

**Potentials and limits of sustainability communication
about food**

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The cases of climate-friendly food and farmed fish

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Declaration of originality

This thesis contains three scientific articles written by me as first author and PD Dr. Katrin Zander as co-author. All articles are published in or submitted to peer-reviewed journals, listed in Thomson Reuters Web of Science:

1. Feucht, Y., Zander, K., (2018). Consumers' preferences for carbon labels and the underlying reasoning. A mixed methods approach in 6 European countries. *Journal of Cleaner Production*, 178, 740-748.

This article is based on empirical research carried out within the project "Understanding consumer behaviour to encourage a (more) sustainable food choice (SUSDIET)". The project was funded by the Federal Office of Agriculture and Food (BLE) within the framework of the ERA-Net SUSFOOD (2814ERA03B). The idea for this project was developed by PD Dr. Katrin Zander and the author. PD Dr. Katrin Zander was the supervisor of this project. The research design and procedure of data collection was developed by the author with the support of PD Dr. Katrin Zander. The author analyzed the data and wrote the raw manuscripts of the present journal article. The online survey including the choice experiments were programmed by the market research company Skopos who also recruited the participants for the survey.

2. Feucht, Y., Zander, K., (2015). Of earth ponds, flow-through and closed recirculation systems — German consumers' understanding of sustainable aquaculture and its communication. *Aquaculture*, 438, 151-158.

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3. Feucht, Y., Zander, K., (2016). Aquaculture in the German print media. *Aquaculture International*, 25, 177-195.

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

Journal articles

1. Hempel, C., Feucht, Y., Zander, K., (forthcoming). Consumer insights into climate-friendliness of food: What is climate change and what can we do about it?.
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Conference proceedings

1. Feucht, Y., Zander, K., (2017). Consumers' willingness to pay for climate-friendly food in European countries. *Proceedings in System Dynamics and Innovation in Food Networks 2017*, 360-377.
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5. Zander, K., Feucht, Y., (2015). Was erwarten Verbraucher von nachhaltiger Aquakultur?. Jahrbuch der Österreichischen Gesellschaft für Agrarökonomie, 24, 121-130.

Reports

1. Korn, A., Feucht, Y., Zander, K., Janssen, M., Hamm, U., (2014). Entwicklung einer Kommunikationsstrategie für nachhaltige Aquakulturprodukte. Universität Kassel, Fachgebiet Agrar- und Lebensmittelmarketing, Witzenhausen und Thünen-Institut, Institut für Marktanalyse, Braunschweig.
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Presentations

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7. Feucht, Y., Zander, K., (2014). Does organic aquaculture meet the expectations of consumers?. Aquaculture Europe, October 14-17, 2014, Donostia–San Sebastián, Spain. Presented by Y. Feucht.

8. Feucht, Y., Zander, K., (2014). Marktperspektiven nachhaltiger Aquakulturprodukte aus Deutschland. Treffen der DAFA-Strategiegruppe Aquakultur, October 13, 2014, Hanover, Germany. Presented by Y. Feucht.
9. Feucht, Y., Zander, K., (2014). Was erwarten Verbraucher von nachhaltiger Aquakultur und wie nehmen sie Haltungssysteme wahr?. 24. Jahrestagung der Österreichischen Gesellschaft für Agrarökonomie, September 25-26, 2014, Vienna, Austria. Presented by Y. Feucht.
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Posters

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2. Feucht, Y., Zander, K., (2014). Consumers' knowledge and information needs on organic aquaculture. 18th IFOAM Organic World Congress, October 13-15, 2014, Istanbul, Turkey.

Magazine articles

1. Feucht, Y., Zander, K., (2017). Aquaculture in the German print media. Aquaculture Europe, 42, 31-35.
2. Feucht, Y., Zander, K., (2016). Aquakultur in den deutschen Medien: Zeitungen zeichnen ein überwiegend positives Bild der Aquakultur. Fischmagazin, 6-7, 90-95.

3. Feucht, Y., Zander, K., (2014). Was erwarten Verbraucher von nachhaltiger Aquakultur?. Fischmagazin, 7-8, 86-90.
4. Zander, K., Feucht, Y., Risius, A., Hamm, U., (2015). Welche Marktchancen hat Fisch aus nachhaltiger deutscher Aquakultur. Auf Auf, 1, 12-15.

Newsletters

1. Feucht, Y., Zander, K., (2016). Climate change, carbon footprint and labelling – Consumer responses. The SUSDIET research project: Towards sustainable diets in Europe, Newsletter, 4, 3-4.

I declare that this thesis 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, ohne unerlaubte Hilfe Dritter angefertigt und andere als die in der Dissertation angegebenen Hilfsmittel nicht benutzt habe. Alle Stellen, die wörtlich oder sinngemäß aus veröffentlichten oder unveröffentlichten Schriften entnommen sind, habe ich als solche kenntlich gemacht. Dritte waren an der inhaltlich-materiellen Erstellung der Dissertation nicht beteiligt; insbesondere habe ich hierfür nicht die Hilfe eines kommerziellen Promotionsberaters in Anspruch genommen. Kein Teil dieser Arbeit ist in einem anderen Promotions- oder Habilitationsverfahren durch mich verwendet worden.

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Yvonne Feucht

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List of abbreviations

CE Choice experiments

FAZ Frankfurter Allgemeine Zeitung

MNL Multinomial logit

NGO Non-governmental organization

RAS Recirculating aquaculture systems/closed recirculation systems

SZ Süddeutsche Zeitung

WTP Willingness to pay

1 Introduction

Since the Brundtland Report, the concept of sustainable development¹ has been widely present in everyday life. The report defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987: 16). Given this, sustainable development is a normative concept that is based on a form of economics and lifestyles that do not endanger our future (Godemann and Michelsen 2011). It implies a continual process of changing human-environment interactions in recognizing the interdependencies between ecological, economic, social and cultural conditions (Kruse 2011). Sustainable development demands a learning and action process which embraces the entire society from policy makers to businesses and citizens (Lass and Reusswig 2001). But thus far, all these actors struggle with the implementation of the concept (e.g., Cox 2013; Eder 1996). Questions remain on how to attain sustainability and on how to engage everyone in the process. Against this background, the present thesis focuses on the potentials and limits of sustainability communication as a mean to foster sustainable consumption.

1.1 Sustainability communication

One important prerequisite for sustainable development is that people have an idea about sustainability. For developing an idea about an issue communication is central since, in line with sociological thinking, it is the mean to construct reality (De Witt 2011; Godemann and Michelsen 2011). Language and other symbolic acts (e.g., visuals like photos) mediate people’s understanding of sustainability and manner in which they act up on this construct (Cox 2013, Godemann and Michelsen 2011). People’s ideas about the environment, about the society and the economy are shaped by the information they receive from sources such as the media, product packaging, family members, friends and the list goes on (Cox 2013). Given this, only through communication can sustainability receive social relevance and meaning (Ziemann 2011). In the words of Luhmann (1986: 63): “Fish may die or human beings; swimming in lakes and rivers cause illnesses; no more oil may come from the pumps; and average temperatures may rise or fall, but as long as this is not communicated it does not have any effect on society”. As Eder (1996) puts it, the way of communicating sustainable conditions and ideas, and frequently not the actual state of the sustainability of the issue at hand, decides if a public discourse about the respective sustainability issue arises.

¹ The terms ‘sustainable development’ and ‘sustainability’ are used synonymously throughout this thesis.

Against this background, sustainability communication can be defined as the many symbolic ways (e.g., words, images) which are used by e.g., citizens, businesses, public officials, media and non-governmental organizations (NGOs) to construct sustainability and to negotiate society's responses to this construct (Cox 2013). Sustainability communication is a social process centering on the discussion of a better ecological, economic and social life (Ziemann 2011). It constructs people's understanding of sustainability and empowers people to act sustainably by educating, alerting, mobilizing and persuading them (Cox 2013; Lass and Reusswig 2001).

Sustainability communication happens between different stakeholders. In line with Cox (2013), Godemann and Michelsen (2011) and Lass and Reusswig (2001), the main stakeholders are:

- Businesses
- NGOs
- Public officials
- Scientists
- Mass media
- Citizens/Consumers

The present thesis focuses on consumers and news media. Therefore, only a brief summary of the role of the other stakeholders in sustainability communication will be given while the engagement of consumers and news media is described in more detail.

Businesses take part in sustainability communication for example through lobbying and marketing efforts. NGOs serve as a source of sustainability communication by addressing sustainability issues through e.g., campaigns. Scientists engage in sustainability communication through, for example, publishing findings relevant for sustainability. Public officials (e.g., policymakers) contribute to sustainability communication, for example, by shaping the regulatory framework for acting sustainably (Cox 2013).

Mass media are a key source of information about sustainability and food (Clayton et al. 2015; Froehlich et al. 2017). They are a central intermediary between scientific information and the public (Froehlich et al. 2017). News media participate in sustainability communication, for example, by selecting which sustainability topics they present and thus making some topics salient while ignoring others. According to the agenda-setting approach, the media has the potential to set the agenda for public concern about and awareness of sustainability issues (e.g., Hansen 2011; Cox 2013). Agenda-setting has a particular strong effect for those issues to which recipients have little personal access and/or connection (Cox 2013).

Citizens take part in sustainability communication by, for example, complaining to public officials about sustainability related issues or by engaging others in discourses about sustainability (Cox 2013). Citizens become consumers by consuming products and services. Consumers engage in sustainability communication by, for example, using information about sustainable products and services provided by businesses. This sustainability communication of businesses to consumers uses tools, techniques and concepts of commercial marketing to pursue environmental/social goals (Peattie and Peattie 2009; De Bakker and Dagevos 2012). Marketing principles and techniques are applied to influence consumers to voluntarily change their behavior for the well-being of others (Peattie and Peattie 2009). In this context, sustainability communication relies on visual images, as well as on claims (here also called communication messages) and sustainability labels on products (Cox 2013).

The presence of a sustainability label and/or a claim conveys to consumers that the labeled product fulfills specific sustainability standards. In this context, claims and labels have the potential to create awareness and provide basic information to consumers about sustainable choices. Both awareness and basic knowledge about sustainable products are necessary for consumers to make conscious sustainable choices (e.g., Kruse 2011; Thøgersen 2000). Additionally, in particular labels have the potential to foster trust in sustainable products. Trust is essential since sustainability is a credence attribute of food and other products. Credence attributes are characteristics that can neither be verified by consumers prior to purchase nor after purchase or only with very high transaction costs (e.g., a consumer could visit the farm which produces for example the salad he/she buys but to do so he/she has to locate the particular farm and spend the time visiting the location. Thus, he/she has to make a lot of effort to verify the respective credence attribute) (Golan et al. 2001; Thøgersen 2000). Thus, enhancing consumers trust in the compliance with the respective sustainability standards increases the likelihood that consumers will consider the respective sustainable product in the choice situation (Golan et al. 2001; Janssen and Hamm 2012).

1.2 Sustainable consumption

The term 'sustainable consumption' emerged in the international policy arena in the Agenda 21 which was adopted during the Earth Summit in Rio in the year 1992. This was the first time that the international environmental discourse acknowledged sustainable consumption as a key element of achieving sustainable development (Seyfang 2005). In order to move toward sustainability, non-sustainable behavior in all areas of everyday life, such as food consumption, has to be abandoned for more sustainable practices (Kruse 2011). "Sustainable consumption is a balancing act. It is about consuming in such a way as to protect the environment, use natural resources wisely and promote quali-

ty of life now, while not spoiling the lives of future consumers” (Yates 2008: 96). Since the Earth Summit, the importance of sustainable consumption as a key driver of sustainable development has increased. For example in the revised ‘Common Market Organization in Fisheries and Aquaculture Products’ the EU underlines the importance of sustainable consumption for the economic growth of the European fisheries sector (European Commission 2009).

The approach of sustainable consumption assumes that consumers can support the development of a sustainable world by preferring allegedly sustainable products and, thus, promoting those products over less sustainable ones (Cox 2013). Sustainable consumption encourages consumers to believe that their actions have an impact on the way the world works and suggests that their purchases exercise a democratic influence (Cox 2013; Seyfang 2005). Sustainable consumption converts purchasing decisions into a moral act (Cox 2013).

Given this, the sustainable consumption literature, and in particular economic research, tend to focus on individual responsibility for solving environmental problems (Middlemiss 2010; Spaargaren and Oosterveer 2010; Seyfang 2005). This individualistic approach centers on strategies to provide information to individuals in order to shift their behavior into a more sustainable direction. Individuals are seen as the key actors for sustainable development assuming that individual laziness and ignorance are the cause of sustainability related problems (Spaargaren and Oosterveer 2010; Maniates 2001). But this assumption bears the danger to morally overburden consumers and to blackguard them (Seyfang 2005; Voegt-Kletschin 2015).

In turning away from this individualistic approach De Bakker and Dagevos (2012) propose a structural approach. They stress that consumers have to be recognized as allies to foster sustainable consumption and not as barriers. They argue that consumers are willing to take part in sustainable development as long as their needs are acknowledged (De Bakker and Dagevos 2012). The entire context of ecological and sociocultural conditions (e.g., economic conditions, social status, given institutional structures) has to be considered in order to support consumers in making sustainable choices (Brulle and Jenkins 2006; Gadema and Oglethorpe 2011; Kruse 2011; Whitmarsh 2009)

In line with this structural approach, Voegt-Kletschin (2015) and Godemann and Michelsen (2011) propose three different approaches for the achievement of more sustainable lifestyles:

- Change of choices: Consumers can voluntarily shift their consumption choices to more sustainable products and services.
- Change of choice conditions: Governments, businesses or other subjects can alter the choice conditions by, for example, increasing prices on unsustainable goods or by banning them.

- Empowering strategies: The empowering strategy consists of measures that support consumers in developing skills to recognize unsustainable activities and to rectify them. Basically the empowering strategies help consumers in voluntarily shifting to more sustainable choices. One way to do so is, for example, an increase in knowledge and awareness, which is accomplished by the use of the instruments of sustainability communication (e.g., sustainability labels and media coverage of sustainability issues).

This contrast between the individualistic and structural approach on sustainable consumption shows that much is still open for discussion on how far consumers are responsible for acting sustainably and how they could be supported in doing so.

One important area of sustainable consumption is food. Food consumption represents a '(un)sustainability hot spot' in individual lifestyle choices (Backhaus et al. 2012; Voget-Kleschin 2015). Food production has wide environmental, social and economic impacts. Globally, food accounts for 45 to 70% of household impacts on the environment (Ivanova et al. 2016). The exact impact on the environment depends on the individual diet composition. For example the consumption of animal-based products, in particular meat and dairy, is much more harmful to the environment than the consumption of plant-based foods (Dagevos and Voordouw 2013). Against this background and the fact that food is a basic need, food consumption is a good example for the tensions between personal lifestyle preferences and the freedom to act on those preferences on the one hand and the societal effects of such individual decision making on the other hand (Voget-Kleschin 2015).

Even though the research on sustainable communication and sustainable consumption is growing there is still much to learn on how to successfully communicate sustainability to consumers and how to motivate them to act accordingly (Reisch and Bietz 2011).

2 Research objectives

In light of the three approaches for the achievement of more sustainable lifestyles, (a) change of choices, b) change of choice conditions, c) empowering strategies, the overarching objective of the present thesis is to explore the potentials and limits of sustainability communication about food as one empowering strategy for fostering sustainable behavior based on the cases of climate-friendly food and farmed fish. The thesis hereby highlights how far sustainability communication as an empowering strategy can support the approach of change of choices and where the voluntary shift of consumers reaches its limits and has to be supported by the approach of change of choice conditions.

The present thesis includes three studies:

1. “Do carbon labels lead to an increase in climate-friendly consumption? A mixed methods approach in 6 European countries”

The study aims to explore if carbon labels represent an appropriate tool to foster climate-friendly behavior. It investigates the reasons why stated preferences for climate-friendly food do not always show up in real market behavior.

2. “Of earth ponds, flow-through and closed recirculation systems — German consumers' understanding of sustainable aquaculture and its communication”

The study aims to reveal German consumers' perceptions of sustainable aquaculture, related production practices and communication tools (labels and claims).

3. “Aquaculture in the German print media”

The study aims to elicit which issues of aquaculture are addressed by the media and in which manner.

In addition to the objectives of the second and third study, the present thesis compares the agenda setting of the media to consumers' perceptions of sustainable aquaculture.

3 Outline of the thesis

The remainder of this thesis is structured as follows:

Chapter 4 “Methodological approaches” depicts the mix of methodological approaches used and explains the reasons for choosing the respective methods. First the applied qualitative methods – focus groups and qualitative interviews – are described. In a next step, the quantitative methods – online survey and choice experiments – are explained. Afterwards, a separate section focuses on content analysis and finally the reasons for applying a combination of different methods are explained.

Chapter 5 “Results” shows the results of the three studies included in this thesis. First, chapter 5.1 “Do carbon labels lead to an increase in climate-friendly consumption? A mixed methods approach in 6 European countries” presents results of a mixed methods approach combining an online survey containing choice experiments with qualitative face-to-face interviews. This study explores consumers’ perceptions of climate-friendly food as well as the limits and merits of a carbon footprint label for fostering climate-friendly consumption. Next, chapter 5.2 “Of earth ponds, flow-through and closed recirculation systems — German consumers' understanding of sustainable aquaculture and its communication” presents the results of focus groups conducted to explore consumers’ perception of sustainable aquaculture and about related sustainability communication instruments. Finally, chapter 5.3 “Aquaculture in the German print media” displays the results of a content analysis conducted with print and online articles of the three most read German newspapers. It inquires how aquaculture is depicted in the media and thus which aspects are highlighted and with which meaning they are predominantly associated.

Chapter 6 “Discussion” reflects the key findings of the three studies in the light of recent research on sustainability communication and sustainable consumption. The medial presentation of aquaculture is discussed in combination with the findings of the focus groups about consumer perceptions of sustainable aquaculture. Potentials and limits of sustainability communication via media are depicted. In a next step, the potentials and limits of labels and claims as instruments of the empowering approach and potential connections to the change of choice conditions approach are discussed.

Chapter 7 “Limitations of the present research and further research needs ” discusses the limits of the present research and further research needs.

Chapter 8 “Conclusions” summarizes the potentials and limits of the sustainability communication via media, labels and claims. The findings are put in the context of the approaches for the achievement

of more sustainable lifestyles. It is highlighted that a combination of all three approaches is necessary to allow consumers to meaningfully contribute to sustainable development. The chapter concludes with suggestions for future research.

4 Methodological approaches

In the present thesis, qualitative and quantitative methods were combined in different ways. The qualitative approach of focus groups was applied to explore consumers' knowledge and perception of sustainable aquaculture and to analyze promising ways of communicating these sustainable practices to consumers. A mix of quantitative and qualitative content analysis was used to analyze the presentation of aquaculture in three leading German newspapers and their online representations. A quantitative online survey containing choice experiments followed by qualitative face-to-face interviews were conducted to elicit whether CO₂ labels are an appropriate communication tool to foster climate-friendly behavior. In addition, this research step aimed to gain more insights into consumers' perceptions of climate-friendly food and information needs with respect to climate-friendly food purchases. Through the combination of different topics and methods it was possible to gain a more complete picture of the potentials and limits of sustainability communication about food to foster sustainable behavior.

In the following the methods applied in this thesis are described and the reasons for selecting these methods are discussed. First the qualitative methods used are depicted followed by the quantitative methods. Afterwards content analysis is described in a separate section since it is a method of data analysis. Finally, the ratio for combining qualitative and quantitative research is explained against the background of the conducted studies.

4.1 Qualitative methods

Qualitative research attempts to interpret issues in terms of the meaning people attach to them. Qualitative research is usually concerned with words or images instead of numbers (Bryman 2008; Ormston et al. 2014). Key elements of qualitative research are:

- The use of non-standardized, adaptable methods of data generation
- Openness to emerging, unforeseen topics at the conduction, analysis and interpretation stages
- The use of a small number of participants who are not necessarily representative of any target group
- The obtained data have a higher richness of context and depth compared to quantitative approaches (Aaker et al. 2011; Burns and Bush 2010; Ormston et al. 2014).

Typical methods applied in qualitative research include focus groups, qualitative interviews and observations² (Shao and Zhou 2007).

4.1.1 Focus groups

Focus groups are a commonly used method in social and marketing research (Finch et al. 2014). Focus groups are applied to investigate perceptions, attitudes, preferences and motives (Burns and Bush 2010). Data are generated by interaction between a moderator and a group of participants (Finch et al. 2014). In focus groups a skilled moderator leads a small group of purposefully selected participants in a discussion about a particular topic (Shao and Zhou 2007). The moderator follows a fairly structured thematic guideline which stimulates the discussion and allows for latitude to the participants (Bryman 2008). He or she encourages openness on the part of the participants while simultaneously ensuring that the discussion stays focused on the general area of research interest (Burns and Bush 2010). The group usually consists of 5 to 12 people who meet once for a period of around one hour to two hours (Finch et al. 2014).

In view of the qualitative methods for data collection individual interviews present an alternative to focus groups. However, the advantages and disadvantages of each method have to be weighed against each other when selecting a method for data collection (Burns and Bush 2010; Bryman 2008). In contrast to qualitative interviews, the accent in focus groups is upon the interaction between group members and on the joint construction of meaning (Bryman 2008). In this manner, focus groups present a more natural setting to participants than interviews since participants are influenced and influence others as in everyday life (Finch et al. 2014). People can probe each other's reasons for holding certain views and challenge forwarded statements. In this manner, more realistic accounts on what people think might be gained with focus groups than with face-to-face interviews where interviewees are rarely challenged (Bryman 2008). Through conversation with others, shared meaning and normative constructs can be revealed, which explain in which way people perceive, experience and understand their environment (Finch et al. 2014). Due to the free flowing atmosphere of focus groups unexpected topics can be caught and further explored (Blank 2007; Halkier 2010). The interactions between participants offer more stimulation to participants than an interview and, thus, increase the probability of generating new ideas and meaningful comments (Aaker et al. 2011). Due to these characteristics, focus groups are frequently used to explore research topics on which knowledge is thus far low (Lamnek 2005). Another advantage of focus groups compared to interviews is that data can be generated in a shorter time and at lower costs (Aaker et al. 2011).

