.

Also note the date on the handout¹³ for participants and give it to the respondent!

Date: _____
Participant's name: _____
Phone number: _____ Mobile: _____
Email (voluntary): _____
Comments: _____ _____

¹³ The handout contained a few information about the study (funding, non commercial research), contact information, directions to the location and the appointed date and time of the group discussion.

Appendix 2: Questionnaire Organic Index and Knowledge

First name: _____

Please answer the following questions. Previously, fill in your name into the box above. The questionnaires are analysed anonymously. Your name only serves allocation purposes.

1. How often do you buy the below mentioned product groups in organic quality? Please indicate as to whether you buy these products hardly ever, occasionally or almost always in organic quality.

Product groups	Hardly ever	Occasionally	Almost always
Fruit and fruit products			
Vegetables and vegetable products			
Eggs			
Milk and milk products			
Bread, pasta, flour and cereal products			
Meat and meat products			

2. Have you ever heard that male pigs are castrated for fattening?

- No
- Yes

Appendix 3: Information provision

<p>Introduction (the same for all three variants)</p> <p>Also in organic farming male piglets are currently castrated. This surgical intervention is performed without anesthesia in most cases. From 2012 onwards, however, castration without anesthesia and analgesia is banned in organic farming. Therefore, alternatives to castration without anesthesia have to be found. In the following, I will present possible alternatives to you. First, I would like to explain briefly, why and how surgical castration without anesthesia is performed.</p> <p>Why are piglets castrated, at all? Castration is traditionally performed because a proportion of the male pigs, called boars, would otherwise develop an odor which a proportion of consumers finds unpleasant. This odor is called boar taint. The substances responsible for boar taint accumulate mainly in fatty tissues. When meat with boar taint is heated the odor is released. Sometimes boar taint can also be tasted in cooked meat. Another reason for castration is that castrated animals are easier to keep because they are less aggressive among each other. Aggressive behavior includes fights between boars but also mounting of each other. Especially, weaker animals may suffer from this.</p>
<p>Surgical castration without anesthesia (description, the same for all variants)</p> <p>For surgical castration, which is conducted in the first seven days of life, the farmer takes the piglet, cuts the skin above the testicles with a scalpel, extracts the testicles and cuts the spermatic cords. Afterwards, the wounds are disinfected, in order to prevent inflammation. The castration is very painful, the strongest pain occurs when the spermatic cords are cut. After the castration the piglets suffer from postoperative pain for several days.</p>
<p>Pros and cons (only added for Variants 2 and 3)</p> <p>It is advantageous that there is no boar taint. It is disadvantageous that the castration is very painful for the piglets and they suffer from postoperative pain.</p>
<p>Surgical castration with anesthesia and analgesia (description, the same for all variants)</p> <p>Against the pain of the wounds an injection can be given before the intervention. However, this only prevents postoperative pain and there is still strong pain during castration if there is no additional anesthesia. For anesthesia during castration there are two options: general anesthesia, for example with an anesthetic gas, and local anesthesia through an injection. For general anesthesia the piglet's nose is brought into a gas mask. It quickly loses consciousness. Then the castration is performed. After removing the gas mask the piglet wakes up. If no additional analgesic is administered, postoperative pain will occur. For local anesthesia an anesthetic is injected into the testicles. Afterwards, there is a waiting time of about two minutes until the anesthetic takes effect. Then the piglet can be castrated. Postoperative pain occurs as well, if no additional analgesic is administered. Therefore, it is recommended to combine anesthesia and analgesia, in order to reduce pain as much as possible.</p>
<p>Pros and cons (only added for Variants 2 and 3)</p> <p>It is advantageous that castrated pigs develop no boar taint. Pain during and after the intervention is eliminated or at least strongly reduced. It is disadvantageous that there is pain due to the injection and higher costs due to the veterinarian and the drugs.</p>
<p>Immunocastration (description, Variants 1 and 2)</p> <p>Another alternative to piglet castration without anesthesia is the so called immunocastration: For immunocastration two vaccine injections are administered into the skin behind the ear of the pig at an interval of several weeks. The sexual development of the boars is inhibited by the vaccination. After the second vaccination the testicles are reduced and the pigs' behavior is similar to that of castrated pigs. Also boar taint is reduced. The vaccine is completely metabolized in the body of the pig and it leaves no residues in the meat.</p>