² Observation refers to 'watching what people do'. Given this, this method is limited to phenomena which can be observed and thus, not applicable to the present research concerned with unobservable psychic processes. (Shao and Zhou 2007).

One important limitation of focus groups is that they are prone to group effects. Overly prominent participants can dominate the discussion and suppress views of others. Therefore, the moderator needs to ensure that all participants have equal chances to participate and express their opinions (Bryman 2008; Shao and Zhou 2007). Additionally, as a group reaches an agreement on a topic, participants tend to think uncritically about it and to get irrationally attached to it (Bryman 2008). Related to the group effect, participants of a focus group are also more prone to express culturally expected views, which can be a problem if the proper view of participants is hidden by this (Bryman 2008). Focus groups are not appropriate for very sensitive topics which might create discomfort among participants and hence are preferably explored in one-to-one interviews (Bryman 2008).

For the research in the first article "Of earth ponds, flow-through and closed recirculation systems - German consumers' understanding of sustainable aquaculture and its communication" focus groups were deemed as the appropriate method due to their explorative and interactive nature. Previous to this work little was known about consumers' knowledge and perception of sustainability in aquaculture. Thus far, no study had inquired how consumers perceive different land-based aquaculture practices and sustainability labels for farmed fish. This lack of research made focus groups an appropriate approach to gain first insights and to assess the issue from a multitude of views and, thus, in its breadth. The interactions in the groups allowed gaining insights in the collective understanding of sustainability in aquaculture. Apart from that, the interactions in the focus groups offered the possibility to understand in more depth the reasoning of consumers for their (dis)interest in information about sustainable aquaculture and supported the generation of ideas of how to improve communication of sustainable aquaculture. These results were made possible by the dynamic atmosphere of focus groups and the fact that participants challenged each other's views. In principal, sustainable aquaculture presents no sensitive topic.

4.1.2 Qualitative interviews

Qualitative interviews are semi-structured or unstructured one-on-one conversations between a trained interviewer and a subject from the target population (Bryman 2008; Burns and Bush 2010; Shao and Zhou 2007). Semi-structured and unstructured forms differ in the amount of guidance provided by the interviewer (Aaker et al. 2011). In unstructured interviews the interviewer uses at most a brief set of ideas to support him or her in dealing with the range of topics addressed and allows the participant to freely float between issues (Bryman 2008; Shao and Zhou 2007). In semi-structured interviews the researcher uses a list of questions and/or topics to be covered, also called interview guide. The interviewee still has some freedom in how to reply and unexpected topics can be addressed by asking questions not included in the guideline (Bryman 2008).

The order of the questions may be adapted to the individual interview situation. But, generally the interviewer will ask all the foreseen questions and a similar wording will be used in all conducted interviews. Both cases have in common that the process is flexible and that the emphasis is on how the interviewee frames and understands the issues at hand (Bryman 2008).

The degree of structure depends on the research topic (Yeo et al. 2014). Unstructured interviews are preferred if there are concerns that even a rudimentary guideline might hinder the genuine access to an issue and/or if the research topic is still very wide (Bryman 2008). Semi-structured interviews are more likely to be chosen if the investigation has a very concrete, narrowed down focus since more structure allows for addressing more specific issues. Additionally, semi-structured interviews are frequently selected in order to ensure comparability of interview styles if more than one person carries out the fieldwork (Bryman 2008).

Compared to focus groups, qualitative interviews have the advantage that they are more detailed and revealing with respect to the individual perspective of each respondent. They can result in twice the amount of information per interviewee because each respondent has more time to talk than in a typical focus group. In contrast to focus groups, one-to-one interviews can avoid the influence of other participants on responses (Aaker et al. 2011; Shao and Zhou 2007). Given this, qualitative interviews have the advantage that they can handle more complex and sensitive topics than focus groups. Interviewees might be more honest and feel more at ease if they are not concerned about group reaction (Shao and Zhou 2007). Qualitative interviews are also more appropriate than focus groups if the research aims to answer very targeted and well defined research questions (in contrast to more broad and explorative questions) in detail since interviews can ask respondents more directly and can stay more focused on a particular topic than in focus groups (Aaker et al. 2011; Bryman 2008). Using focus groups for this kind of research questions bears the risk of getting lost in the dynamic of the discussion and upcoming, unforeseen topics.

Qualitative interviews are particularly useful if the research aims to understand the decision making on an individual level, the use of products, the emotional and sometimes private aspects of consumers' lives (Burns and Bush 2010).

Shortcomings of qualitative interviews are that they do not allow for interaction with other participants, which might result in discomfort for the respondent since he or she might feel alone or trapped (Shao and Zhou 2007). Also interviewers have a much bigger impact on the respondents than in focus groups. Variations in appearance and style can lead to differences in the behavior of respondents (Shao and Zhou 2007).

In light of this, qualitative, semi-structured, face-to-face interviews were chosen for the research in the article "Do carbon labels lead to an increase in climate-friendly consumption? A mixed methods approach in 6 European countries" due to the very concrete focus and the complex nature of the research topic. Recent research highlights that climate change and climate-friendly food consumption are very complex and abstract topics for consumers (e.g., Hartikainen et al. 2014; Lorenzoni and Pidgeon 2006). The concrete focus was given since the qualitative interviews followed the quantitative research step and aimed to answer very specific questions raised by the findings in the previous step. The concise focus was one reason for choosing semi-structured interviews over unstructured ones. Another reason for relying on semi-structured interviews was to ensure cross-case comparability. For this reason all interviews were conducted by the same interviewer.

4.2 Quantitative methods

In contrast to qualitative research, quantitative research follows a more structured approach to data collection and analysis. It is based on larger sample sizes which frequently try to be as representative for the target population as possible. Data format and sources are well defined. Mathematical measures and statistical techniques are used to compile and analyze the data (Bryman 2008; Burns and Bush 2010; Shao and Zhou 2007). Quantitative research can be divided into survey and experimental research. In survey research data are obtained through a structured questionnaire from a usually large sample of the target population (Shao and Zhou 2007).

4.2.1 Survey

Surveys are a very popular method to collect data (Burns and Bush 2010; Aaker et al. 2011). They are a quantitative research method that obtains data with a standardized questionnaire from a large number of participants (Shao and Zhou 2007). Advantages of surveys are that they are easy to administer, that they allow retrieving a lot of information from an individual respondent in an efficient manner, and that they are suitable for statistical analysis (Aaker et al. 2011; Shao and Zhou 2007). Additionally, surveys allow for standardization since each respondent is asked the same set of questions and is confronted with the same response options (Burns and Bush 2010).

Major disadvantages of surveys are that they are prone to response sets, that they are confronted with the problem of meaning and that they have a limited ability to cater for the unforeseen. Response sets are, if respondents answer to a series of questions in a consistent manner but one which is irrelevant to the underlying concept. Prominent types of response sets are the 'acquiescence', also called the 'yeasaying' and 'naysaying' effect, and the 'social desirability bias' (Aaker et al. 2011; Bryman 2008). An acquiescence effect occurs if respondents show a tendency to consistently disagree or

agree with a series of questions or items. The social desirability bias refers to evidence that answers, which are perceived as socially desirable, are more likely to be chosen than those which are not (Bryman 2008). The problem of meaning refers to the notion that the developers of the survey and the respondents might not share the same meaning system and, thus, interpret the questions and answers differently (Bryman 2008). The limited ability of surveys to cater for the unforeseen is rooted in the nature of quantitative methods. Since questions are preset, researchers can only gather emerging ideas by applying open questions, which allow respondents to reply as they wish. But open questions are more time-consuming for researchers and respondents (Bryman 2008).

Given this, a survey was chosen for the research in the article "Do carbon labels lead to an increase in climate-friendly consumption? A mixed methods approach in 6 European countries" because surveys allow for generalization by simultaneously being capable to reveal reasons for the found phenomena.

Different survey modes exist, ranging from self-administered (e.g., mail, online) over personal standardized interviews (e.g., face-to-face computer-assisted, telephone) to surveys which mix self-administered and personal standardized interviews (Burns and Bush 2010; Shao and Zhou 2007).

Online surveys have the advantage that they are fast and cost-effective. Responses can be gathered from a very large number of people in a very short time. As with other computer-assisted survey modes, online surveys give the researcher more control over data quality since the conduction process is completely transparent. Logic checks can be implemented in order to filter contradictory or non-sensical responses. Similar to other electronic questionnaires, online surveys offer a high flexibility in question formats and allow for the inclusion of pictures, videos and other graphical means (Aaker et al. 2011; Burns and Bush 2010; Brace 2013; Dillman et al. 2014; Ramme 2009; Shao and Zhou 2007). They eliminate coding errors since data are collected automatically (Shao and Zhou 2007). Like paper self-completion questionnaires (e.g., mail surveys), online surveys allow the respondent to complete the questionnaire in his/her own time (Brace 2013). Online surveys are more effective in addressing sensitive issues and are less prone to the social desirability bias than survey modes involving an interviewer (e.g., face-to-face computer administered, telephone surveys) (Brace 2013). Since no interviewer is involved, interviewer effects are eliminated. Interviewer effects can occur, for example, in face-to-face interviews or telephone surveys when the interviewer consciously or unconsciously gathers the data incorrectly and/or influences the respondent in some way like giving additional information (Shao and Zhou 2007).

Limitations of online surveys are that they might miss covering the whole target group since they require that respondents are accustomed with the internet, have the ability to use related devices (e.g., computers) and have access to the internet (Burns and Bush 2010; Ramme 2009; Shao and

Zhou 2007). In addition, people need to be receptive to use the internet for the completion of surveys (Dillman et al. 2014). Another disadvantage of online surveys is that, like all self-completion survey modes, no interviewer is present to support respondents in clarifying questions (Brace 2013; Ramme 2009). Also body language cannot be accounted for (Ramme 2009). Furthermore, similar to telephone and mail surveys, online surveys are unable to control for who completes the survey (Ramme 2009).

Against this background, an online survey was chosen for the research in the article "Do carbon labels lead to an increase in climate-friendly consumption? A mixed methods approach in six European countries" since a high flexibility in question formats, like the randomization of response lists and the customization of response lists against previous answers, and the inclusion of images were prerequisites for answering the research question. These characteristics were in particular important for the choice experiments included in the survey. In this context, computer-assisted personal interviews would have been the most appropriate alternative survey mode to online surveys. The reason for choosing an online survey over a computer-assisted personal interview was the ability of online surveys to gather a large data set in a time and cost effective manner. Since the study was carried out in 6 countries it would have taken much more money and time to administer a computer-assisted personal interview.

4.2.2 WTP estimation and preference elicitation method - choice experiments

Different methods for WTP estimation and preference elicitation do exist. Methods either use survey techniques or price response data. Response data can be obtained by market observations (e.g., panel data, scanner data) or by the performance of experiments (e.g., Vickrey auctions, in-store purchase experiments). Data collected from price responses are frequently called 'revealed preference data'. Data obtained by surveys are frequently referred to as 'stated preference data'. Survey techniques can be divided into direct (e.g., contingent valuation, expert judgements, customer surveys) and indirect surveys (choice experiments) (Breidert et al. 2006; Hensher et al. 2015).

Of all mentioned methods only those based on market observations can reveal actual WTP values and preferences while all other methods only provide proximate estimations. But data obtained by market observations are either available on an aggregated level and, thus, do not reveal preferences for individual attributes, or/and are very expensive, time consuming and difficult to control for other parameters than price (Hensher et al. 2015; Voelckner 2006). In addition, the use of market data does not allow for exploring the preferences for products not yet available on markets (Breidert et al. 2006) and, hence, would not be appropriate for testing preferences for the two hypothetical carbon footprint labels introduced in this thesis.

With the exception of methods based on market observations, choice experiments (CE) are framed as the method which most closely resembles individual purchase decisions and thus yield the most realistic estimates for consumers' preferences and WTP (Hensher et al. 2015). CE can be used to simultaneously assess consumers' preferences and their WTP (Breidert et al. 2006; Mauracher et al. 2013; Wägeli et al. 2016). The method is based on the economic theory of choice behavior according to which consumers always try to maximize their benefit/utility by choosing the product alternative that they perceive as best for them (McFadden 1974; Tait et al. 2016).

In CE, participants have to make a choice out of a set of product alternatives. The set of alternatives is called a choice set (Hensher et al. 2015). The alternatives differ with respect to their product attributes (e.g., CO₂ label, local production). The preferences for each attribute are derived from the choices made with respect to the different product alternatives (Hensher et al. 2015; Louviere et al. 2007; McFadden 1974). The estimation of the WTP can help to identify the market perspectives for new products or product attributes since it indicates the money equivalent to consumers' benefit from a product or a product attribute (Miller et al. 2011; Wägeli et al. 2016). In addition, the WTP estimates allow for a comparison of the values people attach to the tested attributes between different models and, thus, in the case of this thesis between study countries.

Besides yielding the most realistic estimates for WTP and preferences, CE have other advantages compared to auction experiments and direct survey approaches. In contrast to experiments involving a bidding procedure³ (e.g., Vickrey auctions, BDM mechanism), CE are perceived by participants as fairer and less complex (Voelckner 2006). CE are more cost and time effective and highly flexible with respect to price, product and attribute combinations (Breidert et al. 2006; Voelckner 2006; Hensher et al. 2015).

A major disadvantage of CE compared to contingent valuation is that CE demand more expertise for the conduction and analysis and hence are more time consuming (Breidert et al. 2006). Also CE tend to result in an underestimation of the WTP compared to the true WTP, even though they show a low hypothetical bias⁴ (Harrison and Rutström 2008; Hensher et al. 2015). The reason for this underestimation is that in real life individuals face constraints which are not accounted for in CE. These "[...] constraints tend to result in higher cost choices more frequently in real life than in hypothetical surveys" (Hensher et al. 2015: 884).

³ Participants have to submit a bid for the tested product. The determination of the WTP estimates differs between procedures (Voelckner 2006).

⁴ Observed differences between a WTP given in a survey and the WTP people reveal in an experiment that involves their money are termed 'hypothetical bias' (Loomis 2011).

In light of this, CE were applied in this thesis since they result in the most realistic estimations while simultaneously allowing for controlling for a range of influential parameters and combining various price levels and product attributes.

In CE, different models are applied for estimating preferences and WTP. All these models have their drawbacks and merits. The most basic choice model is the multinomial logit (MNL) which is very restrictive since it assumes constant variances and zero covariances (Hensher et al. 2015; Louviere et al. 2007). Nowadays, the mixed logit model, also called random parameters logit, kernel logit or mixed multinomial logit, has become the most popular model. It differs from the MNL model by allowing for parameters to be randomly distributed. It is superior to the MNL model since it can identify sources of preference heterogeneity and allows for correlation of unobservable influences on choice making. Preference heterogeneity refers to variances in the preferences of observed individuals (Hensher et al. 2015; Revelt and Train 1998). Mixed logit models were chosen for the present thesis for calculating preferences.

For the estimation of the WTP a generalized mixed logit model was applied. The generalized mixed logit model develops the mixed logit model further by taking account for scale heterogeneity. Scale heterogeneity is the variance in preferences over different choice sets. This property is important for calculating the WTP. Generalized mixed logit models yield more realistic WTP estimates than the originally used approach, in which WTP was computed based on ratios of parameters (Hensher et al. 2015).

Mixed logit models and generalized mixed logit models as well as other discrete choice models are based on the assumption that the utility of choosing alternative i out of a choice set of J alternatives consists of two components: The observed utility V_i and the random error term e_i . The random term e_i captures the unobserved utility. The present study included five variables: 'Organic indication', 'Local claim', 'Climate-friendly claim', 'CO2 label' and 'Price'. All variables except the 'Price' were categorical variables and as such transformed into effect-coded variables. The variable 'CO2 label' was split into two dummy variables, one for each tested CO2 label ('CO2sc' and 'CO2en') and both dummy variables were effect-coded (e.g, for the dummy 'CO2sc': -1 = No label, 0 = CO2en, 1 = CO2sc). 'Price' was included as a metric variable. The model used for calculating the preferences (the so called preference space) was specified as follows:

$$U_i = \beta_{\text{Price}} \text{Price} + \beta_{\text{Local}} \text{Local} + \beta_{\text{Organic}} \text{Organic} + \beta_{\text{Claim}} \text{Claim} + \beta_{\text{CO2a}} \text{CO2sc} + \beta_{\text{CO2b}} \text{CO2en} + e_i$$

The probability (*Prob*) that alternative *i* is chosen out of a choice set of *J* alternatives is expressed by:

$$Prob_i = \frac{\exp V_i}{\sum_j \exp V_j}$$

For calculating the WTP the utility function of the generalized mixed logit model was respecified in the so-called 'willingness to pay space'. The approach assumes that utility can be separated into price and non-price attributes. For the direct estimation of the distribution of the WTP the model is reformulated in a way that the coefficients represent the WTP measures. Thus, the model in WTP space was:

$$U_i = \beta_{\text{Price}}[\text{Price} + \theta_1 \text{Local} + \theta_2 \text{Organic} + \theta_3 \text{Claim} + \theta_4 \text{CO2sc} + \theta_5 \text{CO2en}] + e_i$$

where the price parameter has been normalized to 1.0 and $\theta_1, \theta_2, \theta_3, \theta_4, \theta_5$ represent the WTP estimates for the non-price attributes (Hensher et al. 2015).

4.3 Content analysis

Content analysis is an approach to the systematic and objective analysis of the content and context of recorded communication. Communication in this respect includes language, music, pictures as well as other forms of symbols (Bryman 2008; Mayring 2010; Spencer et al. 2014). It is therefore applicable to a variety of media. It is most commonly used to examine text and in particular mass media (Bryman 2008). Content analysis aims to describe the data and to infer from the analyzed data the circumstances of its origin and its effects on recipients (Bryman 2008; Mayring 2014). It is strictly speaking not a means of generating data but an approach to the analysis of data. However, it is commonly treated as a research method due to its distinctive approach of analysis (Bryman 2008).

A distinctive feature of content analysis is that the data in question are always interpreted according to a coding scheme which represents the rules for analysis. Once the rules are set they should be applicable without the intrusion of bias. In this manner, content analysis ensures objectivity also called inter-subjectivity in content analysis (Bryman 2008; Mayring 2014). The coding scheme specifies the categories which represent the concrete aims of the analysis. The categories are assigned to segments of the data. The segmentation is defined in advance and is called 'units of analysis'. The units of analysis describe the smallest and biggest component of data, which can be assessed within a category (Bryman 2008; Mayring 2010, 2014; Riffe et al. 2005).

The categories used for the analysis of the data are defined in the coding manual. It instructs the coders on how to code the data at hand. The manual aims to describe the categories as completely and concisely as possible in order to ensure objectivity, reliability and validity (Bryman 2008; Früh 2011; Mayring 2014). If more than one coder analyzes the data, the reliability can be assessed by letting different coders analyze the same material and then comparing the results for agreement in coding. This is called inter-coder reliability. If only one coder analyzes the data, the intra-coder agreement and, thus, the coding consistency over time can be measured. The single coder achieves this in coding the same material twice without knowing how he or she coded the material in the first place. In both cases, only a selection of the data is used for the reliability test. The degree of agreement can be calculated according to different reliability tests. One frequently applied test, which leads to robust results, is Cohen's Kappa (Bryman 2008; Mayring 2014; Riffe et al. 2005).

Content analysis can be divided into a quantitative and a qualitative approach. While quantitative content analysis aims broadly speaking to quantify the 'manifest' content of the data at hand, qualitative approaches seek to uncover the 'latent content'. 'Manifest' content refers in this respect to the apparent content (Bryman 2008; Mayring 2010). This involves for example the counting of appearances of certain elements, like specified words, in the data and comparing their frequencies of occurrence and the categorization of defined data components according to valence (e.g., positive – negative) (Mayring 2010). In contrast, 'latent content' refers to the underlying meaning of the content, which needs to be interpreted (Bryman 2008). Bryman (2008: 529) describes it as "[...] searching-out of underlying themes in the materials being analysed [...]".

Both approaches categorize the data according to a coding scheme, but qualitative content analysis allows for the inclusion of categories and variables which emerge during the analysis (Bryman 2008). Additionally, if the coding scheme is derived inductively, the categories are directly deduced from the data themselves and not from theoretical considerations (Mayring 2014). In contrast, quantitative content analysis typically applies a predefined coding scheme to the data (Bryman 2008).

A combination of qualitative and quantitative content analysis was chosen for the research concerned with the medial presentation of aquaculture in order to draw on the strength of both approaches and to gain a more complete picture of the presentation of aquaculture in German newspapers.

However, the distinction into a qualitative and a quantitative approach is fiercely debated in the literature. While for example Bryman (2008) clearly separates both approaches, Mayring (2010) and Früh (2011) try to reconcile both. Mayring (2010) and Früh (2011) argue that both approaches consist in fact of qualitative and quantitative research steps and are thus compatible and are frequently

combined. For example, more qualitative oriented research frequently draws on quantification in order to generalize the results (Mayring 2014). Against this background, Früh (2011) as well as Spencer et al. (2014) prefer to speak of content analysis instead of making a distinction into qualitative and quantitative content analysis.

Alternatives to content analysis are semiotics⁵ and hermeneutics⁶. Compared to these two methods content analysis is a more systematic approach to data analysis. It allows for verifiability and replicability which is not the case for hermeneutics and only true to a limited degree for semiotics (Bryman 2008; Früh 2011; Stepchenkova and Zhan 2013). While hermeneutics and semiotics mainly aim to understand the data in question in an all-embracing manner, content analysis explores the data with respect to one or more defined research questions and thus in a more targeted way. Content analysis aims to reduce complexity and accepts information loss resulting from this approach (Bryman 2008; Früh 2011). This information loss can be seen as an advantage of content analysis since the limitation to certain elements of the data allows to elicit bigger structural relations and to make comparisons in a systematic manner (Früh 2011). In this context, content analysis offers the possibility to conduct longitudinal analysis by systematically gathering data over a longer period of time and analyzing the frequency of appearance of specific topics along the respective time line. The frequency of appearance is an indication for the importance of the researched issue at a certain moment in time (Bryman 2008).

A disadvantage of content analysis is that, due to the reduction in complexity and the systematic approach, the method has only a limited ability to uncover underlying meanings and to catch the uniqueness of each unit of analysis (e.g., of each document if more than one document is analyzed). Semiotics and hermeneutics are much more adapted in this respect (Mayring 2014). Another critical point is that coding manuals always entail some interpretation by the coder. Even the most precise coding manual still refers to a socially constructed frame of meaning which can differ from the frame other individuals apply (Bryman 2008). That is why coding manuals frequently underpin the definitions of the categories with citations originating from the data.

For the research in this thesis content analysis was used due to its transparent and systematic nature. This approach allowed to a certain degree for generalization of the results and for comparison to other research findings. The study about consumers' understanding of sustainable aquaculture and its communication as well as the media analysis aimed to inquire specific research questions and

⁵ Semiotics is a method to analyze symbols and signs. It treats phenomena as text and is concerned with ordinariness of everyday life. Semiotics aims to reveal the hidden meanings which reside in texts. It analyzes the obvious, formal meaning of symbols and signs as well as the contextual meaning of both (Bryman 2008).

⁶ Hermeneutics is an approach to analyze text and theological text in particular. It aims to elicit the meaning of a text from the perspective of the author and therefore considers the social and historical context within which the analyzed text was created (Bryman 2008).

not to grasp the data in its entirety and uniqueness. In the media analysis the use of content analysis allowed to reveal argumentation schemes and tones, which would not have been possible without the reduction of complexity undertaken in this method.

4.4 Combining qualitative and quantitative methods

Qualitative and quantitative research can complement each other and a combination of both approaches, also called mixed methods, is increasingly used by researchers (Bryman 2008; Shao and Zhou 2007). In mixed methods research qualitative and quantitative data are collected and analyzed together either sequentially or embedded. The principal assumption is that the combination of both approaches leads to a better understanding of research questions than either approach alone (Creswell and Plano Clark 2011). The mixture of both approaches allows to offset their specific weaknesses and to draw on the strengths of both (Bryman 2008).

In the present thesis qualitative and quantitative data were collected sequentially. Following the classification of rationales identified by Bryman (2006) the reasons for combining both approaches were: To bring together a more complete picture of the research topic, to capture the diversity of views, to draw on the strength of both approaches and to explain and contextualize results generated in the quantitative or qualitative research steps.

For the study focusing on climate-friendly food an online survey was conducted consisting of a standardized questionnaire combined with choice experiments followed by qualitative interviews. The questionnaire compiled socio-demographic data and some additional insights in consumers' attitudes towards the two tested CO₂ labels and on climate-friendly behavior. The choice experiments revealed preferences and WTP. The qualitative interviews served to explain the preferences and WTP found in the choice experiments. Further they deepened the understanding of consumers' knowledge about climate change and climate-friendly behavior. For the media analysis quantitative and qualitative content analysis were combined within the same study. Quantitative content analysis was used to gain insights into the tones used with respect to aquaculture, to elicit the importance of different aspects of aquaculture in the media and to explore the magnitude of references to stakeholders from the aquaculture sector. Qualitative content analysis was applied to illustrate findings of the quantitative step and to explore the argumentation schemes underlying the attributes attached to aquaculture by the media. In this respect, qualitative content analysis was also used to understand which aspects of sustainability the media connected to aquaculture.

5 Results

5.1 Do carbon labels lead to an increase in climate-friendly consumption? A mixed methods approach in 6 European countries

This chapter represents an earlier version of an article written by the author of this thesis and PD Dr. Katrin Zander as co-author. Any reference to this chapter should be cited as:

Feucht, Y., Zander, K., (2018). Consumers' preferences for carbon labels and the underlying reasoning. A mixed methods approach in 6 European countries. *Journal of Cleaner Production*, 178, 740-748.

5.1.1 Abstract

Carbon footprint labelling represents one option to enable consumers to act climate-friendly and consumers frequently state that they are interested in carbon labels. But even though various carbon footprint labelling schemes exist throughout Europe, their market relevance is low. In this context, the present research aims to investigate preferences for climate-friendly food and to identify barriers for these preferences to become effective in European market places. Using a mixed methods approach combining choice experiments and a questionnaire with qualitative face-to-face interviews, the preferences and willingness to pay for carbon labels and a climate-friendly claim are explored in six European countries. Consumers' perceptions of climate-friendly food and their information needs with respect to climate-friendly food are elicited. Our results show that the presence of a carbon label increases the purchase probability and that consumers are willing to pay a price premium for a carbon label in all countries under investigation. But the contribution of a carbon label to a more climate-friendly consumption might be limited since consumers are frequently overstrained with respect to climate-friendly buying decisions. Policy makers and the retail are challenged to set appropriate structures to support climate-friendly consumption.

Keywords: Carbon footprint labeling; consumer research; climate change; climate-friendly food; mixed methods; choice experiments

5.1.2 Introduction

At the United Nations Climate Change Conference in Paris in December 2015, a global agreement on the reduction of climate change was negotiated - the so called Paris Agreement. In the agreement,

the signing parties committed themselves to limiting global warming to less than 2 degrees Celsius compared to pre-industrial levels (UNFCCC 2016). In order to meet this target, the agreement calls for collective efforts to combat climate change. This includes a widespread public engagement, embracing the industry as well as individual citizens.

One way of combatting climate change as an individual citizen is to engage in a climate-friendly lifestyle (O'Neill and Nicholson-Cole 2009). In this respect, food consumption constitutes an important field of action since it contributes significantly to the total greenhouse gas emissions (Vanclay et al. 2011; Vanhonacker et al. 2013). One option to enable consumers to act in a climate-friendly manner is the implementation of carbon labeling schemes (Onozaka et al. 2015). Various retailers through Europe display carbon labels on foods and recent research shows that consumers are generally in favor of a carbon label (e.g., Gadema and Oglethorpe 2011; Hartikainen et al. 2014).

But so far, carbon labels have only minor relevance on the markets in most European countries, and research findings differ with respect to the willingness to pay (WTP) for carbon labels (Onozaka et al. 2015). Although some studies (Grunert et al. 2014; Hartikainen et al. 2014; Lüth et al. 2009) found that people frequently refuse to pay a price premium for climate-friendly products, others come to the opposite conclusion (e.g., Caputo et al. 2013; De Marchi et al. 2016; Hartikainen et al. 2014; Onozaka and Mc Fadden 2011; Van Loo et al. 2014). Van Loo et al. (2014), for example, found that Belgian consumers were willing to pay a price premium of up to 24% for carbon-labelled chicken breast. Research has also shown that climate-friendliness is of less importance to European consumers than other sustainability attributes (Eurobarometer 2009; Hartikainen et al. 2014; Guenther et al. 2012; Gadema and Oglethorpe 2011). Consumers are frequently inclined to pay higher price premiums for local and organic production and animal welfare indications than for carbon labels (De Marchi et al. 2016; Onozaka and Mc Fadden 2011; Van Loo et al. 2014).

The information provided by carbon labels is often not easily comprehended by consumers. For instance, in a UK study 89% of the respondents were confused by carbon labeling (Gadema and Oglethorpe 2011). The underlying concept and its implications are complicated and sometimes scientifically controversial, as is the calculation of the carbon footprint itself (Baldo et al. 2009; Boardman 2008; Burger et al. 2010; Onozaka et al. 2015). In this context, an important reason for the lack of success of carbon labels is the consumers' limited knowledge about the carbon footprint and about climate-friendly food (Hartikainen et al. 2014; Upham et al. 2011). Consumers lack an understanding of the possibility of making environmentally and climate-friendly choices by changing their food consumption habits. Therefore, they have only a limited ability to act in accordance with their interest in climate-friendly behavior (Beattie and Sale 2009; Gadema and Oglethorpe 2011; Hartikainen et al. 2014).

Against this background, there appears to be a need to design carbon labels which are easily understood by consumers (Upham and Bleda 2009). Studies have shown that consumers prefer simple and concise carbon labels (Berry et al. 2008; Upham and Bleda 2009). Consumers favor a scale which depicts the carbon footprint (Hartikainen et al. 2014; Berry et al. 2008; White et al. 2009). Scales allow customers to make a valuation based on the relative classifications, which makes the labels more meaningful to consumers (Berry et al. 2008; Boardman 2008; Upham et al. 2011). The colors of the scale should correspond to traffic lights because these are generally familiar and thus easily handled (Berry et al. 2008; Gössling and Buckley 2016; Rööös and Tjärnemo 2011). Some consumers appreciate an absolute number for the CO₂-equivalent per unit. In this context, the combination of a scale and a number appears to be the most promising approach since it allows for direct comparison of product categories and with other actions (Berry et al. 2008; Hartikainen et al. 2014; Leire and Thidell 2005).

Additionally, regarding the low prevalence of carbon labels on the European market, whether carbon labels are an appropriate and effective tool to increase climate-friendly consumption in Europe has to be discussed. Politics and the economic sector (e.g., producers and retail) also play an important role for the mitigation of climate change and their responsibility in this process has to be considered. Recent studies point out that joint efforts of politicians, the economic sector and consumers are essential for coping with the complex issue of climate change (e.g., Berry et al. 2008; Dagevos and Voordouw 2013; Whitmarsh 2009; Whitmarsh et al. 2011).

Accordingly, the present research investigates whether there is a chance for carbon labels despite the above mentioned barriers. It compares the preferences for carbon labels in six European countries. We explore which label design would be the most appropriate one for the European market and compare the preferences for carbon labels with preferences for the indications of organic and local production. Additionally, we attempt to better understand the reasons why stated preferences do not appear in real market behavior. We follow this objective by using a mixed method approach, combining a quantitative survey consisting of choice experiments (CE) and a questionnaire with qualitative face-to-face interviews. The strength of this approach is that we are able to reveal stated preferences and values associated with carbon labels as well as the reasoning underlying the revealed attitudes. In this manner, the approach allows to obtain a more realistic answer to the question of whether carbon labels are an appropriate communication tool to foster climate-friendly behavior.

The present paper is structured as follows: First, the methodological approach is depicted. In the next step, the results of the survey including the estimates resulting from the choice experiments are displayed, followed by the results from the interviews. Then the results are discussed in the light of re-

cent research and finally recommendations for the communication of climate-friendly food are presented in the conclusions.

5.1.3 Method

Since European consumers' interest in carbon labels is a quiet controversial topic, we decided to address it in an all-embracing manner and therefore chose a mixed methods approach. In mixed methods research, quantitative and qualitative viewpoints are combined in order to obtain a more elaborated understanding of the issue at hand (Johnson et al. 2007). The use of mixed method research allows the consideration of different perspectives and considers convergent and/or complementary effects of different approaches. Hence, the use of mixed method research enhances the validity of the results (Denscombe 2008).

In the present study, two different research steps were combined in order to gain a more complete understanding of European consumers' preferences with respect to carbon labels. First, a quantitative online survey consisting of choice experiments and a questionnaire was conducted with 6007 consumers in six European countries (France, Germany, Italy, Norway, Spain and United Kingdom) in order to investigate the consumers' preferences for two different carbon labels in comparison to local and organic production and a claim of climate-friendliness. Based on the outcomes of the survey, an interview guideline was developed and qualitative face-to-face interviews with 32 consumers were conducted in France, Germany and the United Kingdom. The interviews attempted to obtain insights into the underlying reasoning for the preferences revealed in the survey and thus tried to close the attitude-behavior gap further.

5.1.3.1 Online survey design

The online survey was conducted in June 2015. Participants were recruited by means of a representative online access panel run by a commercial market research agency. A quota was set for age and gender. Country-specific quotas for the three age groups ('18-29', '30-49', '50-70') were set according to their shares in the total population. As far as possible, the same number of men and women participated. People working in marketing/market research and/or in the food retailing industry were excluded in order to avoid distorted results due to expert knowledge. Participants had to be at least partially responsible for the food purchasing in their household.

Table 1 shows the socio-demographic characteristics of the sample. The participants in the UK were slightly younger than in the other countries while the German sample showed the highest share of the oldest age group. In comparison to census data in the six countries, people with higher education

(12 or 13 years of school attendance, college or university degree) were overrepresented in our data. This must be taken into account when evaluating the results.

Table 1: Socio-demographic characteristics of the survey sample (per country)

	DE	ES	FR	IT	NO	UK
Gender						
Female	49.7%	50.1%	50.8%	50.6%	51.4%	50.1%
Male	50.3%	49.9%	49.2%	49.4%	48.6%	49.9%
Age						
18-29	23.1%	20.9%	25.0%	21.0%	22.9%	26.9%
30-49	40.6%	43.7%	39.5%	44.1%	41.0%	39.3%
50-70	36.4%	35.4%	35.5%	34.9%	36.2%	33.8%
Education						
No formal qualification	0.2%	0.8%	2.6%	0.5%	0.5%	4.2%
Approximately 10 years of school attendance	48.9%	14.7%	15.6%	15.1%	5.7%	24.1%
12 or 13 years of school attendance	27.3%	40.3%	34.9%	50.1%	35.8%	19.5%
College or university degree	23.7%	44.2%	46.9%	34.3%	58.0%	52.2%
N	1001	1002	1000	1003	1001	1000

DE = Germany, ES = Spain, FR = France, IT = Italy, NO = Norway, UK = United Kingdom

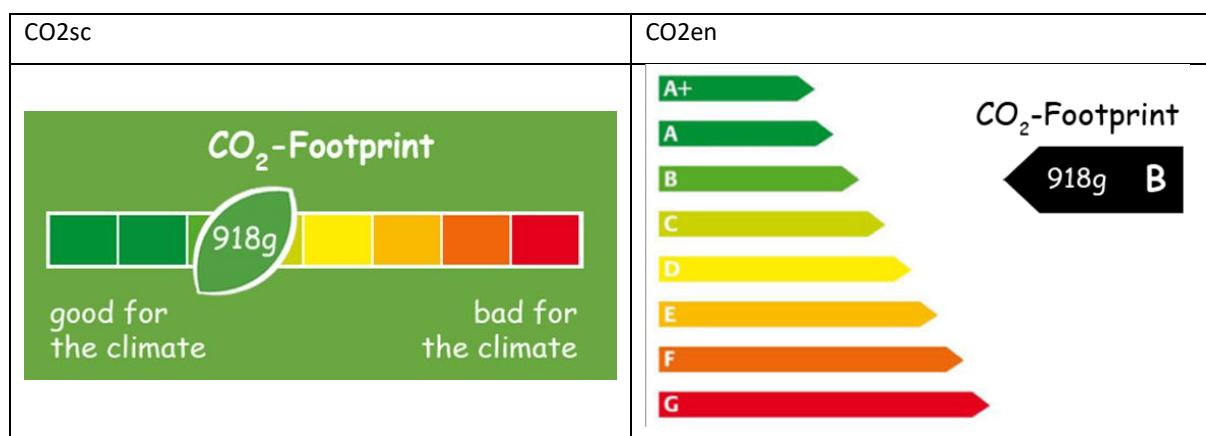
The choice experiments and the questionnaire were developed in German and English and then translated into the other languages by means of the back-translation method. The questionnaires were pre-tested in the respective national languages and checked by native speakers.

5.1.3.2 Choice Experiments

In the present study, choice experiments (CE) were used to assess consumers' preferences and willingness to pay (WTP) for climate-friendly labelled food and for two different carbon labels in particular. CE are a stated preference method commonly used to simultaneously assess consumers' preferences and their WTP (Hensher et al. 2015; Mauracher et al. 2013; Wägeli et al. 2016). Milk was selected as the target product since it is a widely available product and many consumers regularly buy it. In order to test designs for a carbon label, we created two experimental labels (Figure 1). The CO₂sc label was inspired by the carbon index of the French retailer Casino ('l'indice carbone'). The other label was adapted from the EU energy label. The design of both labels was based on findings from previous studies (e.g., Berry et al. 2008; Gadema and Oglethorp 2011; Hartikainen et al. 2014).

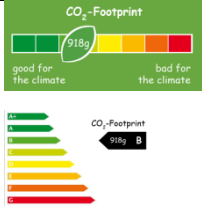

The carbon footprint level for the two labels was based on CO₂ equivalents of milk found by Fritsche et al. (2007).

Figure 1: Carbon labels tested in the online survey



The alternatives in the CE varied by five attributes: Claim of organic production with EU organic label, claim of local production, claim of climate-friendliness, carbon label and price (Table 2).

Table 2: Attributes and their levels in the choice experiments

Product attributes	Attribute levels
Carbon label	 No carbon label
Claim 'climate-friendly'	Yes/No
Claim 'local product'	Yes/No
Claim 'organic' with EU organic label 	Yes/No
Price (in relative price levels)	0.6/1.0/1.4

We tested three different price levels. In all study countries, the relative price levels were the same: 0.6, 1.0 and 1.4. The absolute prices used in the experiments were inferred from the average market price for 1 l of UHT milk in the study countries one month before the experiments were conducted. The average market price equals price level 1.0 (Table 3).

Table 3: Prices in the CE in all study countries*

Price levels	DE	ES	FR	IT	NO	UK
0.6	0.50EUR	0.59EUR	0.66EUR	0.73EUR	10.80NOK (1.12EUR)	0.43GBP (0.59EUR)
1.0	0.85EUR	0.99EUR	1.10EUR	1.21EUR	18.00NOK (1.87EUR)	0.71GBP (0.97EUR)
1.4	1.19EUR	1.39EUR	1.54EUR	1.69EUR	25.00NOK (2.60EUR)	1.00GBP (1.36EUR)

* Prices in Euro for Norway and UK are based on the exchange rates by the European Central Bank on the 6th of January 2016. DE = Germany, ES = Spain, FR = France, IT = Italy, NO = Norway, UK = United Kingdom

SPSS software was used to create an orthogonal fractional factorial design for the CE. The design resulted in 64 choice sets. We divided the sample into eight blocks. Eight choice sets within each block were shown to each participant in random order. Before the choice tasks, a short instruction was given to the participants: "Please imagine that you wish to purchase UHT-milk. In what follows, we will present you with 8 choice situations. Each choice situation corresponds to an individual shopping transaction. In each, please choose one milk product out of the three on offer by clicking on "buy". In each choice set, participants had to choose between three alternatives. We decided to use forced choice sets because milk is an everyday product. Given this, we assumed that consumers who intend to buy milk will not cancel the purchase because of the specific combination of attributes presented to them in a choice set.

The CE were analyzed with mixed logit models using the NLogit 5.0 software. All product attributes were modelled as random parameters and were assumed to be normally distributed with the exception of 'price'. A lognormal distribution was imposed on the price variable because this distribution results in more reasonable price estimates than a fixed price coefficient or a normal distribution (Hensher and Greene 2002; Meas et al. 2015; Revelt and Train 1998; Train and Weeks 2005). Halton draws with 100 to 1000 replications were used for the estimations. We considered repeated choice situations and allowed for correlation between the error components of different choice situations from a given individual. The WTP was calculated in WTP space since Hensher et al. (2015) found that this modelling approach results in more reasonable estimates of WTP than when the WTP is computed using ratios of parameters. Coefficients within each country model were compared with the Friedman test. Differences between country models were compared by using the Kruskal-Wallis-test.

5.1.3.3 Questionnaire

To collect additional information on consumers' attitudes and behavior, the CE were accompanied by a questionnaire. The questions focused on the attitudes towards the two tested carbon labels and on

climate-friendly behavior. A list of activities to tackle climate change was shown to the participants and they were asked to indicate which of those measures they would be willing to take. Attitudes towards the carbon labels were assessed by the degree of comprehensibility and the indicated trust in the shown labels. The comprehensibility of the two labels was explored by showing the labels to the participants and asking them to indicate on the basis of the following five statements which information they could derive from these labels:

- The effect of a product on the climate
- The power consumption of a product
- The healthiness of a product
- None of the above
- I don't know.

Additionally, we assessed participants' perception of responsibility to act against climate change. On a five-point Likert scale ranging from 'no responsibility' to 'very high responsibility', participants indicated which level of responsibility they ascribed to the government, the industry, non-governmental organizations (NGOs), to citizens in general, and to themselves. Differences between variables were calculated with the Wilcoxon signed-rank test.

5.1.3.4 Face-to-face interviews

In order to explore why the stated preferences identified in the CE frequently do not transfer in actual purchase behavior of climate-friendly food, we conducted face-to-face interviews. These interviews followed a semi-structured guideline and were conducted in May 2016 in France, Germany and UK. In total, 32 interviews took place, 11 in Germany (Brunswick) and UK (Edinburgh), respectively, and 10 in France (Paris). Each interview lasted for half an hour to an hour and was audio recorded.

Participants in Paris were randomly recruited from the street by students trained for the recruitment. In Brunswick and Edinburgh, participants were recruited by the researchers themselves by means of a snowball scheme. Participants had to be at least partially responsible for doing the grocery shopping in their household.

In total, 23 women and 9 men, 50% of whom had a university degree, participated in the interviews. Persons between the age of 18 and 30 and between 41 and 50 were the most prevalent in the sample. A summary of the sample characteristics is shown in Table 4.

Table 4: Sociodemographic characteristics of the interview sample (per country)

	DE	FR	UK
Female	7	7	9
Male	4	3	2
18-30	4	5	1
31-40	1	2	1
41-50	3	2	6
>50	3	1	3
Approx. 10 years of school attendance	2	0	0
12/13 years of school attendance	4	3	0
College or university degree	5	7	11
N	11	10	11

At the beginning of the qualitative interviews, consumers were tested for their knowledge of the impact of food production and consumption on climate change. Consumers were asked whom they consider primarily responsible for taking actions against climate change and why. Following this, participants were asked to give for their perception of climate-friendly food in particular with respect to organic and local production. Participants spoke about their interest in carbon labels. Afterwards, participants talked about barriers as well as incentives for climate-friendly food purchase behavior. In a next step, we explored participants' information needs with respect to the purchase of climate-friendly food.

The interviews were transcribed by native speakers. For the analysis of the transcripts, we used content analysis according to Mayring (2010) and the software MAXQDA software version 11. The basic unit of analysis was a word. The category system was developed beforehand in line with the findings of the survey. The system was pretested with 6 interviews - two for each country - and adjusted where necessary. Each text segment could be assigned to more than one category.