Immunocastration (description, only Variant 3)
Another alternative to piglet castration without anesthesia is the so called immunocastration: For immunocastration two vaccine injections are administered into the skin behind the ear of the pig at an interval of several weeks. The vaccine is similar to a hormone produced naturally in the body. The pig generates antibodies against the vaccine and the hormone; as a result the sexual development of the boars is inhibited. After the second vaccination the testicles are reduced and the pigs' behavior is similar to that of castrated pigs. Also boar taint is reduced. The vaccine is completely metabolized in the body of the pig and it leaves no residues in the meat.
Pros and cons (only added to Variants 2 and 3)
It is advantageous that there is no boar taint and no surgical intervention. Thus, there is no pain due to castration or postoperative pain. It is disadvantageous that there is slight pain due to the injections. Additionally, aggressive behavior between boars is increased until the second vaccination is administered.
Fattening of boars (description, the same for all variants)
Another alternative to piglet castration without anesthesia is the fattening of boars. There are no interventions on the animal, the boars stay uncastrated. In order that the female pigs do not conceive, males and females are separated during fattening.
Pros and cons (only added for Variants 2 and 3)
It is advantageous that there is no surgical intervention. Thus, the piglets are spared the pain of the castration and the wounds. Also, there is no pain through injections. It is disadvantageous that a proportion of boars will develop boar taint. Animals with boar taint need to be identified and sorted out after slaughter. Another disadvantage is the more pronounced aggressive behavior including mounting behavior among boars.

Appendix 4: Topic guide for focus group discussions and auctions: „Alternatives to piglet castration without pain relief in organic farming”

Part 1: Focus group discussion

Length (End)	Topics and questions	Additional directions	Objective
10 minutes (18:10)	<p>Arrival and questionnaire</p> <p>On arrival welcome participants and hand out a questionnaire. Collect all questionnaires before the focus group discussion commences.</p> <p>Make sure participants fill in their names on the questionnaire.</p>		Participants' knowledge on piglet castration and buying frequency of organic products
10 minutes (18:20)	<p>Introduction</p> <ul style="list-style-type: none"> – Welcome participants, introduce moderator and assistant. – Introduce general topic of the focus group discussions: Research project within the Federal Programme for Organic Agriculture. Non-commercial research, funded by the Federal Government. Study on consumer attitudes towards quality of organic meat. – Purpose of the focus group discussions: Gaining insights into participants' opinions and attitudes, particularly into the variety of perspectives; there are no right or wrong answers. The group discussion is not about coming to an agreement. We ask participants to express their views also when they are different from other people's. – Explain the technical equipment (camera, tape and microphones). We ask participants to speak loud and clearly and avoid unnecessary noises in order to ensure good recording quality. – Confirm anonymity. „Are there any questions from your side?” – Ask participants to write their first name on the name plate. – Introduction of participants: – „I would like to ask everyone to introduce themselves. Please say your first name and tell us your favourite meat dish.” 	No mentioning of piglet castration and animal welfare issues.	Getting to know each other
10 minutes	Knowledge		Level of knowledge on piglet castration