5.1.4 Results

This chapter first depicts the results of the CE, presenting consumer preferences and WTP for the different attributes. In the next step, consumers' willingness to take actions against climate change and their trust in the experimental carbon labels is discussed. Subsequently, the results of the face-to-face interviews with respect to knowledge and perception of climate-friendly food and carbon labels are presented.

5.1.4.1 Choice experiments: Consumer preferences and willingness to pay

Consumers' stated preferences and their WTP for the experimental carbon labels compared to a claim stating climate-friendliness and to organic as well as local production were analyzed with CE (Table 5). All significant mean coefficients of the tested product attributes except 'price' had a positive sign. This shows that all product attributes with the exception of 'price' had a positive impact on the purchase probability of milk. In line with economic theory, the parameter 'price' had a negative sign, highlighting that consumers were less willing to buy the product when the price increased.

Table 5: Estimates for consumers' marginal utilities in the 6 European study countries

	FR	DE	IT	NO	ES	UK
Random parameters						
CO2sc label	0.409 *	0.628 *	0.689 *	0.588 *	0.491 *	0.372 *
CO2en label	-0.014	0.096	0.206 *	-0.019	0.368 *	0.145 *
Climate-friendly claim	0.291 *	0.340 *	0.503 *	0.437 *	0.703 *	0.118 *
Organic indication	0.360 *	0.479 *	0.654 *	0.413 *	0.524 *	0.155 *
Local claim	0.656 *	0.936 *	0.773 *	0.840 *	0.461 *	0.706 *
Price	-1.906 *	-1.806 *	-0.766 *	-1.460 *	-1.939 *	-1.597 *
Model specifications						
Observations	7680	7808	7616	7680	7808	7744
Log likelihood	-5337.813	-5488.771	-5767.541	-4613.074	-5793.489	-5909.165
McFadden Pseudo R ²	0.367	0.360	0.311	0.453	0.325	0.305

Note: Significance on a 99%*. FR = France, DE = Germany, IT = Italy, NO = Norway, ES = Spain, UK = United Kingdom.

Local production was preferred over all other tested attributes in the study countries with the exception of Spain, where the climate-friendly claim was the most preferred attribute (Friedman test $p < 0.001$). The positive coefficients for the two carbon labels suggest that climate-friendly labelled milk is more likely to be chosen than milk not declared to be climate-friendly in the investigated countries. In all study countries, the mean coefficients for CO2sc were significantly higher than those for CO2en (Friedman test $p < 0.001$) indicating that consumers preferred the CO2sc label to the CO2en label. Except in the UK the climate-friendly claim was preferred over CO2en in all study countries. Purchase probability also increased for organic milk. In France, Italy and Spain, preferences for the CO2sc label and organic production were similar. Interestingly, in Germany, Norway and UK the CO2sc label was preferred over organic production (Friedman test $p < 0.001$).

The presented preferences were reflected in consumers' WTP to a certain extent. When comparing all tested product attributes, with the exception of Spain, consumers were willing to pay the highest price premium for locally produced products (Table 6). The price premiums for local production var-

ied between 14% in Norway to 24% in Germany compared to the average market price. In Spain, WTP for local and organic production as well as for the indication of a claim signaling climate-friendliness did not differ significantly. Thus, Spanish participants were prepared to pay similar prices for these three attributes and comparatively less for the two carbon labels (Friedman test $p < 0.001$).

Table 6: Estimates of consumers' willingness to pay in Euro per 1 l UHT-Milk

	FR	DE	IT	NO	ES	UK
Random parameters						
CO ₂ sc label	0.11 *	0.13 *	0.24 *	0.14 *	0.14 *	0.10 *
CO ₂ en label	0.03 *	0.03 *	0.09 *	0.00	0.11 *	0.06 *
Climate-friendly claim	0.06 *	0.05 *	0.14 *	0.09 *	0.15 *	0.04 *
Organic indication	0.12 *	0.10 *	0.23 *	0.14 *	0.16 *	0.09 *
Local claim	0.19 *	0.20 *	0.27 *	0.27 *	0.15 *	0.15 *

Note: Significance on a 99% level*. FR = France, DE = Germany, IT = Italy, NO = Norway, ES = Spain, UK = United Kingdom.

Consumers were willing to pay a price premium for climate-friendly labeled food in all study countries. Of all three explicit indications of climate-friendliness, consumers were willing to pay the highest price premium for the CO₂sc label, followed by the claim and the CO₂en label (Friedman test $p < 0.001$). Price premiums for the CO₂sc label compared to the average market price for milk ranged between 7% (€0.14) in Norway and 20% (€0.24) in Italy. The claim indicating climate-friendliness reached higher price premiums compared to the CO₂en label (Friedman test $p < 0.001$) in all countries except for the UK.

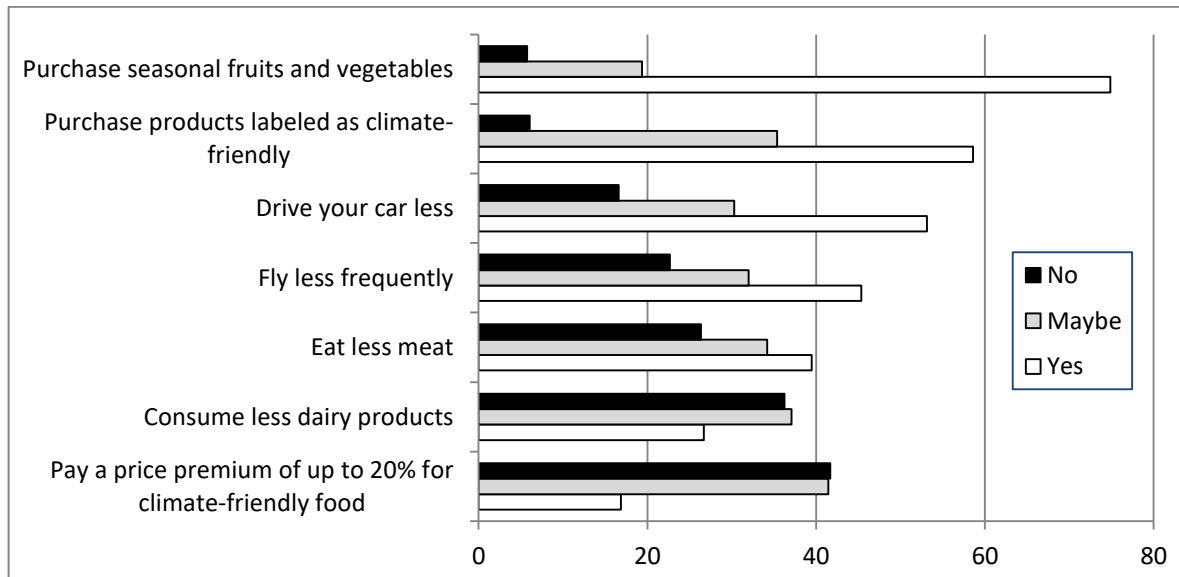
In France, Italy, Norway and the UK, participants revealed a similar WTP for the CO₂sc label and organic production. Price premiums for the CO₂sc label and organic production in the four countries ranged between 7% in Norway and 20% in Italy. The German participants were willing to pay a price premium of 15% (€0.13) for the CO₂sc label and a premium of 12% (€0.10) for organic production compared to the average market price. It is noteworthy that the stated WTP for organic milk was lower than the average price premium for 1 l of organic UHT-milk at that time in all study countries with the exception of Italy. For example, in Germany the stated WTP for organic milk was 8% lower than the average retail premium.

5.1.4.2 Questionnaire: Activities to tackle climate change, trust in experimental carbon labels

After the CE, participants were asked a series of questions related to their willingness to tackle climate change and their perception of the two experimental carbon labels. Participants were willing to tackle climate change predominantly by purchasing seasonal vegetables and fruits, followed by buy-

ing climate-friendly products in general (Figure 2). They were the least willing to consume fewer dairy products or pay a price premium of up to 20% for climate-friendly food.

Figure 2: Participants' willingness to undertake suggested activities in order to tackle climate change (%)



Question: Which of the following steps would you personally take in order to tackle climate change?

Of the two tested carbon labels, the CO₂sc was the more trusted and the more comprehensible one. As could be expected, the CO₂en label was more often wrongly interpreted as indicating the power consumption of a product because it was mistaken for the European energy label. Nearly half of the participants perceived governments and industry as highly responsible for tackling climate change whereas citizens and the individual participant were presumed to have a medium responsibility. NGOs were perceived as the least responsible group.

5.1.4.3 Face-to-face interviews: Knowledge and information

The results of the questionnaire and the CE point out that European consumers valued food that is labeled as climate-friendly. But, market experience shows that these preferences are frequently not translated into actual purchase behavior. The face-to-face interviews explored the reasons for this. Additionally, the interviews attempted to obtain a deeper understanding of consumers' knowledge of climate change and climate-friendly food as well as resulting information needs in order to develop recommendations for the support of climate-friendly food consumption.

5.1.4.3.1 Knowledge about the climatic impact of food production and consumption

Our interview results show that participants had a general idea of how food production and consumption have an impact on climate change, but struggled to connect climate change with their everyday life. When they were asked how food production and consumption affect climate change, par-

Participants frequently stated that the emissions resulting from global food trade and from the production process itself exacerbated climate change. Deforestation caused by agriculture was another aspect mentioned. A few participants pointed out that livestock farming had an impact on climate change because of the climate-damaging gases emitted by, for example, cows. Accordingly, the reduction of meat consumption would be beneficial for the climate. Other food specific measures mentioned were the avoidance of food waste and in this context the reduction of overproduction.

Participants had difficulties separating climate change from other environmental and ethical topics. They tended to subsume climate change and related issues under the umbrella of environmental and ethical issues. When asked which measures could be undertaken to combat climate change, some participants spoke not only about directly climate related topics, but also about measures they undertook for the environment, to foster animal welfare and about fair trade. One common topic in this respect was the engagement in activities for an efficient use of resources (e.g., wearing second hand clothes). Especially in France and the UK recycling emerged as a solution for climate change, whereas it was not mentioned in Germany.

In line with the basic to vague knowledge about the impact of food production and consumption on climate change, people often lacked a concrete idea of what climate-friendly food means. Frequently, participants started to develop ideas about the term when asked if they bought climate-friendly food:

"Probably if the product is grown naturally – meaning not in a greenhouse. Is this correct?" (DE, Participant 2, female).

Climate-friendly food was associated with local production and sometimes also with seasonal production. Local production was mostly associated with a more climate-friendly production due to shorter transport distances. However, some participants argued that local products are not particularly climate-friendly as long as they are produced conventionally. Some participants related organic to climate-friendly food. It was reasoned that the ban of artificial pesticides and fertilizers made organic products more climate-friendly. Others stated that they had no clear idea of whether organic goods are more climate-friendly than conventional products. Part of the participants doubted the climate-friendliness of organic food due to potentially long transport distances and large-scale production.

5.1.4.3.2 Information and labels

Labels for climate-friendly products were mostly unknown even though the UK retailer 'Tesco' had a carbon label before it started to phase it out in 2012 and the French retailer 'Casino' still has a carbon footprint label on their own products. Many participants said that information about climate-friendly

food was scarce or not to be found at all and that they needed more information in order to consider buying climate-friendly food. Accordingly, climate-friendliness was often not the main reason for preferring certain products over others but rather a positive side-effect. In line with this, some participants stated that they would not be willing to pay a price premium for climate-friendly food.

Some participants were skeptical about the sustainability information offered because they perceived it as greenwashing. Others felt overwhelmed by the product information already offered and were not inclined to consider, for example, another label in their purchase decision. Others were generally in favor of more information. Thus, the interviewees were indecisive as to whether too much or too little information about climate-friendly behavior and climate-friendly food consumption in particular was available:

"Well, if I would start to look for information about climate-friendly food I would certainly find enough. But having a label would still be beneficial. But then eventually there will be too many labels to consider climate-friendliness in the purchase decision" (DE, Participant 1, male).

Given these contradictory views, participants tended to prefer to have more information about climate-friendly food - but only to have the information at hand when they needed it, but not in order to consider this information in their everyday choices. The information was perceived as an assurance for an ethically acceptable production on which consumers wanted to rely instead of scrutinizing the actual ethical justifiability of a product on an everyday basis. According to the interviewees, the information should be practical and enabling, such as advice about how to integrate climate-friendly behavior in everyday life. Additionally, the information should be concise, comprehensible, reliable and readily available. In this context, a carbon label was welcomed but not perceived as absolutely needed, and some participants even doubted that they would use such a label.

5.1.4.3.3 Perceived responsibility to tackle climate change

The analysis of the interviews confirmed that participants perceived the government as one of the primary responsible agents for acting against climate change. Reasons stated are the organizational as well as financial capacities of the government. Participants reasoned that the government would be able to initiate collective actions which would be more effective than individually undertaken measures. Furthermore, participants said that the government as the representative of the people has an obligation to act.

In line with the results of the questionnaire, the industry and particularly retailers were mentioned as other responsible parties for tackling climate change. Some participants said that the industry had to do their share and even take a pioneering role. Sometimes it was suggested that retailers should use

their influence on the market to provide affordable climate-friendly food. But in general, participants tended to focus more on the responsibility of the society as a whole. A typical statement was:

"Everyone is responsible, everyone without exception" (DE, Participant 10, male).

5.1.5 Discussion

The results of the survey and the interviews confirm European consumers' general interest in climate-friendly behavior. In both research steps participants welcomed carbon labels on foods. In the CE, consumers were willing to pay a price premium of up to 20% for products showing an explicit indication of climate-friendliness. Of the two tested carbon labels, the one showing a horizontal scale (CO₂sc) was clearly preferred over the one inspired by the EU energy label (CO₂en). The CO₂sc label was more comprehensible and more frequently trusted. Consumers in all study countries were willing to pay higher price premiums for the CO₂sc label than for the CO₂en label and the claim.

However, our study stresses that climate change is less important to consumers than other environmental, personal and social issues (see also Hartikainen et al. 2014; Lorenzoni and Pidgeon 2006). In most of the study countries, consumers considered local production as particularly important and they were willing to pay higher price premiums for such products than for climate indications and organic production. These findings underline the growing popularity of locally sourced food (Darby et al. 2008; Feldmann and Hamm 2015; Meas et al. 2015; Zepeda et al. 2006). In four of the six study countries, the WTP for the CO₂sc label and organic production was similar. This highlights on the one hand that 'organic' as product attribute might have become more commonplace and lost some of its uniqueness to consumers (see also Janßen and Langen 2017), whereas consumers are curious about a carbon label. On the other hand, this result suggests potential substitution effects between the shown carbon labels and the attributes 'local' and 'organic production'. Lombardi et al. (2017) found that after informing consumers about climate change issues the utility of carbon free milk increased while the utility of organic milk decreased. Onozaka and Mc Fadden (2011) and Akaichi et al. (2017) showed that carbon labelling is complementary to the indication of local sourcing. Participants in both studies were more reluctant to purchase local products if they displayed a high carbon footprint. But Janßen and Langen (2017) pointed out that the relationship between these sustainability labels depends on the consumer segment and might only be relevant to a small group of consumers particularly sensitive to sustainability issues.

The interviews show that consumers had problems defining and identifying climate-friendly food. This might be another reason for consumers to prefer local and organic production over any explicit climate indications. Consumers were more familiar to the term 'local' and to the organic logo as both

are actually more present in the market. Moreover, consumers associated more ethical and personal benefits with the attributes 'organic' and 'local' than with indications of climate-friendliness (Röös and Tjärnemo 2011; White et al. 2009). Consumers associated local production with the benefits of sustaining local farmland and contributing to the local economy as well as healthiness (Onozaka and McFadden 2011; Darby et al. 2008; Feldmann and Hamm 2015).

Combining the results of the preferences for carbon labels, local and organic production with the findings of the interviews shows that participants tended to subsume climate indications together with the attributes 'local' and 'organic production' under the umbrella term 'eco-friendly behavior'. Consumers paid more attention to more 'general' green and ethical goals than to climate change in particular (see also De Boer et al. 2016; Hartikainen et al. 2014). The carbon footprint is one aspect of many environmental and ethical criteria which many consumers are unlikely to differentiate in detail. Some consumers just preferred products with one or more sustainability labels without any further differentiation (see also Janßen and Langen 2017).

Consumers' problems in defining climate-friendly food are also an indication for their lack of knowledge about climate-friendly engagement and their difficulties in connecting the complex issue of climate change to their everyday life (see also Berry et al. 2008; Lorenzoni and Pidgeon 2006; Upham and Bleda 2009). Consumers felt that they were not knowledgeable enough about their options to act in a climate-friendly manner (see also Beattie and Sale 2009; Gadema and Oglethorpe 2011; Hartikainen et al. 2014). Some demanded more practical and concise information. In this context, they also welcomed the introduction of a carbon label. But participants also stressed the existing information overflow as well as label fatigue and skepticism. Therefore, information should be available but will not necessarily be considered in everyday choices. In our study, some of the interviewees doubted that they would pay attention to carbon labels even though they generally appreciated the presence of such information. Thus, a substantial use of carbon labels by consumers is questionable (see also Grunert et al. 2014; Hartikainen et al. 2014; Upham et al. 2011).

Consumers clearly expected policy makers to provide a favorable environment for climate-friendly behavior and also suggested that retailers should support consumers in making climate-friendly choices. This result shows that consumers are well aware of their limits of action in dealing with such a complex and wide-ranging issue as climate change. Climate change is perceived as a challenge which has to be addressed collectively (see also Lorenzoni et al. 2007). This is well in line with other studies which point out that the political sphere and the economic sector also have to address climate change in order to successfully reduce its negative impacts (e.g., Berry et al. 2008; Gadema and Oglethorpe 2011; Seyfang 2005).

5.1.6 Conclusions

Our study shows that consumers are interested in and concerned about climate change and are also willing to engage in actions against climate change. The results suggest that carbon labels are preferred over a claim stating climate-friendliness and that the CO₂sc label might be an appropriate design. When aiming at fostering climate-friendly consumption with the introduction of a carbon label, various aspects have to be taken into account: First, the introduction of just one reliable carbon label is advisable. Second, this label needs to be easy to comprehend for consumers and third, it has to be well communicated.

But the contribution of a carbon label to a more climate-friendly consumption will be limited for several reasons. Due to a lack of knowledge and problem awareness, consumers might be overburdened with respect to climate-friendly buying decisions. They tend to subsume climate-friendliness under the umbrella terms 'eco-friendly' and 'ethical behavior'. This makes it unlikely that a noticeable fraction of consumers will actively consider carbon labels when making purchase decisions, also in trade-off with local and organic production.

Nevertheless, there are also indirect effects of consumer labels which can be quite effective: Retailers might adjust their sourcing policies by requiring carbon footprint labeling and removing products with particularly high carbon values within a product category (e.g., Berry et al. 2008; WB 2011). One excellent example is the sustainability label of the MSC (Marine Stewardship Council) for wild fish. In Germany, the largest fraction of frozen fish is labelled with the MSC logo and many retailers committed themselves to phase out wild fish products without a sustainability label, although consumer knowledge is limited (Zander et al. 2015).

Our results underline the limits of climate-friendly consumer behavior. Labeling can be just one part of a broader concept to promote lifestyle changes and public acceptance (Berry et al. 2008; Gadema and Oglethorpe 2011; Prieß 2011; Whitmarsh 2009; Whitmarsh et al. 2011). Other options might for example be nudging solutions like a dedicated space for climate-friendly food in supermarkets and the positioning of climate-friendly food on eye-level. Nudges have the advantage that they help people to act in line with a desired behavior without taking away their choice options (Thaler and Sunstein 2009).

Given that the mitigation of climate change is a societal and political aim, policy makers are challenged to set proper structures to foster climate-friendly behavior not only at the consumer but also at the industry level. Options at the consumer level are, for example, information campaigns or the inclusion of climate-friendly behavior in formal education. Measures targeting the industry would be, e.g., taxes on foods and other products with a particularly high carbon footprint. These activities

should consider the broader context of environmental and general ethical issues in order to facilitate uptake and to avoid potential negative effects resulting from standalone actions.

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5.2 Of earth ponds, flow-through and closed recirculation systems — German consumers' understanding of sustainable aquaculture and its communication

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5.2.1 Abstract

Although aquaculture can have various positive effects, it is also criticized for its potentially negative impacts on the environment and for its consequences on fish welfare. One solution to these problems and a promising development track for the German aquaculture sector is the promotion of sustainable production methods. The establishment of a new market segment for domestic, sustainable fish from aquaculture would suit the trend towards ethical consumerism. Thus far, only little is known about the consumers' knowledge and perception of different production methods used in aquaculture especially in comparison to each other. Against this background, the present contribution aims to explore perceptions and knowledge of German consumers with regard to sustainable aquaculture, its production systems, related labels, and communication messages. Focus groups were used to obtain insight into the multitude of consumers' perceptions. One result is that consumers, even though they had little knowledge of aquaculture, often had a limited need for information about aquaculture. For the most part, they were unaware of potential problems resulting from aquaculture. However, they had some clear expectations on sustainable aquaculture. The use of drugs (e.g. antibiotics) should be minimized; production systems should be near-natural and should respect fish welfare. Earth ponds were the most desirable of the presented production systems. Participants were mostly unfamiliar with existing labeling schemes and found the presented communication messages too vague and/or too complex. They wanted to rely on the aquaculture industry to comply with sustainable standards. Our results leave the aquaculture sector with the task of communicating sustainable aquaculture in a reliable and comprehensible manner to consumers. Thus far, consumers who are generally interested in sustainability issues seem to prefer organic aquaculture products to products from other forms of sustainable aquaculture.

Keywords: Aquaculture, Fish farming, Sustainability, Consumer behavior, Label, Organic aquaculture

5.2.2 Introduction

Currently, aquaculture is one of the fastest-growing food-producing sectors globally (FAO, 2012). From 1980 to 2010 world production of farmed fish has increased nearly 12-fold with an average annual growth of 8.8% (FAO 2012), whereas capture fisheries production has remained constant. As the global demand for seafood also rises, hopes that aquaculture might contribute to global food security while simultaneously reducing the pressure on wild fish stocks are also rising (Swaminathan 2012). Yet these hopes involve some problems, which have to be faced by the aquaculture industry in order to continue to grow and prosper. As several studies have pointed out (Subasinghe et al. 2012; Jacobs et al. 2002; Naylor et al. 2000; Olesen et al. 2011), the rapid expansion of aquaculture has entailed and can entail ecological and social problems as well as potential health risks for consumers.