(18:30)	You just indicated in the questionnaire whether you have heard before that male piglets are castrated for fattening. Indeed, piglets are routinely castrated in conventional and organic farming. Do you have an idea why this is done?		and boar taint
10 minutes (18:40)	Information provision In the following we will talk about castration of pigs. I will give you some information on this topic. I will read out the information literally. There will be several focus group discussions and the information provided should be exactly the same in each group.	Hand out leaflet with information	Informational basis for the discussion
15 minutes (18:55)	Reactions to information about castration without pain relief in organic farming During the presentation, you learned that male piglets are usually castrated in conventional and organic farming and that there will be alternative methods in the future. “What do you think about the fact that piglets are castrated without pain relief also in organic farming in order to avoid the occurrence of boar taint?”		Evaluation of the animal welfare issues against the background of organic farming
30 minutes (19:25)	Evaluation of alternatives During the presentation you heard that there are different alternatives to piglet castration without pain relief (and that these have different pros and cons). I would now like to discuss the different alternatives. In the handout the information are briefly summarised. Castration with anaesthesia and analgesia If you look at the information on castration with anaesthesia and analgesia: In your personal opinion, what are important reasons for or against the implementation of this alternative in organic farming. Under which conditions would you eat meat from pigs castrated with anaesthesia and analgesia? Immunocastration If you now look at the information on immunocastration or vaccination against boar taint: In your personal opinion, what are important reasons for or against the implementation of this alternative in organic farming. Under which conditions would you eat meat from immunocastrated pigs? Fattening of boars If you look at the information on the fattening of boars: In your personal opinion, what are important reasons for or against the fattening of boars in organic farming	Ask „why“ if necessary	Acceptance of alternatives

	Under which conditions would you eat boar meat?		
5 minutes (19:30)	<p>Conclusion of the discussion</p> <p>There are people who favour labelling which alternatives to piglet castration without pain relief have been used. Other people are against labelling of alternatives. What is your opinion?</p> <p>Introduction of auction</p> <p>Thank you very much for your active participation in the discussion. Before we come to a conclusion, I have prepared an experiment.</p>		

Part 2: Auction and tasting

15 minutes (19:45)	<p>Introduction of the auction mechanism</p> <p>Here, I have four salamis from pigs which have been castrated or rather not castrated using one of the discussed alternatives. You now have the chance to purchase one of these salamis by auction. Before I tell you more about the offered products, I will explain how this auction works.</p> <p>In this auction, sealed bids are placed simultaneously. This means, you will receive a form on which you indicate how much you are willing to pay for each of the four salamis. If you don't want to purchase one of the salamis at all, you can place a bid of 0€.</p> <p>If you placed the highest bid for one of the salamis, you will receive this product. However, you only have to pay as much as the second highest bid. At the end of the auction you will receive your salami and the price payable will be deducted from your 30€ allowance for participating in the focus group discussion. Here is a fictive example: You bid 100€ and this is the highest bid. The second highest bid is 96€. Hence, you win the auction and pay 96€.</p> <p>Please always indicate a price you are indeed willing to pay. I will explain with a brief example why this is reasonable. Assume you were willing to pay 100€. Yet, you bid 105€ in order to win and this is indeed the case. Now, if the second highest bid would be 104€, you would have to pay this amount, which is 4€ more than you were actually willing to pay. Conversely, if you bid only 95€ and another bidder 96€, the other person would win the auction and you would not receive the product even though you were actually willing to pay 100€.</p> <p>If you were willing to pay 100€ for a product, you should indeed bid 100€. Then you do not risk paying more than you intended or that another bidder wins who bid less than 100€.</p> <p>The bids for each of the four salamis are treated as separate auctions. Hence, theoretically you</p>		Explanation of procedure and bidding strategy
-----------------------	--	--	---

	could receive up to four packages of salami if you place the highest bid for each product. By drawing lots we ensure that you only have to buy one of the packages.		
	<p>Presentation of the salamis Information on the products, methods of castration/no castration</p>	Hand out bidding forms	Giving information on the products
	<p>Auction I Participants bid simultaneously for all four products Important: Fill in name on the form</p>	Assistant collects bidding forms and determines the winners Winners are not announced	Determining willingness-to-pay
15 minutes (20:00)	<p>Tasting of product samples You have just heard a lot about piglet castration and the alternative methods. The most important reason for piglet castration is the avoidance of boar taint which cannot be detected by all persons. Hence depending on the point of view, castration and fattening of boars are controversial methods. Now, you have the opportunity to taste a sample of a product made from boar meat. You will receive two samples of salami, one after the other. One of these samples is standard salami from castrated or female pigs; the other one is made with boar meat. Please try both samples and indicate how you like their odour and flavour. Please smell at the salami first and then taste it. Between samples, drink some water and eat a piece of bread.</p>	Hand out questionnaire Make sure everybody has enough water available Hand out meat samples	Sensory evaluation
	<p>Auction II Which salami has been produced with boar meat? Announcing which sample contained boar meat After tasting, how much are you now willing to pay for boar salami?</p>	Hand out second auction form	Effect of tasting on willingness-to-pay
	<p>Conclusion Thank participants, explain that auctioned products needn't be purchased as they are not available on the market and therefore could not be supplied in sufficient quantity Thank participants</p>	Handle organisational details (allowance ect.)	