Thus far the German aquaculture sector has not made a contribution to increasing worldwide production. Nearly 90% of the fish consumed in Germany are imported (FIZ 2013). German aquaculture competes with production from countries which have lower labor costs and in many cases lower environmental standards. That is why the German aquaculture sector has to develop high price market segments in order to grow. A promising development track for the German aquaculture sector could be an improved and more focused communication of its sustainable production methods. The advancement of a market segment for domestic, sustainable fish would suit the trend towards ethical consumerism in Germany (Lasner 2011). Moreover, parts of German aquaculture might meet the requirements for sustainable production easily because many of the German fish farms are semi-extensive (not intensive) and work with near-natural systems (e.g. earth ponds) (DESTATIS 2013). Sustainability is defined as integrating the three dimensions of environmental, social and economic development (WCED 1987) and has been extended to include animal welfare considerations.

Various studies (e.g. Jaffry et al. 2004; Olesen et al. 2010; Verbeke et al. 2007a; Whitmarsh and Palmieri 2011) have found that to some consumers sustainability and fish welfare are important additional values. In this context, implementing sustainable practices supposedly provides an opportunity for product differentiation on the market (Mauracher et al. 2013). Sustainable aquaculture does match the demand of a particular consumer segment that appreciates additional ethical values of products by simultaneously tackling potential negative implications of conventional aquaculture (see also Altintzoglou et al. 2010a; Lasner 2011).

The question of how to best communicate sustainable production to consumers still has to be answered. To date, labeling is the most frequently used approach. Different initiatives for labeling sustainable aquaculture products exist on the German market. The most common are eco-labels, such

as 'Naturland' (an organic farmers' association, which has certified organic fish since the 1990s), the EU organic logo (in accordance with the EU Regulation on 'Organic production and labeling of organic products', EC 834/2007 since 2010 for aquaculture products) and the national organic logo (the German Biosiegel also since 2010 for aquaculture products). Additionally, some other company and third party labels, which also refer to sustainable aquaculture, exist on the German market. The ASC label ('Aquaculture Stewardship Council') is one recent example of a third party labeling scheme for sustainable aquaculture products. It was introduced in 2012 to the German market.

Labeling is a market-based instrument, which aims at providing selected information in a condensed manner in order to influence consumers' product perception, evaluation and purchase decision (Thøgersen et al. 2010). Labels have an impact on consumers' purchase decision if consumers are aware of, comprehend and approve them (Janssen and Hamm 2011). Labels are particularly important for products which consumers cannot easily make a quality assessment. Thus, labels often serve as quality indicator for consumers (Verbeke et al. 2007a). Labels are also needed to indicate product properties which consumers can neither observe nor verify, such as specific production methods. These properties are called credence attributes. Labels have the potential to convert credence attributes into search cues (Albersmeier et al. 2010; Kalshoven and Meijboom 2013). However, the applied standards have to be credible to and comply with consumers' expectations.

Although some research does exist on sustainability in fish production in general, thus far only little is known about consumers' knowledge and perception of sustainability in aquaculture and about promising ways of communicating these sustainable practices to consumers. The aim of this contribution is to close this gap by exploring perceptions and knowledge of German consumers with regard to sustainable aquaculture, its production systems and corresponding labels as well as communication messages. From these findings we make recommendations for an improved communication of sustainable aquaculture and its products to consumers.

5.2.3 Methodological approach

In this exploratory research, we used the methodological approach of focus groups. Focus groups are loosely-structured interactive discussions among a small group of respondents (6–12), headed by a trained facilitator. The strength of this technique lies in discovering the unexpected, which may result from a free-flowing group discussion. Focus groups offer the opportunity to gain deeper insights into consumers' perceptions by letting them exchange thoughts and opinions in a dynamic manner (Blank 2007; Halkier 2010; Wilson 1997). The discussions in focus groups stimulate the expression of individual opinions by actively building on social interaction and avoiding predefined variables (Halkier 2010). In this manner, individual opinions are more likely to become transparent in focus groups than

in standardized interviews in isolated environments (Finch and Lewis 2003). The prevailing range of opinions, perceptions, and preferences regarding an issue can be assessed (Ryan et al. 2014). Indeed, due to the openness of the method, the exploration of future research questions is facilitated. Focus groups can elicit relevant variables for subsequent quantitative steps (Rabiee 2004).




We conducted 6 focus groups each consisting of 7 to 12 participants in three German cities (Stuttgart, Leipzig and Hamburg) in April 2013. Participants were recruited by means of a representative online access panel run by a commercial market research agency. Quota sampling was used with respect to age and employment:

- 50% of the participants needed to be aged 20 to 45 and the other half 46 to 70,
- a minimum of 33% and a maximum of 80% of the participants had to work part- or full-time,
- no employment in agriculture, fisheries, food industry and market research.

Additionally, all participants purchased fish at least once a month. Three groups consisted of consumers who almost exclusively buy conventional food, whereas the other three groups were composed of consumers who stated that they also buy organic food. Consumers were classified as buying organic if they purchased organic food at least once a week. According to Sanders (2013) about 41% of all German consumers belong to this group. In total 56 people participated, half of whom were organic food consumers.

Each focus group discussion lasted one to one and a half hours and followed a thematic guideline. Participants were asked about their understanding of sustainable aquaculture. Afterwards, they were informed about three production methods prevalent in Germany (earth pond, flow-through system and closed recirculation system) within the focus groups (Figure 3).

Figure 3: Information given to the participants about the presented production methods

Earth ponds	Flow-through systems	Closed recirculation systems
 <p data-bbox="328 510 459 533">Lehmann 2007</p>	 <p data-bbox="738 510 847 533">Feucht 2013</p>	 <p data-bbox="1126 510 1262 533">Klinkhardt 2012</p>
<p data-bbox="201 555 585 674">Mainly farming of carp and small numbers of accompanying fish, such as tench, zander, pike & cat fish</p> <p data-bbox="201 680 427 710">Near-natural system</p> <p data-bbox="201 714 408 743">Small stocking rate</p> <p data-bbox="201 748 555 777">Seasonal variation in production</p> <p data-bbox="201 781 440 810">High demand for land</p>	<p data-bbox="611 555 973 613">Farming of trout, salmon trout and samlet</p> <p data-bbox="611 618 831 647">High water demand</p> <p data-bbox="611 651 810 680">High stocking rate</p> <p data-bbox="611 685 815 714">Feeding necessary</p> <p data-bbox="611 719 847 748">Low demand for land</p>	<p data-bbox="999 555 1390 613">Farming of thermophile fish – wide variety of fish</p> <p data-bbox="999 618 1235 647">No use of medication</p> <p data-bbox="999 651 1390 748">No environmental pollution through discharged substances (e.g. feed remains, excrements)</p> <p data-bbox="999 752 1230 781">High energy demand</p> <p data-bbox="999 786 1251 815">Very high stocking rate</p> <p data-bbox="999 819 1203 848">Feeding necessary</p> <p data-bbox="999 853 1390 902">Alternative: Production in Tropics and Subtropics</p>

Based on this information, they discussed their attitudes towards the presented systems. Next, the participants were exposed to five different communication messages:

- Near-natural production
- Plenty of room to move
- Minimal drug usage
- No environmental pollution through nutrient run-off
- Minimal usage of fish meal and fish oil in order to protect the oceans.

These messages had previously been identified on fish packages. They were selected because they cover different aspects of sustainability and are characteristic for the packages on the German market. They displayed various levels of abstraction and demanded different degrees of previous knowledge. The participants were asked to argue about the purchase relevance of these messages.

Afterwards, we showed the participants the five most prominent sustainability labels for products from aquaculture on the German market: the three labels indicating organic production (EU organic logo, 'Naturland', 'Bio-Siegel'), the company label of Femeg 'zertifiziert kontrolliert nachhaltige Fischzucht' ('certified controlled sustainable fish farming'), and the label of the non-governmental organization World Wild Fund for Nature (WWF) (Figure 4). Even though the WWF-label does not indicate a certification scheme, it was considered in the study. It is frequently used on fish packages to indicate sustainable production. The German supermarket chain EDEKA actively communicates "its partnership with the WWF for sustainability" (EDEKA 2014). Additionally, we showed the ASC-label ('Aquaculture Stewardship Council') which by then had been newly introduced to the German market. It

was listed because the food industry expects it to become an important sustainability label. All labels were presented on a slide at the same time and in the same constellation as shown in figure 4.

Figure 4: Labels shown to the participants of the focus groups



This study did not attempt to assess the objective sustainability of the labels shown to the participants, as it focused on consumers' perceptions and evaluations of sustainability claims and of related labels on aquaculture products. The products had to be perceived by consumers as being sustainable. The participants were asked whether they had seen any of these labels on fish products before. Finally, participants discussed their information requirements regarding products from aquaculture.

All sessions were audio- and videotaped and transcribed for qualitative analysis. We used content analysis according to Mayring (2010) and the program MAXQDA version 10 to analyze the transcripts. This approach is based on the development of a category system in order to analyze participants' statements of the topic under question. The basic unit of analysis was a word. The categories were not specified beforehand, but were developed inductively in accordance with the text material. This also allowed investigation of unexpected aspects. Each text fragment could be assigned to more than one category. The identified categories were divided in main and sub-categories, such as 'Expectations of sustainable aquaculture' (main category) and 'Near-natural and environmentally aware production' (sub-category). For some research questions, the categories were compiled into code families. For instance, the code family 'Recognition of sustainability labels' was compiled from the main categories 'Skepticism towards labels', 'Label' and 'Purchase relevance of labels'. The transcripts were categorized by a single researcher. In order to ensure the reliability of the established category system, a second researcher analyzed parts of the transcripts again. For the comparison a part of a focus group with organic consumers and a part of a session with consumers of conventional food were randomly selected. The two analyses were compared and the category system was adjusted where necessary.

5.2.4 Results and discussion

We start by outlining the participants' expectations of sustainable aquaculture. This part is divided into 5 subsections reflecting the different aspects participants related to sustainable aquaculture. Next, the attitudes of participants towards different production methods are shown. Then we look at how the participants perceived the presented communication messages. Afterwards, we discuss the participants' knowledge of the most prevalent sustainability labels. Finally, we point out further information needs of consumers regarding sustainable aquaculture.

5.2.4.1 Expectations of sustainable aquaculture

5.2.4.1.1 Near-natural and environmentally aware production

Participants of the focus groups perceived sustainable aquaculture as a natural way of production which respects the environment. A sustainable fish farm should have natural and esthetical surroundings, which would also please a layperson's eye. It should respect and actively support nature conservation, for example, by rearing fish for release to the wild. Some participants conjectured that sustainable aquaculture should consider the environmental impact of the complete value chain from production inputs to the consumers (cradle-to-grave approach). Fish feed was expected to be sustainable and species-appropriate.

Some participants judged the use of fish meal and fish oil as unsustainable and occasionally associated it with cannibalism. Several participants also feared that feeding animal products to fish might promote the development of illnesses similar to bovine spongiform encephalopathy (BSE) in fish. Consumers also associated natural food production with their personal health since they perceived naturally produced fish to be healthier. "Unnatural" practices are only accepted if they serve consumers' well-being. These results are in line with earlier research (e.g. Macnaghten 2004; Schlag 2010). The desire for authenticity and naturalness was present through all the group sessions. According to Macnaghten (2004), idealizing nature helps people to deal with their fast and complex everyday lives. Thus, naturalness was not only requested for altruistic reasons. Instead, among other things, it was, related to better taste:

"Fish from aquaculture is not like the original fish. Its feed, its behavior and its whole life is different." (Leipzig, Participant 2, female, conventional food consumer) - *"Therefore farmed fish does not have the right taste. Nature creates taste"* (Leipzig, Participant 3, female, conventional food consumer).

5.2.4.1.2 Fish welfare and size of fish farm

Another criterion for sustainable aquaculture was fish welfare. *"The exploitation of fish [...]"* (Hamburg, Participant 5, male, conventional food consumer) should be avoided in sustainable aquacul-

ture. The animals should be allowed to mature in accordance with their natural rhythm, for example without the influence of growth-promoting hormones. A farmed fish's life should be free of stress and pain. A species-appropriate design of the sites, such as sand on the ground to allow dabbling or sufficient space for each fish, was demanded by some participants:

“Fish should have enough space to roam freely and not be penned up like chickens” (Hamburg, Participant2, male, conventional food consumer).

Some of the participants assumed that fish would taste better if they were reared in accordance with their natural requirements. Hence, they perceived fish welfare as an indication of quality (see also Solgaard and Yang 2011). Hughner et al. (2007) came to a similar conclusion for animal welfare in relation to the quality of organic food. The majority of participants expected sustainable fish farms to be small to medium sized. Large dimensions were mostly associated with industrial livestock farming and perceived as not being desirable for and contradictory to sustainable aquaculture.

5.2.4.1.3 Minimal use of medication

The use of drugs (e.g., antibiotics) in fish farming was a highly discussed subject in the focus groups. Some participants were unaware of the fact that farmed fish is treated with medicine, if necessary. The use of medication contradicted their image of fish as a natural and healthy product. Altogether, the utilization of drugs, hormones and other artificial additives was linked with health risks for consumers as well as for the environment:

“I don't want drugs in my food, if I need drugs, I visit a doctor” (Hamburg, Participant 1, male, organic food consumer).

Thus, most of the participants expected sustainable aquaculture to restrain from drug usage to the greatest possible extent and to work without artificial additives (see also Aarset et al. 2004). Only a few participants approved the use of medication to treat sick fish.

5.2.4.1.4 Production according to organic standards

Even though the moderator of the focus groups did not explicitly mention organic aquaculture, the subject was brought up by participants in each discussion. Organic aquaculture primarily had a positive image. Many participants even perceived organic fish farming as the ideal aquaculture practice. Thus, some of them expected sustainable aquaculture to follow organic standards. The characteristics participants ascribed to organic aquaculture primarily conformed to current organic aquaculture practice. Obviously, the participants inferred from their knowledge of other organic food production to organic fish production. Participants imagined organic fish farming as natural combining eco-friendliness with fish welfare:

"[...] organic, the fish is happy [...]" (Hamburg, Participant 3, female, conventional food consumer).

Other traits of organic aquaculture mentioned by participants were the exclusive breeding of native fish species and the renunciation of drug usage, especially antibiotics. Some participants referred to organic aquaculture as a practice that is eco-friendly in a holistic manner. Furthermore, it was interpreted to be more traditional, meaning less industrialized, by several of the participants.

A large number of the participants did not clearly distinguish between sustainable and organic aquaculture. Some of them mixed the two terms and used them synonymously. Whereas, 'sustainability' was perceived as a vague term with an unclear definition for most of the consumers, the term 'organic' was familiar to the majority (see also Hughner et al. 2007; Zander and Zanoli 2013). They often knew it from products other than fish. Some of the organic consumers participating knew that a clear regulatory framework defining the term 'organic' exists. Some participants used 'organic' as a heuristic for naturalness (see also Aarset et al. 2004). Overall, the groups of organic and conventional consumers hardly differed in their perception and knowledge of sustainable and organic aquaculture.

5.2.4.1.5 Geographical origin

A further aspect of sustainable aquaculture was geographical origin. Some participants argued in favor of European products instead of products from overseas. They assumed that food monitoring was more rigid in Europe than in non-European countries, even though their trust in European control bodies was affected by recent food scandals. The participants especially doubted the quality of aquaculture products from Asian countries. Referring to negative media coverage some participants stated that they worried about the supposedly excessive use of antibiotics and unhygienic conditions in Asian fish farms:

"If you see those reports from Asia: So many of these dirty, overcrowded ponds and antibiotics by the bucket — that just does not work for me" (Hamburg, Participant 4, female, organic food consumer).

These findings confirm that the indication of European origin and quality control can have a positive effect on the perception of farmed fish (Altintzoglou et al. 2010a). Indeed, according to Claret et al. (2012) and Verbeke and Ward (2006), country of origin is often used as an indication of quality by consumers. In fact, the image of a country can have a positive or negative effect on the interest in a product (Claret et al. 2012). Some of the participants stated that the energy balance of local and European products might be better than of those from other continents. They argued that local and European products might need fewer resources and consume less energy to farm fish in some cases. Participants associated longer distances with higher environmental impact, e.g. higher carbon footprint, whereas shorter transport routes were related to improved freshness (see also Mauracher et al. 2013).

Some participants especially approved of German aquaculture products, because they wanted to support the local economy. Reasons for this might be the gratification gained from altruistic behavior and/or ethnocentrism (Claret et al. 2012; Mauracher et al. 2013). Others, in turn, found that the aquaculture sector in other countries would also be worthy of support as long as good working conditions exist. Apart from that, some participants assumed that local products are sustainable if they made use of indigenous fish species. They argued that the rearing of adventitious fish species could threaten the ecological balance. Some participants also conjectured that the farming of subtropical and tropical fish species in Germany might be very energy intensive and therefore unsustainable.

5.2.4.2 Attitudes towards different production methods

During the focus group discussions, the participants were informed about three production methods used in German aquaculture (Figure 3) and asked about their attitudes towards these systems. Many participants were familiar with earth ponds and flow-through systems whereas closed recirculation systems (RAS) were mostly unknown. Earth ponds were often considered to be the most desirable of the three production methods presented. The visual appearance of earth ponds as well as the description of the system were closest to the participant's expectations of a sustainable aquaculture.

“To me, the earth pond appears to be the most consumer-friendly and fish-friendly as well as the most natural, likable and eco-friendly method” (Stuttgart, Participant 2, female, organic food consumer).

Fish farmed in earth ponds were put on a level with ‘happy’ free-range chickens from organic farms. From the point of view of most of the participants, the naturalness of earth ponds outweighed their low control degree compared to more highly engineered systems. Participants inferred a low disease pressure from the low stocking rate in earth ponds. This argument led to the conclusion that drugs are rarely needed in this system, which in turn led some participants to conclude that fish from earth ponds would not constitute a threat to the health of consumers.

In support of their preference for earth ponds and flow-through systems, participants pointed out that the fish are kept outdoors. Thus, the fish *“[...] get fresh air [...]”* (Leipzig, Participant 1, female, conventional food consumer). Participants also appreciated the lower stocking rates in earth ponds and flow-through systems in contrast to those in RAS. Nonetheless, some participants were skeptical about the high stocking rates in flow-through systems. They were concerned about the stress level of the fish and their options to behave naturally. Apart from that, participants criticized the lower control degree in flow-through systems compared to RAS. Flow-through systems were regarded as near-natural if the vicinity of the sites was vegetated. Without vegetation the approval for this production method was lower. The participants perceived flow-through systems as an intermediate stage be-

tween earth ponds and RAS. In sum, most of the participants accepted flow-through systems as long as general aquaculture legislation was respected.

Many of the participants perceived RAS as the most industrialized and most unnatural method of all those presented. Some were unaware that these systems are already in operation in Germany. Many participants were alienated by this method and considered it to be deterrent. A large part of the participants judged RAS to be too artificial:

“Like a factory —you put fish in and get a ready to eat filet out” (Leipzig, Participant 4, female, organic food consumer).

Due to their industrial appearance and the high stocking rate of RAS, participants also often associated them with ‘mass animal husbandry’. Both aspects were also used by consumers to describe the term ‘mass animal husbandry’ in the context of agricultural systems (Busch et al. 2013; Zander et al. 2013). Fish welfare was heavily doubted in these systems. Some participants also expressed reservations about the low/ no drug use in RAS since such highly engineered systems were supposed to have a higher disease pressure than less intensive systems. Apart from that, this production method was criticized for its high energy need.

Altogether, many participants judged RAS to be neither sustainable nor organic, whereas others adopted a more balanced view. They argued, for example, that these systems could be sustainable if run with renewable energy. Some participants acknowledged the sustainability of this system with regard to shorter transportation distances between producer and consumer compared to fish products from the tropics and subtropics. Additionally, they stated that farming tropical and subtropical fish species in Germany would help to protect the corresponding wild stocks. In line with this argumentation, some participants appreciated that RAS increase the variety of fish species produced in close proximity to the consumer. Several participants were also pleased by the high control degree in RAS, among others, because these regulated conditions usually result in no drug usage at all. Accordingly, some participants assessed RAS as the most hygienic method of all and thus as the healthiest one for consumers.

However, the focus groups revealed a mainly skeptical and negative attitude towards RAS. Probable ecological advantages with respect to nutrient run-offs were outweighed by the lack of naturalness and the assumed deficiencies in fish welfare. Obviously, the high technical level of RAS contravened the participants longing for naturalness. Schlag and Ystgaard (2013) also observed that consumers tended to equate the industrialized food production with unnaturalness.

The attitudes of the participants towards the presented production systems reveal that preferences for production systems and for fish species are to a certain degree contradictory. For example, participants preferred earth ponds over the more technical systems while simultaneously stating mostly a low interest in the fish species farmed in earth ponds in Germany. This contradiction might be a result of the limited knowledge of many participants. Also, in some cases the discussions in the focus groups just evoked the awareness of different production systems and potential problems in aquaculture.

Even though we tried to present all production systems in an equal manner, the imagery had an influence on the participants' perception of the production systems. Influence means in this context that participants often referred to the pictures presented when stating their perception. This influence could not have been avoided, but we tried to minimize it by showing real and, as far as possible, not idealized pictures. Especially, the pictures of the RAS might have influenced participants' perception due to their unfamiliarity with this system. The description of RAS is longer because we found in our first focus group that more detail was needed in order to enable the consumer to develop an idea of this system.

5.2.4.3 Evaluation of communication messages

As outlined in the introduction section, communication messages on product packages are an important information source for consumers. In the study we tested five communication messages pointing out different aspects of sustainability. The communication message 'near-natural production' was the most approved message of all presented. Some participants associated this message with a production system being as near-natural and respecting animal welfare as far as possible. An aquaculture product using this communication message was supposed to use species appropriate feed and to avoid the use of drugs. A tasty and healthy product was expected. At the same time, the message was criticized for its lack in informative value:

"A pond in the vicinity of a forest — that is my idea of a near-natural production" (Hamburg, Participant 5, female, conventional food consumer) — *"A near-natural production can mean everything or nothing"* (Stuttgart, Participant 4, female, organic food consumer).

Some participants argued that rearing fish in a near-natural way is not enough. They preferred a natural aquaculture. Several participants were also skeptical about the healthiness of a product advertised in this way. They underlined that fish produced near-natural could still be contaminated. The term 'near-natural production' was refused for RAS because of their high technical level. In sum, the communication of naturalness or rather of closeness to nature is promising. Many western cultures consider the adjective 'natural' in connection with food as positive (Gaskell 2010). However, the suc-

cess of a corresponding claim depends on a clearly defined and verifiable content. The communication message 'plenty of room to move' was seen as an indication for fish welfare. Some participants associated this message with naturalness. More critical consumers perceived the message as imprecise because the amount of space for each fish was not specified. For several participants the message even evoked the awareness of potential problems in aquaculture, they did not know about before:

"This message startles me. Now, I am asking myself, did the fish have enough space?" (Stuttgart, Participant 1, female, organic food consumer).

Some participants related the term 'room to move' with intensive poultry farming. This is well in line with other studies (e.g., Busch et al. 2013, Zander et al. 2013), which found that room to move is a crucial concern of consumers when discussing farm animal welfare. The reactions to the message 'plenty of room to move' indicate that animal welfare was important to consumers with respect to sustainable fish (see also DG Mare 2008; Kalshoven and Meijboom 2013). However, the verbal communication of this issue is challenging. On the one hand, consumers approved the message. On the other hand, the message raised doubts about the naturalness and animal welfare standards of aquaculture. An unambiguous and meaningful communication is expected.

The participants mostly rejected the message 'minimal drug usage', because most of them refused the use of drugs in aquaculture. Negative associations to and concerns about consumers' health were strong. Fish advertised with this message was suspected to have definitely received drugs. Some participants also perceived this message as too vague because the drugs used and their amounts are not stated. 'No drug usage', as an alternative to the message presented, was also rejected by the majority. They regarded this statement as a lie or considered it irresponsible not to treat sick fish. Only a few participants were pleased by the honesty of the communication message. From this message they concluded that no preventive medication takes place.

In the opinion of several participants, the issue of no or low drug usage should preferably be communicated by avoiding the term 'drug' or by just stating the healthiness of the product. Therefore, the communication of low or no drug usage in aquaculture on the package does not appear to be promising. Most of the participants also disliked the message 'no environmental pollution through nutrient run-off'. The term 'nutrient run-off' was largely unknown, while 'environmental pollution' was taken as an indication for potential problems in aquaculture. 'Environmental pollution' evoked associations with industrial and unhealthy food contradicting the healthy image of fish.

"I don't want to think about environmental pollution when purchasing fish. It sounds so negative" (Hamburg, Participant 1, male, organic food consumer).

A few participants appreciated this message because they perceived it as clear and meaningful as well as honest.

The message ‘minimal usage of fish meal and fish oil in order to protect the oceans’ was also widely rejected by the participants. They found it hard to understand and too long. Some of the participants had problems in relating the protection of the oceans with the use of fish meal and fish oil. The message did call consumers' attention to the fact that wild fish is captured for the use as fish feed in aquaculture: A practice that many participating consumers disapproved of. Some participants also stated that this message left a general negative impression:

“[...] minimal use of fish meal — that just sounds like industry and somewhat not like healthy fish, which is good for me [...]” (Leipzig, Participant 4, female, organic food consumer).

The word ‘fish meal’ was associated by some participants with low quality feed originating from slaughterhouse waste. Only the ‘protection of the oceans’ was judged to be a good communication message.

Participants were basically dissatisfied with all messages presented. The messages were perceived to be too imprecise and too difficult to comprehend. Although the content of the messages was commonly considered to be relevant, the chosen formulations were frequently rejected. This result shows that it is difficult to communicate characteristics of sustainable aquaculture, in a manner that is appreciated by consumers, in a comprehensible, reliable and appealing manner. On the one hand, consumers have expectations on sustainable aquaculture, which they want to be informed about to a varying degree. On the other hand, messages that contain too detailed or too vague information are often rejected.

5.2.4.4 Recognition of sustainability labels

Even though sustainable fish products are sold by all major food retailers in Germany most of the participants were unaware of sustainability labels on aquaculture products (Figure 4): The majority did not recognize any of the presented labels from fish products (see also Aarset et al. 2004). Instead, most participants knew some of the labels from other food. The best-known labels were the organic labels, particularly by organic consumers. Most of the participants were unaware of the company label of Femeg ‘zertifiziert kontrolliert nachhaltige Fischzucht’. Still some found the label appealing because of its precise and comprehensible message. The WWF logo was recognized by some of the participants. They connected it mostly with the Marine Stewardship Council label (MSC). The only sustainability label for fish participants mentioned frequently and unaided, which only refers to wild fish. The ASC label was mostly unknown and sometimes mistaken for the MSC label. This might be

due to the circumstance that – at the time of the focus groups – the ASC label had only been available on the German market for a short period. However, it also indicates that participants had difficulties differentiating between wild and farmed fish as far as labels are concerned, which reveals the low knowledge of many participants. Consumers' low knowledge of fish origin has been reported by various studies (e.g., Aarset et al. 2004; Pieniak et al. 2013; Vanhonacker et al. 2011). Because of this low knowledge and awareness consumers' perception of aquaculture is more driven by emotions than by reason (Vanhonacker et al. 2011; Verbeke et al. 2007b).

Several of the participants mentioned that they never before looked consciously for a sustainability label on fish products. Others said that they trusted their retailer or fishmonger and therefore did not look for labels:

“When I buy fish at the fish monger of my confidence I don't look for a label” (Stuttgart, Participant 1, female, organic food consumer).

Some participants underlined that looking for labels was too time consuming. Nonetheless, a part of the participants approved labels as a supplemental quality indication. Some participants, especially those who consume organic products, were convinced that organic products have higher, if not the highest and most rigid standards. Accordingly, they trusted organic labels the most.

However, several of the participants criticized labels in general. Their relevance in assessing the intrinsic product attributes as well as their credibility were questioned (see also Verbeke et al. 2008). Some participants mistrusted the certification processes and the compliance of the certified products to specific standards. Lack of trust in (organic) certification processes and the corresponding labeling schemes is known from other food products as well (e.g., Zander and Zanolli 2013). A general skepticism towards the food industry could be observed (see also Aarset et al. 2004). Various participants pointed out that they did not know enough about labels to trust them and consider them in making their purchase decision. Some participants perceived the diversity of labels as ‘information overload’ (see also Hwang, Lin 1999) and stated that as a result they ignored available information and/or become uncertain in their purchase decision (see also Altintzoglou et al. 2010b).

5.2.4.5 Information needs

The theoretical solution to limited knowledge of sustainable fish from aquaculture is to offer additional information (Thøgersen et al. 2010). For example Claret et al. (2012) stated that the provision of information is central for the overall acceptance of farmed fish. However, the participants' opinion regarding additional information on sustainable aquaculture was contradictory. Although some participants were aware of their knowledge gap and called for more transparency and for standardized

as well as comprehensible information on the packages, others were not interested in additional information at all. They did not want to know more about fish farming because they feared that more information might be confusing because of an existing information overload.

"I don't want to be talked to death by the package. If there is too much information, the frozen fish will melt before I was able to read everything" (Stuttgart, Participant 1, female, organic food consumer).

Some participants stated that the available information was mostly incomprehensible or, rather demanded too much involvement in order to understand it (see also Pieniak et al. 2007a). Mirroring the results of Verbeke et al. (2008), several participants also feared that knowing more about aquaculture might cause them to stop consuming fish. Some participants also raised concerns over the information value and validity of the information given on the package.

One solution from some participants' point of view was the development of an 'app' providing additional information about each label for those consumers interested without burdening those not interested. An informative and interesting web presence for the respective aquaculture product was also welcomed. Many participants favored a unification of the labels instead of aggravating the 'information overload' by adding more information. Some of the consumers of organic products challenged the need for a label for sustainable aquaculture in addition to the organic ones.

The observation of limited information needs also in consumers with limited knowledge has already been reported by Pieniak et al. (2007a). Most consumers mainly wanted to be assured that fish products are healthy and tasty (see also Pieniak et al. 2013). That is why, instead of being better and better informed about the specific product characteristics, many participants demanded that the offered products complied with their expectations of animal welfare and environmental protection. They did not always want to judge the compliance to these expectations by themselves at the point of purchase. Instead, the majority wished that they could rely on the information given by the producers. Therefore, an honest, transparent and trustworthy communication was expected from the producers. The information offered should be adjusted to the needs of different consumer groups and their different degrees of knowledge (see also Verbeke et al. 2008; Verbeke et al. 2007c).

5.2.5 Conclusions

The focus groups revealed that consumers often had little knowledge of aquaculture, which mirrors the results of previous research (e.g., Aarset et al. 2004; Pieniak et al. 2013; Vanhonacker et al. 2011). Many participants were, for example, unaware that fish is increasingly produced on farms. Consumers' limited knowledge led to low awareness of potential negative and positive impacts of the

sector. Consequently, consumers often had a romantic and misleading perception of modern aquaculture. According to our own findings as well as to the research by Aarset et al. (2004), O'Dierno et al. (2006) and Schlag and Ystgaard (2013), consumers inferred their understanding of aquaculture to a large extent from their knowledge of terrestrial animal husbandry. Accordingly, they also tended to transfer their concerns about modern agriculture onto aquaculture.

As a result of their longing for naturalness and authenticity participants mainly approved near-natural production methods, such as earth ponds and flow-through systems (if surroundings are vegetated), while simultaneously refusing more highly engineered systems, such as closed recirculation systems (RAS). The participants' expectations of sustainable aquaculture were mostly inferred from their understanding of sustainable and organic agriculture. Thus, RAS were put on one level with intensive farm systems, especially poultry farming, because of their high stocking rates and industrialized appearance.

Many participants had no desire for additional information. Nevertheless, in order to prevent consumers from developing incorrect conceptions of modern aquaculture, which might lead to severe image problems for the whole sector, transparent communication is needed (see also Whitmarsh and Palmieri 2011). Therefore, communicating sustainable aquaculture to consumers is an important, but challenging, task. The question of how to provide information to those consumers who desire it, without confusing those who do not demand further information remains.

Mere rational arguments, such as the energy balance of a particular aquaculture type, will not be enough to convince consumers to accept sustainable aquaculture. Participants judge aquaculture according to their own moral standards and emotionally-motivated ideas, which sometimes cannot be reached by rational arguments. Furthermore, the communication and practice of sustainable aquaculture should consider consumers' expectations of sustainable aquaculture. The information provided should be precise, comprehensible, interesting, and balanced between rational and affective elements. In general, specific wordings should be pretested in order to ensure their success.

Our recommendation is that consumer communication should include affective and moral aspects based on reliable facts. For example, storytelling as well as pictures of the respective farm of origin might help consumers in their purchase decision. However, pictures of more highly engineered systems like RAS might have a rather deterrent effect on consumers. They still have to become acquainted with and to understand these systems. Open days and improved public relations might help in reducing reservations to RAS.

To date, labels appear to be of little help to consumers in distinguishing sustainable aquaculture products from conventional ones. According to our results, participants who were interested in sus-

tainability issues seem to prefer organic aquaculture products and produce from sustainable wild fisheries. Additional labels for 'just' sustainable aquaculture products might even confuse consumers because of their difficulties in differentiating between organic and sustainable practices as well as between wild and farmed fish. The introduction of only one common label for sustainable aquaculture products besides organic ones should be considered. In sum, the development of a higher priced market segment for sustainable aquaculture products from Germany in addition to organic ones will be a challenging task. The market niche for sustainable aquaculture products appears to be already occupied by organic products. In any case, further product differentiation in this market segment will only be successful if 'sustainable' aquaculture relies on clearly defined, verifiable and markedly higher standards than the legal requirements. These standards need to be actively communicated to consumers using various communication tools and media, as well as in a manner that is also understandable to consumers with limited knowledge.

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5.3 Aquaculture in the German print media

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5.3.1 Abstract

The current aquaculture methods are criticized by the public for potentially causing ecological problems and health risks for consumers. An unfavorable public perception may lead to a decline in consumption. Also the production might be affected negatively since legislation and as such approval procedures are influenced by public perception. The aquaculture industry has to consider public reactions to their production practices in order to prosper further. One way to learn about and to understand public perception is the analysis of media coverage since media are an important source of information for the public. Thus, the media coverage of an issue reveals potential points of conflict between the aquaculture sector and the public. We aimed to identify which attitude the media adopted toward aquaculture as a news issue and to determine which aspects of aquaculture were highlighted and how they were discussed. The study also focused on the presentation of recirculating systems and of organic aquaculture. Using this approach, we analyzed the media coverage of aquaculture in the most widely read German newspapers in the time period from 2008 to 2013. A mixture of qualitative and quantitative content analysis was used to examine the coverage in the *Süddeutsche Zeitung*, the *Frankfurter Allgemeine Zeitung* and the *BILD*. Our results indicate that the analyzed media primarily reported on aquaculture in a positive to neutral tone. Economic benefits of aquaculture dominated the coverage, whereas potential negative aspects of aquaculture received less attention. Organic fish farming and closed recirculating systems were both presented as eco-friendly practices. The German aquaculture sector was described as being sustainable and practicing good management.

Keywords: Agenda-setting, Aquaculture, Communication, Closed recirculating systems, Farmed fish, Media analysis, Newspaper, Organic aquaculture, Public media

5.3.2 Introduction

Aquaculture production has increased worldwide, and production practices have intensified. This development went along with ecological problems as well as health risks for consumers (Subasinghe et al. 2012; Jacobs et al. 2002; Olesen et al. 2011). In the 1990s, the public began to become aware of the potential problems of aquaculture, and the acceptance of aquaculture practices and their products declined (Bergleiter and Meisch 2015). But, further development of the aquaculture sector largely depends on consumer demand for its products on the one hand and on favorable legislation which allows for establishing new farms or enlarging existing ones on the other hand. Both aspects are based on a general positive public perception of aquaculture practices. In this respect, analyzing the media coverage helps to understand the public perception since media reflect to a certain point the existing perceptions about an issue. Additionally, media actively impacts people's knowledge and perception of reality (Schenk 2007).

Media coverage is purported to be of crucial importance in public and consumer perception of aquaculture since media are an important source of information for consumers (Amberg and Hall 2010; Hicks et al. 2008; Paquotte 2007; Pieniak et al. 2007b). There are several instances in which negative media coverage about aquaculture resulted in temporary decline in sales⁷. Public media are an important source of information with a high potential impact on public opinion (Bergleiter and Meisch 2015; DG Mare 2008; Hall and Amberg 2013).

Stakeholders have sometimes criticized German media coverage for stressing the risks in the sector while ignoring potential benefits, and for presenting imprecise and sometimes even incorrect information (e.g., Kaiser 2012; Klinkhardt 2014; Fischmagazin 2015). The aquaculture sector is concerned about its public image (see, e.g., Kaiser 2012; Paquotte 2007). In particular, increased use of technical systems is assumed to be less accepted by the public, whereas near natural practices are seen more favorably. For example, a previous study showed that German consumers had a rather negative perception of recirculating systems (RAS), whereas ponds and organic⁸ practices were more readily accepted (Feucht and Zander 2015).

Scientific knowledge on the presentation of aquaculture in the media is limited, and to our knowledge only four studies exist to date (Amberg and Hall 2008, 2010; Höijer et al. 2006; Schlag 2011). The studies by Amberg and Hall (2008, 2010) and Höijer et al. (2006) focused on farmed salm-

⁷ For example, the drop in the sale of fresh salmon filets in France due to the media coverage of the research findings of Hites et al. (2004) regarding contaminants and toxins found in farmed and wild salmon (Paquotte 2007).

⁸ The term 'organic aquaculture' refers in this paper to all production practices which are in accordance with the EU Regulation on 'Organic production and labeling of organic products', EC 834/2007.

on and on media responses to selected scientific publications. Schlag's research (2011) took a more holistic approach and compared the media coverage of various aspects of aquaculture in different European countries during a 5-year period (2002–2007). All four studies found that the examined media mostly transmitted a negative image of aquaculture. Risks for human health and for the environment were emphasized, whereas the benefits were less frequently considered. Benefits were mainly reported with respect to economic aspects (Amberg and Hall 2008, 2010; Höijer et al. 2006; Schlag 2011). None of these studies investigated the medial presentation of the production methods used in aquaculture. Instead, they focused on the medial risk communication of aquaculture.

Against this background, the present research aimed to elicit the most recent German media coverage of aquaculture in detail by analyzing the prevalent manner in which aquaculture is presented and the underlying argumentation in greater depth by means of a media analysis. Do German media still describe aquaculture predominantly in terms of risks? Which aspects of aquaculture are emphasized by the media? How are different production methods described by the media? We conclude with some suggestions as to how the sector could communicate with the public via media.

5.3.3 Media and public perception

Media fulfill an important role in democratic systems. They act as information providers for and as aids to orientation for the general public (Haas 2005; Kleinschmit 2010). Media function as gate keepers because they choose which information is published and which is not (Bonfadelli 2010). In this role, media can increase or reduce awareness about issues and influence the direction in which public opinion on an issue shifts (Amberg and Hall 2008; Schoenbach et al. 2005). The individual recipient selects those media information which he or she adopts and selectively connects the perceived information with the individual external (e.g., social and situational conditions) and internal contexts (e.g., knowledge and attitude). Recipients rely on “a version of reality built from personal experience, interaction with peers, and interpreted selections from the mass media” (Neuman et al. 1992: 120). This implies that the relevance and magnitude of the effect which media have on recipients depend on the latter's individual cognitive schemes (Bonfadelli and Friemel 2011; Schenk 2007; Scheufele and Tewksbury 2007). In turn, media react to the wishes of their readership. This two-way relationship between information, behavior and attitudes is dynamic (Schenk 2007).

Today, the agenda-setting approach, developed by McCombs and Shaw (1972), is the most important theory for elucidating the effects of media (Bonfadelli and Friemel 2011). ‘Agenda’ is defined by the issues which are salient in the media or in the consciousness of the readers (Takeshita 1997). By concentrating on certain issues while ignoring others and/ or prioritizing some issues, mass media is assumed to influence public awareness and concern about an issue (Schenk 2007; Takeshita 1997).

The influence of medial agenda-setting on the individual agenda depends on several conditions, such as interest of a person as well as interpersonal communication (Bonfadelli and Friemel 2011; Schenk 2007).

The concept of the agenda-setting theory has been expanded, and research now differentiates between two levels of agenda-setting: The first level concentrates on the perceived importance or relative salience (in other words prominence) of an issue and, thus, on the original notion of an agenda of issues (Bonfadelli and Friemel 2011; Golan et al. 2007; Takeshita 1997). The second level focuses on the perceived importance of different facets of the issues (Bonfadelli and Friemel 2011). The different facets of an issue are called attributes. Each issue has numerous attributes which are linked to it and which can be emphasized or ignored by the media (Golan et al. 2007; Bonfadelli and Friemel 2011). Similarly, each attribute can be divided in various aspects. Thus, in addition to an agenda of issues, there is an agenda of attributes (Bonfadelli and Friemel 2011; Takeshita 1997). The basic idea of second-level agenda-setting is therefore that by selecting specific attributes and aspects media tell people how to think about issues (Coleman and Banning 2006; Schenk 2007; Takeshita 1997). Thus, in second-level agenda-setting the notion of an issue (tone) becomes as important as the amount of coverage (Coleman and Banning 2006).

The present paper adopts the basic assumptions of the agenda-setting approach that media tell people what to think about and that the selection of particular attributes and aspects of a subject impacts the way people think about an issue (Freeland 2012; Schenk 2007).

5.3.4 Methodological approach

In order to identify how German media covers aquaculture, we conducted a media analysis. We analyzed all relevant articles published in the period from January 1, 2008, to December 31, 2013, in the print and online editions of the three most widely read daily newspapers in Germany: 'Süddeutsche Zeitung' (SZ), 'Frankfurter Allgemeine Zeitung' (FAZ) and 'BILD' (IVW 2015). The selected print media have a national coverage and reflect a political spectrum from social liberal (SZ) to right-wing populism (BILD) (Baron and Steinwachs 2012). The Süddeutsche Zeitung and the Frankfurter Allgemeine Zeitung are the two premium newspapers with the highest coverage in Germany. In contrast, the BILD is a tabloid and the top-selling daily paper in Germany (BILD 2012; IVW 2015). Each of the chosen media has its own, independent online editorial staff; thus, the published content can differ between the print and online editions of the analyzed press. The website 'bild.de' is the most popular news website in Germany (180 Mio. visits per month on average) (AGOF 2014; IVW 2015).

The articles were obtained from the online archives of the newspapers and imported into the MAXQDA 11 software for further analysis. The keywords aquaculture, fish farming, fish farm, aquafarm, fishkeeping, pond-farming, farmed fish, rearing and fish, rearing and algae, rearing and shrimp, rearing and mussel⁹ were used to collect the articles. To be considered for analysis, the articles had to contain at least one sentence which dealt with aquaculture. Articles focusing on a topic other than aquaculture and briefly mentioning one of the keywords without giving any additional context were excluded (e.g., “The restaurant XYZ is situated near a fish farm”). The texts of picture series without accompanying articles were also excluded as were preannouncements of audiovisual contents and reviews of books and films. Articles published identically in the print and online editions were counted as one. The version included in the sample was the one which came up first during the search in the archives.