Appendix 5: Bidding form for Auction I

First name: _____

Please imagine that you want to buy salami.

Please indicate what you are willing to pay for each of the salamis.

My bid for:

Smoked organic salami, 80 g

Standard (Castration without pain relief) _____ €

Smoked organic salami, 80 g

Castration with anaesthesia and analgesia _____ €

Smoked organic salami, 80 g

Immunocastration _____ €

Smoked organic salami, 80 g

No castration, fattening of boars _____ €

Appendix 6: Questionnaire for sensory evaluation

First name: _____

Assess odour and flavour of the salami. Smell at the salami and indicate how you like the odour. Then, taste the salami and indicate how you like the taste. Hereby, 7 is the best grade

Salami A

	Don't like						Like	
Odour	1	2	3	4	5	6	7	
Flavour	1	2	3	4	5	6	7	

After tasting, drink some water and eat some bread. Then, assess odour and flavour of the second salami.

Salami B

	Don't like						Like	
Odour	1	2	3	4	5	6	7	
Flavour	1	2	3	4	5	6	7	

Which salami do you prefer?

Fill in as appropriate

- Salami A
- Salami B
- No difference

What do you think, which salami has been produced with boar meat?

- Salami A
- Salami B

Appendix 7: Bidding form for Auction II

First name: _____

Auction of boar salami

After tasting a sample of boar meat: How much are you willing to pay for a package of boar salami?

My bid for:

Smoked organic salami, 80 g

No castration, fattening of boars _____ €

**Appendix 8: Example for the step IV “Assessment of the criteria by experts”
(for the criterion animal welfare) in the scoring model**

Criterion	Animal Welfare (weight: 0.3)	Weights			
Alternative	Sub-criteria (derived from the focus group data)	Sub-criteria	FG 1	FG 2	FG 3
Castration without pain relief					
	Use of drastic words like cruelty, disgrace, shocking	-2	-2	-2	-2
	Pain (negative)	-2	-2	-4	-2
	Pain (animals perceive pain differently/less)	1	0	0,5	0
	Relation of castration to other living conditions (e.g. animal friendly housing)	1	0	0	0
	Slaughtering puts castration into another perspective	1	1	0	0
	lack of diligence by farmers during castration	-1	0	-1	0
	Castration is one of the side effects of factory farming	-1	0	0	0
	Can castration (cruelty to animals) be justified for good taste?	-1	0	0	0
	Scores (weighted sum)		-3	-6,5	-4
Castration with pain relief					
	Free of pain	2	4	2	4
	Stress (negative)	-1	0	0	0
	Pain due to injections/lack of effectiveness of anaesthesia	-1	0	0	0
	Conflict: Animal welfare vs. no drugs	-1	-1	-1	0
	Scores (weighted sum)		3	1	4
Immunocastration					
	Free of pain	1	0	0	0
	Harmless intervention/no stress	2	2	2	2
	Natural behaviour of the pigs	1	0	0	1
	Negative side effects for the pigs	-2	0	-2	-2
	Scores (weighted sum)		2	0	1
Fattening of boars					
	Aggressions: natural/no problem	1	0	0	0
	Aggressions: stress/injuries	-2	-2	-4	-4
	Separation of males and females: no problem	1	1	0	0
	Separation of males and females: unnatural	-1	-1	-1	-1
	Free of pain/no interventions	1	1	0	0
	Natural way of pig keeping/alternative	1	0	1	0
	Scores (weighted sum)		-1	-4	-5
FG= focus group; 0=not discussed, 1=discussed, 2=discussed intensively; values are multiplied with the weight given to each sub-criterion and then summed up to a score for animal welfare for each alternative					