Media analysis is intended to examine the presentation of issues in the media as well as the effects that the coverage has on the recipients (Bonfadelli 2010). Our analysis was based on the agenda-setting approach, which distinguishes between first- and second-level agenda-setting. First-level agenda-setting focuses on the amount of coverage of an issue such as aquaculture, whereas second-level agenda-setting refers to the tones which result from the selection and description of an issue's attributes and aspects. In our study, we focused on the second-level agenda-setting effect in order to identify how the analyzed media presented aquaculture as a news issue. Additionally, we analyzed the influence of different stakeholders on the media. The degree of influence can be approximated by the frequency of references and by assessing the roles that the respective stakeholders took in the articles (Buba et al. 2009; Hallahan 1999; Schulze et al. 2008; Walling and Hiemstra 2007).

Content analysis is frequently used to examine textual data (Amberg and Hall 2008; Boulus and Dowling 2014). We combined quantitative and qualitative content analysis in order to develop a better understanding of how aquaculture is covered by the German media. This combination of quantitative and qualitative content analysis allowed us to obtain both an overview of the coverage and deeper insights into the media assessment of the subject in question. Quantitative content analysis serves to elicit the frequency of certain elements and makes variation in the communication content explicit as well as measurable (Riffe et al. 2005). In our study, we used quantitative content analysis to explore the frequency of occurrence of attributes and the aquaculture issue itself as well as of subjects connected to aquaculture, such as different production methods and stakeholder groups. Every time a production method or a stakeholder was mentioned it was registered as an individual count. Qualitative content analysis according to Mayring (2010) allowed us to explore the different argumentation

⁹ In German: Aquakultur, Fischzucht, Fischfarm, Aquafarm, Fischhaltung, Teichwirtschaft, Zuchtfisch, Zucht und Fisch, Zucht und Alge, Zucht und Garnele, Zucht und Muschel, züchten und Fisch, züchten und Alge, züchten und Garnele, züchten und Muschel.

schemes used in connection with the attributes of aquaculture and their aspects. The exploration of argumentation schemes was used to identify the interpretation of aquaculture conveyed by the media.

For both qualitative and quantitative content analysis, we used a combination of deductive and inductive category development to identify the tone in which the issue and its attributes were presented. We started our analysis by coding the collected articles in accordance with a preliminary scheme based on the findings of previous research, which identified risk and benefit frames (Amberg and Hall 2008; Höijer et al. 2006; Schlag 2011). Thus, every article was first categorized either as presenting aquaculture in a negative or positive tone. An additional neutral category became necessary since many articles emphasized neither risks nor benefits. Tones were coded by reading the respective article and qualitatively assessing the predominant tone. For example, an article was coded as predominantly negative in tone if we found words like 'factory farming' or descriptions of fish farms as intensive mass production. In addition, we categorized the text segments of the articles into attributes and their aspects. The analysis of the text segments resulted in the definition of four attributes and 12 aspects. The text segments were coded according to the attributes 'economy,' 'environment,' 'human health,' 'animal welfare' and 'regulation.' We added 'animal welfare' as a new facet not analyzed in the previous studies of Amberg and Hall (2008, 2010), Höijer et al. (2006) and Schlag (2011). An overview of the coding scheme is given in table 7. The entire sample was designated by one coder. In order to assess the coding stability, we estimated the intracoder reliability¹⁰ with Cohen's Kappa. Cohen's Kappa yielded a value of 0.95, which indicates an adequate stability in coding.

¹⁰ The intracoder reliability measures the relative consistency of judgments within a coder over time. The amount of inconsistency depends, for example, on the carefulness and mood of the coder (Chen and Krauss 2004; Riffe et al. 2005). Cohen's Kappa is a widely used index in communication research and controls for the possibility of chance (Lombard et al. 2010; Riffe et al. 2005). Cohen's Kappa assumes the value of one for total consistency. In general, figures that are 0.80 or higher indicate an adequate reliability (Riffe et al. 2005). For the calculation of the index, the coder coded the same 30 randomly selected articles of the sample once at the beginning of the content analysis and again at a later stage of the analysis.

Table 7: Coding scheme used to analyze the press articles about aquaculture

Categories	Level	Description
Tones		
Negative	Article	Emphasizing predominantly negative aspects of aquaculture (e.g., risks for the environment) and uses words like 'factory farming' or/and describes fish farms as intensive mass production.
Neutral	Article	Referring to aquaculture in a well-balanced manner. The message of this tone can be summarized as follows: Aquaculture bears risks as well as benefits.
Positive	Article	Highlighting mostly advantages/benefits of aquaculture like the high culinary value of farmed products or the promising economic prospects of the sector.
Attributes		
Economy	Text segment	Which focuses on the economic aspects of aquaculture, e.g., 'business opportunity of the future'. Aspects: Prospects of the sector, Production description
Environment	Text segment	Which referred to environmentally relevant issues (e.g., biodiversity, energy consumption) in connection with aquaculture. Aspects: Environmental risks Environmental protection Use of resources Genetic engineering
Human health	Text segment	Which points out risks and/or benefits to human health including the source of the risks/benefits, e.g., "[...] illegal, carcinogenic pesticides are used against parasites" (FAZ 2010). Aspects: Good for human health Risk for human health
Animal welfare	Text segment	Which focuses on the animal welfare of farmed aquatic species. Also if words like 'fish welfare' and 'animal cruelty' are used in the context of aquaculture. Aspects: Appropriate husbandry Animal health

Regulation	Text segment	Which refers to regulatory aspects with respect to aquaculture, e.g., food safety issues or the control regime in general Aspects: Regulation and control on national level Impact of the EU Conflict of interest
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5.3.5 Results

The search of articles related to aquaculture resulted in a total of 208 articles (online and print). The majority of the articles were released in the print editions of the analyzed newspapers (Table 8).

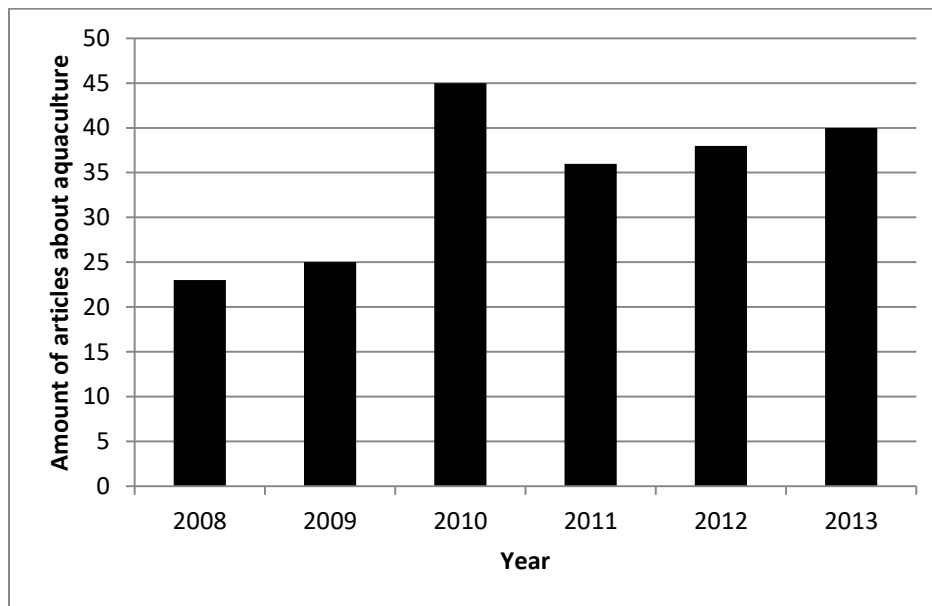
Table 8: Number of articles about aquaculture per analyzed newspaper and kind of presentation and percentage (%)

Newspaper	Print edition	Online presentation
Süddeutsche Zeitung	96 (81%)	23 (19%)
Frankfurter Allgemeine Zeitung	45 (88%)	6 (12%)
BILD	19 (50%)	19 (50%)
All	160 (77%)	48 (23%)

The comparison of the number of articles in the respective newspapers showed that the majority of the articles were published by the SZ. Thus, the SZ had a stronger focus on aquaculture compared to the FAZ and the BILD in the analyzed time period. This is probably due to the fact that most of the German fish farms are located in Southern Germany (Bavaria and Baden-Württemberg) (DESTATIS 2014), the region in which the headquarters of the SZ are situated. The relation between the localization of a newspaper and its coverage was described in another context by Boulus and Dowding (2014).

First-level agenda-setting refers to the salience of an issue in the media. Within the time period observed in this research, media coverage of aquaculture increased. In 2008, 23 articles were published, whereas the number increased to 40 articles in 2013. The increase was steady over the analyzed time period with the highest amount of articles published in 2010 (Figure 5). In the year 2010, the negative effects of the first infectious salmon anemia (ISA) outbreak on the aquaculture sector in Chile became more and more public in Germany. Additionally, in the same year a documentary with the title 'Lachsfieber' which reported on shortcomings in the Chilean aquaculture sector gained a lot of public interest. The increase in articles from 2008 to 2013 indicates that media attention on aquaculture increased during the research period.

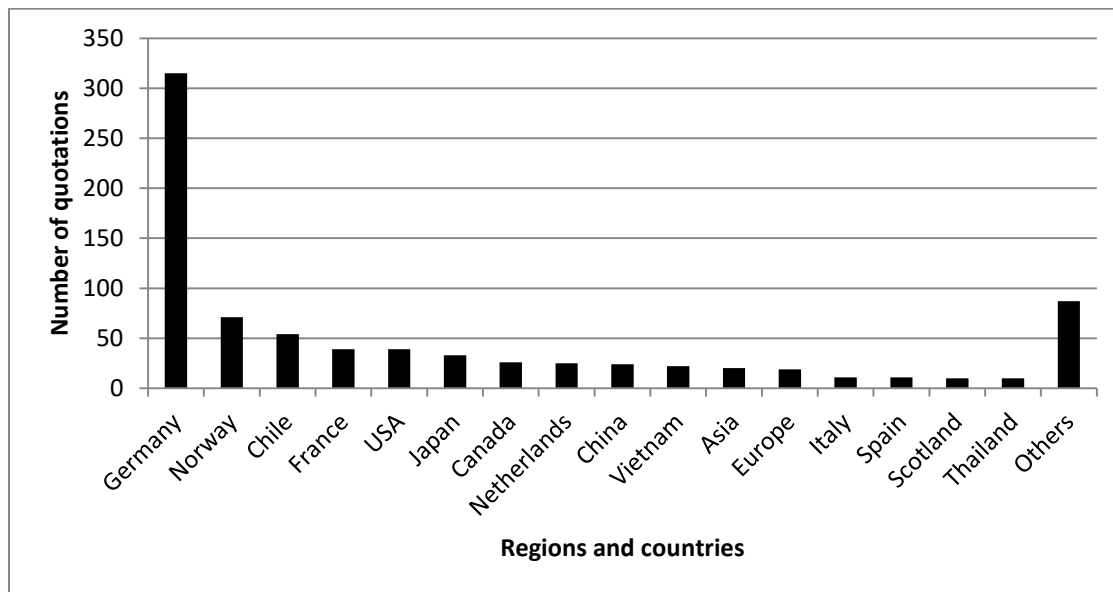
Figure 5: Amount of articles referring to aquaculture published in the Frankfurter Allgemeine Zeitung (FAZ), Süddeutsche Zeitung (SZ) and in the BILD between 2008 and 2013



5.3.5.1 Farmed species and production countries

The articles referred to 37 different fish and seafood species reared in aquaculture. Most of the articles focused on finfish (72%), followed by crustaceans (14%), and mussels (10%). Algae were mentioned in 7% of the articles. The species mentioned in more than 10% of the articles were salmon (25%), trout (22%), carp (19%), sturgeon (13%) and shrimp (11%). Since salmon and trout are the two most frequently consumed fish in Germany which originate primarily from aquaculture (FIZ 2014) and are as such the aquaculture species in which German consumers are most interested in, it is not surprising that the media covered these two species the most. The articles referred in total to 50 different countries and several continents (e.g., Asia). With 315 quotes, they primarily referred to Germany, followed by Norway (71) and Chile (54) (Figure 6). The predominance of German aquaculture in German media is again in line with Boulus and Dowding (2014).

Figure 6: Regions and countries mentioned in press articles about aquaculture which were quoted at least ten times, total quotations n = 816



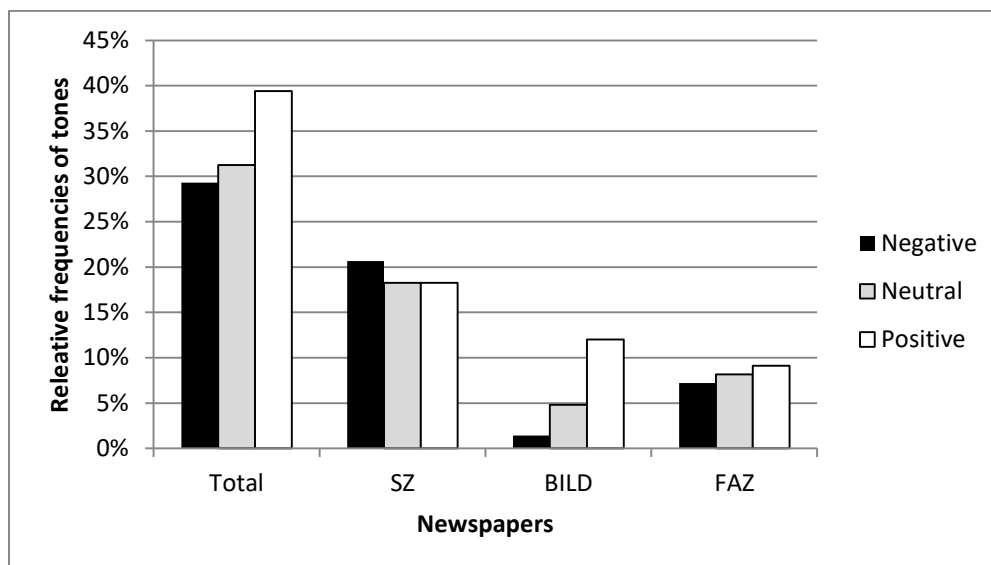
5.3.5.2 Tones, attributes and their aspects

5.3.5.2.1 Tones

Following the second-level agenda-setting approach, we categorized the articles as belonging to one of the three general tones. The tones were deduced from the selection and presentation of the attributes and their aspects and refer always to whole articles. We distinguished a positive, a negative and a neutral tone.

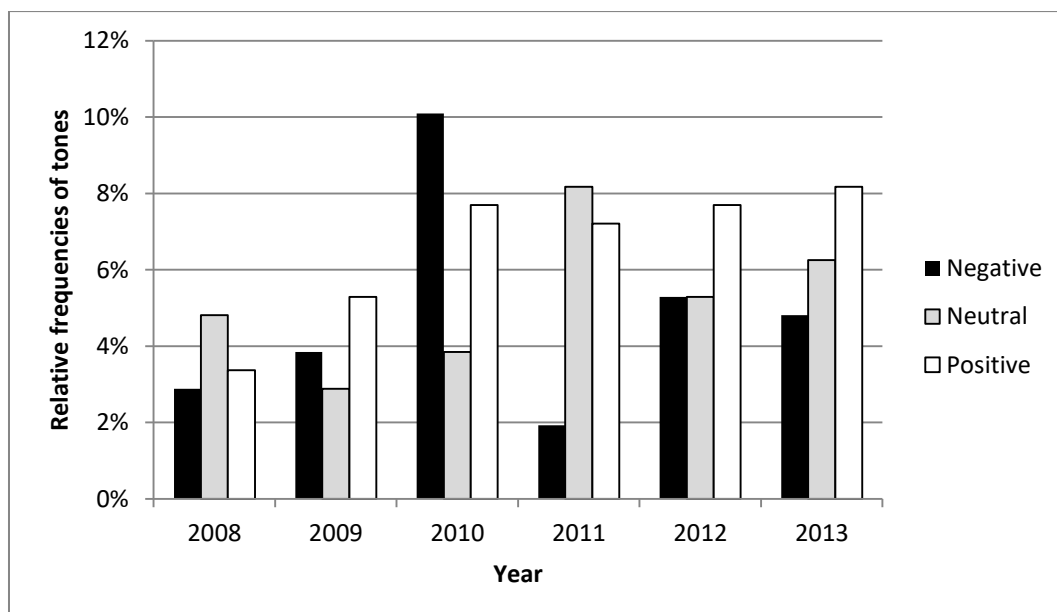
Considering all of the analyzed newspapers, the positive tone (with 39%) was most prevalent in the presentation of aquaculture, followed by the neutral (31%) and negative tone (29%) (Figure 7). These results contradict the studies of Amberg and Hall (2008) as well as that of Schlag (2011), who found that aquaculture was mainly framed in terms of risk, which is almost identical with our 'negative' tone. There were, however, some differences between the newspapers. The Frankfurter Allgemeine Zeitung (FAZ) and BILD primarily emphasized the positive aspects of aquaculture, whereas the Süddeutsche Zeitung (SZ) covered aquaculture predominantly in a negative tone. The neutral tone was the second most used one in the FAZ and BILD, whereas the articles in the SZ used the neutral and positive tone equally. Consequently, the SZ promoted a less positive and neutral idea of aquaculture than did the FAZ and the BILD in the analyzed time period.

Figure 7: Relative frequencies of tones applied by the analyzed newspapers (n = 208)



Comparing the distribution of the tones over the analyzed time period, we found that the highest amount of articles with a positive tone (8%) was published in 2013 while the highest share of articles with a negative tone (10%) was published in 2010 (Figure 8). The peak of articles with a negative tone in the year 2010 might be due to the increasing interest in the problems of the Chilean salmon aquaculture. The frequency of the tones did not differ greatly between the online and print editions of the newspapers. This is in line with Boulus and Dowding (2014), who stated that print content can be used as approximation for online content.

Figure 8: Relative frequencies of tones applied by the analyzed newspapers between the years 2008 and 2013 (n = 208)



5.3.5.2.2 Attributes and their aspects

Within the issue of aquaculture (first-level agenda-setting), the content of the articles is structured in accordance with the idea of various attributes with different aspects each (second-level agenda-setting). In total, five different attributes (economy, environment, human health, animal welfare and regulation) were identified in the 208 analyzed articles. 'Economy' was addressed most frequently (37%), followed by 'environment' (31%). The attributes 'human health' (11%) and 'animal welfare' (11%) were addressed equally often, whereas 'regulation' (10%) received the least treatment.

The 'economy' attribute

The 'economy' attribute consisted of two aspects: 'prospects of the sector' and 'production description.' The analyzed media mostly discussed the economic prospects of the aquaculture sector (61 % of all articles in this attribute) and described the production to a lesser extent (39%).

Articles which belonged to the 'prospects of the sector' aspect highlighted the huge economic potential of aquaculture in developed and developing countries. The increasing share of aquaculture products in the worldwide seafood production as well as the high profitability of some segments of aquaculture was pointed out: *"Fish is perceived as the big business opportunity of the future. Experts say that in a few years this food will be sold for prices not yet imaginable"* (SZ 2011).

Therefore, aquaculture was perceived as a good investment opportunity. One example of an aquaculture segment with promising prospects was the farming of species with small population sizes or even endangered populations and thus sometimes protected, such as lobster, sturgeon and tuna. The establishment of aquaculture in other niche markets such as the production of biofuel by algae was also covered by the newspapers. Some articles mentioned the potential of direct selling of aquaculture products to generate additional income particularly in the context of smaller family-owned businesses. They reported that direct selling is appreciated by many consumers.

Articles which focused on the aspect of 'production description' primarily explained production procedures in different systems such as in RAS used for sturgeon and shrimp farming as well as in flow-through systems for trout. It was pointed out that high knowledge intensity was required in order for fish farmers to succeed due to the often very specialized and sometimes highly technical production systems required to cover the complex and strongly varying demands of some of the farmed species. The articles described aquaculture as a sector under high competitive pressure, which is sometimes intensive in cost and human capital and risky due to natural hazards, sophisticated systems, and sensitive as well as demanding and sometimes challenging to raise species.

A main focus of the articles which belonged to the 'economic' attribute was on German aquaculture. Some articles highlighted that economic success in this area requires much managerial input and effort. The recognition and reward of a high-quality product by retailers and consumers require good and well-targeted marketing concepts. Two main strains were addressed by the media: On the one hand, economically well-situated family businesses and part-time farms which often make a living by direct selling were described. And, on the other hand, some concentration and mechanization trends in German aquaculture which are similar to the changes that had already occurred in agriculture were mentioned. The German aquaculture sector was described as small compared to the production in other European countries and worldwide. The German aquaculture sector was presented as a quality-oriented market primarily dominated by salmonid and carp farming.

According to the articles, organic aquaculture as well as other niche markets such as aquaponics or the farming of highly demanding species such as sturgeon in closed recirculating systems showed particular market potentials. German aquaculture was also reported as an option for farmers who are searching for a second mainstay in addition to their agricultural activity. A side track of German aquaculture as a highly innovative field was the ongoing research focusing on environmental protection and energy supply, e.g., biofuel from algae or carbon reduction through algae farming. Basically, German aquaculture, especially those operations with ponds and flow-through systems and on a low technical level, was described as sustainable, trustworthy, environmentally friendly and practicing good management. Major constraints for the development of the sector were seen in high production costs and regulations (e.g., environmental specifications). Therefore, German aquaculture was not described as a growing sector per se, but rather as a market with a traditional base which guarantees a living and has a potential for innovation in niche markets (e.g., aquaponics).

The 'environment' attribute

The second most frequently mentioned attribute in the articles was 'environment.' It included four aspects: 'environmental risks' (42%), 'environmental protection' (37%), 'use of resources' (18%) and 'genetic engineering' (4%).

In the 'environmental risks' aspect, the use of wild fish in fish feed as well as for stocking purposes in aquaculture (in particular in the case of tuna) was a major issue. Aquaculture was considered to enhance the depletion of wild fish stocks by using fish feed made from wild fish: *"Large quantities of wild fish are fed to the "cage fish." This is outrageous since this practice depletes the oceans further"* (SZ 2012). However, this information was often outbalanced in the same aspect by mentioning the efforts made by the aquaculture sector to reduce fish meal and oil in fish feed: *"Scientists try to reduce the proportion of fish meal in feed pellets by replacing it with plant-based nutrients"* (SZ-Online

2013). The general tenor was that fish from aquaculture would be much more acceptable if the fish feed was to be plant based to the greatest possible extent and if the remaining wild fish fraction were to originate from discards and wastes of food fish production.

Many articles also reported on potential contaminations caused by aquaculture production, e.g., fish feces, feed losses, released parasites (e.g., sea lice) and chemical residues. The risks which can result from potential contaminations were sometimes put into perspective by references to innovations which alleviate the negative effects reported on, e.g., new water treatment methods and improved control mechanisms.

Other environmental risks covered by the analyzed media were further disturbances and destruction of surrounding ecosystems by aquaculture. For example, articles reported on the competition with wildlife for food, the introduction of invasive species and the potential risks resulting from mating of wild species with escapees. The destruction of mangroves as well as the salinization of fresh water bodies by shrimp farms was also discussed in the analyzed articles. With 408 records, salmon was the predominant fish species reported in the 'environmental risks' aspect, followed by tuna with 164 records.

The analyzed articles under the aspect 'environmental protection' highlighted the diverse ecosystem services provided by aquaculture. Some articles showed that ponds, in particular, are important elements of specific cultural landscapes, e.g., the Aischgrund in Bavaria (traditional landscape characterized by the farming of carp in ponds since the Middle Ages). Aquaculture's contribution to the preservation of biodiversity through rearing aquatic species for the release into the wild as well as providing habitats for wildlife was described. In contrast to the articles which discussed aquaculture's contribution to the depletion of wild stocks, several articles argued that aquaculture takes part in the conservation of wild fish stocks by substituting wild species for farmed ones.

It was pointed out that some forms of aquaculture can even help to keep bodies of water clean, e.g., mussels, which feed on soluble nutrients and therefore reduce the nutrient load. Due to the high quantity of carbon stored in their shells, mussels were also presented as contributing to the mitigation of climate change. Local fish farms were also described as generally reducing the impact of climate change because of the reduction in carbon emissions resulting from shorter transport distances.

The 'use of resources' aspect focused on the use of energy and water. The high energy demand especially of RAS was discussed. The articles mentioned various eco-efficient ways for dealing with the high energy consumption of these systems (e.g., use of solar power or waste heat from biogas production). The use of water in aquaculture was mainly discussed in the context of policies which are

intended to regulate water usage (e.g., number of net cages allowed in a fjord or the usage right of a water source). The articles also reported on the efforts made by the aquaculture sector to reduce water use and to improve the wastewater treatment in different production systems (e.g., in organic pond aquaculture or in recirculating systems).

A few articles (3%) reported on the application of 'genetic engineering' in aquaculture. Half of the articles addressed the authorization of a genetically modified salmon for the US market. The potential endangerment of the wild salmon population due to possible mating with escaped, genetically modified fish as well as potential health risks for consumers (e.g., higher risk of cancer and allergic reactions) were discussed. Simultaneously, it was pointed out that no genetically modified fish has been approved in Europe thus far. Hence, European consumers are protected from the potential health risks resulting from genetically modified fish to date. The other half of the articles concentrated on the fact that genetically modified feed is used in conventional aquaculture, whereas it is not allowed in organic aquaculture. Therefore, organic aquaculture would avoid risks for the environment and human health which might potentially arise from genetically modified feed.

The 'human health' attribute

The 'human health' attribute was much less frequently mentioned than 'economy' and 'environment.' It consisted of two aspects which highlighted contradicting points of view: 'good for human health' and 'risk for human health.'

The majority of the articles (79%) emphasized potential direct and indirect health risks for humans. The aspect 'risk for human health' reported on the use of colorants and other chemical additives in fish feed and on the application of chemicals against parasites as well as the use of growth-promoting hormones and antibiotics. The articles pointed out that these chemicals are potentially carcinogenic. Some articles also reflected upon the concentration of noxious substances such as polychlorinated dibenzo-p-dioxins in farmed seafood. The most controversial subject in this aspect was the use of drugs and in particular of antibiotics in aquaculture: *"Onshore as well as in water-industrial animal production forces the perversion of nature and thus finds itself confronted with a massive image problem. A problem which was also fostered by Asian fish farmers, who stuffed shrimps and other seafood with antibiotics until the EU stopped the import in 2002"* (SZ-Online 2010). Some articles compared aquaculture to mass animal husbandry and inferred from this an excessive use of antibiotics. Articles also criticized the preventive application of antibiotics.

Other arguments discussed in this aspect pointed out the decreasing use of antibiotics and stated that the use of antibiotics was no longer a concern in aquaculture: Improved farm management, innovations (e.g., use of cleaner wrasse) and more rigid controls would prevent the improper use of

drugs, especially antibiotics: *“Compared to the year 1987, when Norway fed one kilogram of antibiotics per metric ton of farmed salmon, the amount of antibiotics has decreased to a minimum today”* (SZ-Online 2010). With regard to the use of antibiotics, German aquaculture was presented favorably. Some articles stated that German aquacultures rarely employed antibiotics and other kinds of drugs also due to the rigid regulations in place.

Only a minority of articles (21%) in this attribute highlighted seafood as healthy food for human beings. These articles argued that seafood is high in omega-3 fatty acids as well as in iodine, vitamins and micronutrients. The preventive effect of seafood on cardiovascular diseases was also mentioned. Some articles referred to the German Food Association (DGE, Deutsche Gesellschaft für Ernährung), which recommends the consumption of seafood once to twice a week.

As in the ‘environment’ attribute, with 374 records salmon was the fish species most often referred to in this attribute, followed by sturgeon (86 mentions) and trout (68 mentions).

The low coverage of the potentially positive effects of seafood consumption on human health was obvious. This does not necessarily mean that health effects are of lower relevance for the media or the consumers. Since the health benefits of seafood consumption are already widely recognized, media may have decided to present new information instead of repeating what is already well known (see also Amberg and Hall 2008; Schlag 2011).

The ‘animal welfare’ attribute

The ‘animal welfare’ attribute was addressed as often as the ‘human health’ attribute. It included two aspects: ‘appropriate husbandry’ (64%) and ‘animal health’ (36%), which indicates that the appropriate culturing of farmed aquatic species was more at the focus. The articles in this aspect, most frequently discussed questions related to the stocking density. It was stressed that high stocking densities are common in some forms of aquaculture. Examples were salmon and shrimp farming. Articles related high stocking densities with a low freedom of movement, which would result in a potentially high stress level for the fish. Consequently, the possibilities of species-appropriate behavior and thus animal welfare were questioned in some forms of aquaculture. It was concluded that the high stocking densities in aquaculture might imply animal welfare problems similar to those in intensive pig and poultry farming: *“Aquaculture is the pig fattening of the sea, the animal welfare problems are comparable to those of intensive livestock farming”* (SZ-Online 2012). In contrast, other articles argued that some species (e.g., trout) need a certain stocking density in order to meet the requirements of animal welfare.

Part of the articles also discussed the growth period for fish and the design of species-appropriate aquaculture systems. Some articles highlighted the fact that the growth period for some fish species such as salmon is very short in aquaculture, and thus, the natural rhythm of the animals is ignored. Other articles pointed out that the rearing of some species, such as sturgeon, allows for longer growth periods.

Aquaculture systems which enable species-appropriate behavior and are near natural were described as particularly animal friendly. German pond aquaculture was acknowledged to be animal friendly.

Articles focusing on 'animal health' argued that the rearing of aquaculture species in intensive production systems enhances stress levels and as such reduces resistance to environmental challenges including pathogens. A decreased fitness in aquaculture was also linked to antibiotic resistance originating from a high use of antibiotics in highly stocked farms. The salmon aquaculture in Chile was presented as particularly vulnerable for epidemics due to low animal welfare and environmental standards. The composition of fish feed was another topic in this aspect. Some articles reported on the difficulties in producing species-appropriate plant-based fish feed.

The 'regulation' attribute

The 'regulation' attribute was the least frequently considered attribute. We divided the 'regulation' attribute in the three aspects 'regulation and control on national level' (50%), 'impact of the EU' (42%) and 'conflict of interest' (8%).

In the 'regulation and control on national level' aspect, existing controls were criticized. Part of the articles doubted that controls are sufficient with respect to environment and food safety. Some articles reported on incidents of misdeclaration of species in Europe and worldwide. Other articles focused on the regulation of aquacultural production, which was described as being rather strict in European countries. In contrast, the regulations in Chile, the USA and Canada were described as less rigid and in case of Chile as particularly inefficient. The articles highlighted the schemes of Norway and UK as European examples for well implemented regulations. It was acknowledged that both have taken into account the potential problems which had arisen during the fast development of salmon farming (e.g., high use of drugs, compromise of surrounding ecosystems). In general, the European aquaculture sector was described as safe for the consumer and the environment.

The 'impact of the EU' aspect referred to the positive and negative impact of the EU as a regulatory body in the aquaculture sector. On the one hand, some articles described the EU regulations as an additional burden to national laws for the economic development of the sector. On the other hand, the EU was presented as a supporter of the European aquaculture industry because of its efforts in

setting standards and labeling, such as indications of origin (PDO, protected designation of origin) and organic production. Other articles also mentioned some strategies developed on the EU level to foster the development of the EU aquaculture sector. Some articles pointed to the subsidies issued for the aquaculture sector by the EU.

All the articles which reported on the 'conflict of interest' aspect belonged to the negative tone. The articles described situations in which an excessively close relationship between politicians or NGOs and the aquaculture industry had been observed. Some articles suggested that the aquaculture industry uses these connections to hush up critical incidents: *"For years, the salary of a salmon expert of the WWF Norway was completely paid by Marine Harvest, the biggest player in the sector"* (FAZ-Online 2012a).

5.3.5.2.3 Production systems

Aquaculture produces a variety of seafood products which are produced in many different production systems. People's appreciation of aquaculture heavily depends on the production system used (see also Feucht and Zander 2015). That is why the analysis of media coverage has to differentiate between the different production systems. The analyzed newspaper articles covered a total of nine different production systems. The three most prevalent were ponds (38%), recirculating systems (21%) and cages (19%). Flow-through systems, aquaponics, pole culture and rope culture were also mentioned.

Because a previous study had shown that German consumers had a rather negative perception of recirculating systems (RAS) and a rather positive perception of organic practices (Feucht and Zander 2015), we intended to explore how the public media presented those two practices with respect to the attributes found.

RAS as well as organic farming were described as having good economic prospects due to the fact that they both operate in profitable and booming niche markets. The prospects for RAS were particularly seen in the production of exotic and highly demanding species like shrimp and sturgeon. In contrast, market potential for organic aquaculture would be based on practicing particularly eco- and animal friendly.

Organic aquaculture was presented as an eco-friendly alternative to conventional production practices due to its holistic approach and its claim to produce as close to nature as possible. Additionally, RAS and especially aquaponics were depicted as eco-friendly production methods. Some articles argued that these systems use water very efficiently and protect the surrounding ecosystems due to their closed cycles: *"The ECF (an aquaponic system—author's note) [...] requires much less water than*

industrialized agriculture” (FAZ-Online 2012b). However, the high energy requirements of RAS were criticized by the media.

Organic aquaculture practices as well as RAS were described as healthy alternatives to other forms of aquaculture. The articles reported that organic aquaculture is free of chemicals, genetically modified components and other additives due to higher standards compared to conventional aquaculture. Because of the sophisticated and sensitive technology used in RAS, it was acknowledged that these systems are free of pharmaceuticals, hormones and other chemicals.

With respect to animal welfare, organic aquaculture was presented as being particularly appropriate. The high degree of animal friendliness was inferred from lower stocking densities compared to conventional aquaculture and the near naturalness¹¹ of the farms: *“Organic salmon of the coast of Scotland and Ireland, for example, are less cramped together than its relatives in conventional salmon fatteners”* (SZ-Online 2008). In contrast, the species appropriateness of RAS was partially doubted because of the high stocking densities often found in these systems. High stocking densities were associated with augmented stress levels and increased incidences of cannibalism. Moreover, the articles also questioned whether the facilities used in RAS would support fish welfare by for example avoiding fin erosion due to abrasion. On the other hand, RAS were presented as systems with a particularly low pathogen load due to their independence from the surrounding environment.

5.3.5.2.4 Stakeholders in the media

Stakeholders can play an active role in the media coverage of issues. By, for example, forwarding press releases to the journalists who might use them as information source for an article, they can influence the content of media reporting. From a journalist point of view, references to stakeholders enhance the credibility of articles. We found in total 759 references to stakeholders (Table 9). The majority of the references referred to fish farmers (30%), followed by scientists (15%) and NGOs (15%).

¹¹ When articles used the term ‘near naturalness’, they referred to the scenic environment as well as to the design of the systems themselves (e.g., sand on the bottom of a basin).

Table 9: References made by the articles about aquaculture to stakeholders (absolute and percentage)

Stakeholders	References
Fish farmers	228 (30%)
Scientists	116 (15.3%)
NGOs	111 (15%)
Political sphere (politicians, public and governmental authorities)	98 (13%)
Organizations/Institutions (associations, institutions of the United Nations, municipal service providers)	90 (12%)
Processors (also cooks and restaurants)	54 (7%)
Retail	25 (3%)
Media	17 (2%)
Equipment manufacturers	11 (1.5%)
Certification institutions (Naturland, MSC, ASC)	9 (1.2%)
Total	759 (100%)

In order to further investigate the potential influence fish farmers have on the media coverage, we explored the roles ascribed to them in the analyzed articles. We found that the fish farmers had four different roles: agents, experts, opponents and critical farmers, whereby each fish farmer could occupy various roles in one article. Articles referred to producers as 'agent' if the person was neutrally described as pursuing his or her profession. Fish farmers were assigned the role of an 'expert' if they were presented as an authority in their field or if the person was described as the person providing specific information. In the role of opponents, fish farmers articulated opposite positions to, e.g., NGOs or politicians. As 'critical farmer,' fish farmers pointed out problems connected with aquaculture, such as conflicts with wildlife or rigid environmental regulations. Most of the articles referred to fish farmers as agents (43 %) and experts (32 %). In 16 % of the references, fish farmers were presented as opponents, whereas the producers were at least often portrayed as critical farmers (9 %). These results indicate that the media rely to a considerable extent on the stakeholders of the aquaculture sector in their reporting. Particularly, fish farmers are frequently used as 'informants.' This implies that fish farmers have a remarkable potential to influence media coverage in accordance with their specific interests.

5.3.6 Discussion and conclusions

Our analysis revealed that the German media primarily described aquaculture in a positive to neutral tone. Articles pointing out negative aspects of aquaculture often balanced their critique by simultaneously giving favorable counterarguments. This is in itself a good message for the aquaculture sector since the German readership does receive mainly positive to neutral impulses from the media with respect to aquaculture. It also shows that in comparison with previous studies, the media position toward aquaculture might have changed from primarily emphasizing risks to highlighting the benefits of this sector. In accordance with previous studies (Amberg and Hall 2008; Höijer et al. 2006; Schlag 2011), economic benefits were still predominantly discussed compared to the benefits of the other attributes.

With regard to the different systems and practices, we found that ponds as well as RAS and organic fish farming were primarily presented in a positive light. All three systems were described as being eco-friendly and representing a healthy alternative. Thus, the coverage supported the acceptance or at least interest in systems with a higher technical level (e.g., aquaponics).

Stakeholders play an important role in media coverage. In contradiction to the perception within the aquaculture sector that media normally referred to stakeholders outside of the aquaculture sector (e.g., NGOs), our study revealed that the media primarily considered the fish farmers' perspectives, in their roles as agents or experts, as well as scientists' views. The aquaculture sector itself has thus a remarkable opportunity to influence the medial presentation of aquaculture. For obvious reasons, e.g., physical proximity, this holds particularly true with respect to German aquaculture. This is reflected in our results, which show that the German aquaculture sector was primarily presented in a positive light. It was described as being eco-friendly and producing healthy food while simultaneously providing eco-services which are of relevance to society as a whole. The argument of ecosystem services might foster the perception of traditional pond aquaculture as worthy of protection due to its status as cultural heritage and important element in nature conservation.

In addition to the attributes found by earlier studies (Amberg and Hall 2008; Höijer et al. 2006; Schlag 2011), our analysis revealed that 'animal welfare' is another relevant attribute in the media coverage of aquaculture. This reflects the general increase in public concern about the impacts of farming on animal welfare. It is also in line with other studies which have shown that fish welfare is an emerging issue (e.g., Andersen 2011; Eurobarometer 2007; Honkanen and Olsen 2009; Pieniak et al. 2013; Röcklinsberg 2015). We also found that the media coverage sometimes compared aquaculture to intensive terrestrial livestock farming. This phenomenon is in accordance with recent results in con-

sumer research (e.g., Vanhonacker et al. 2011; Feucht and Zander 2015). Presumably, animal welfare will become a more prominent and more intensely discussed attribute of aquaculture in the future.

With respect to the human health and environment attribute and their respective aspects, our findings show that compared to the studies by Amberg and Hall (2008) as well as Schlag (2011) the media coverage was focused less on negative impacts on human health than on the environment. The analyzed media acknowledged the progress made to reduce the use of chemicals and in particular antibiotics. However, the relatively low coverage of the benefits of aquaculture in combination with environmental aspects is evident. According to the agenda-setting approach, the prevalence of environmental risks in the coverage might lead the recipients to think of aquaculture as rather harmful to the environment. This could impact the favorable public perception of aquaculture as an ecofriendly alternative to capture fishery negatively, especially, due to the fact that negative information is weighted more heavily by the reader than positive information (Hallahan 1999).

The general presentation of aquaculture in the media can be summarized as follows: Aquaculture is a dynamic economic sector with potential for innovation—a sector that is able to connect environmental-friendly practices with local production and quality (freshness, taste, etc.). Nonetheless, aquaculture exhibits some critical issues with respect to the environment and animal welfare.

Media turned out to be open-minded toward information coming from the aquaculture industry which is reflected by the attempt of many articles to grasp the complexity of the issue by presenting both advantages and disadvantages of the sector and referring to stakeholders as experts. The media can thus take over an important role as intermediary translating the complex content for their readership. But the media depend on the input of the aquaculture sector which clearly needs to address advantages and disadvantages of its production practices. Environmental and animal welfare effects of aquaculture production are of particular relevance in this respect. An open and honest communication is required in order to increase and maintain public's trust in aquaculture.

5.3.7 Acknowledgements

We thank two anonymous reviewers for their valuable comments and suggestions.

6 Discussion

In the following the results of the three presented studies are discussed in light of the potentials and limits of sustainability communication as an empowering strategy to foster sustainable food consumption. First the results of the media analysis, in combination with the outcomes of the focus groups, are debated with the focus on sustainability communication via media. Afterwards, the potentials and limits of sustainability communication via labeling and claims on products are reviewed based on the results of the study about consumer perception of sustainable aquaculture and of the study analyzing the potential of carbon labels.

6.1 Medial presentation and consumer perception of sustainable aquaculture

In the media coverage, as well as in the perception of the participants, environmental aspects and animal welfare emerged as important issues. The analyzed media as well as the focus group participants mostly condemned the use of fish meal and fish oil in aquaculture. In both studies the sustainability in aquaculture was linked to the activities undertaken in fish farming to protect endangered species (e.g., farming of endangered species for the release into the wild). Animal welfare issues addressed by participants as well as in the media centered on stocking densities, the freedom to move and the species-appropriateness of different production systems. Media and focus group participants compared aquaculture and in particular more intensive and technical systems (e.g., RAS) with intensive livestock farming.

The use of drugs, in particular antibiotics, and growth promoting hormones was a controversially discussed issue by the participants and the media. In general, the use of drugs and any other potentially harmful substances to humans was rejected. Even though some participants acknowledged that the use of pharmaceuticals might be necessary for the welfare of the fish. The excessive use of antibiotics was in particular connected by the participants of the focus groups to farming practices in Asia. This was to a certain degree also reflected in the media coverage. In contrast to the discussion of the focus groups, the press also acknowledged the ongoing reduction in the use of antibiotics in aquaculture.

Overall, the media and the participants held the most positive views about the German aquaculture sector compared to other countries. German aquaculture was described by focus group participants and in the media as trustworthy, producing high quality and healthy fish. Additionally, locally produced fish was depicted by both as preferable with respect to higher freshness and having a lower climate impact due to shorter transport distances.

With respect to the production systems (pond aquaculture, flow-through and recirculation systems) and practices (conventional and organic production), the comparison of the results of the focus groups and the media analysis revealed that pond aquaculture emerged as the most favored system. It was described as sustainable, species-appropriate and closest to nature. The ecosystem services of pond aquaculture were acknowledged by consumers as well as by the media. The naturalness of the production method was seen as an indication of eco-friendliness. Both the media as well as the participants depicted organic aquaculture as the best aquaculture practice.

In tendency, the media transported a more positive view of RAS than the one found in the focus groups. The participants in the focus groups frequently were alienated by the high technical degree of RAS. Most of them deemed RAS as being 'artificial' and highly industrialized and, thus, assumed a low degree of sustainability. In contrast, the media mainly described RAS as a sustainable production system. The media presented the sophisticated technology used in RAS as an asset for an economically viable and eco-friendly aquaculture. The high water efficiency and the closed cycles of RAS were highlighted as very eco-friendly. The media acknowledged that these systems are free of pharmaceuticals, which was also recognized by some of the participants. The presentation in the media and the participant's perception were in line with respect to concerns about the animal welfare conditions in RAS.

Main similarities between the media coverage and participants opinions were the views on environmental aspects, on animal welfare issues, on German aquaculture and on pond as well as organic aquaculture. Also the media as well as the focus group participants rejected the use of drugs and other harmful substances to humans in aquaculture. This comparison shows that many topics related to sustainable aquaculture coincide between the studied articles and the perceptions of the focus group participants. This highlights that the agenda setting of the media has an influence on what consumers think about aquaculture. Additionally, consumers in the focus groups explicitly referred to the media as a source of information. Given this, these findings underline the importance of the media coverage of sustainability issues as an empowering tool for sustainable behavior. Public media coverage has the potential to increase awareness and knowledge about various sustainability topics (Bergleiter and Meisch 2015; DG Mare 2008; Hall and Amberg 2013; Hansen 2011). The media has the ability to break down complex issues in a way that laypersons can understand them. Against this background, the study focusing on the presentation of aquaculture in the media highlights that the media can act as an intermediary between the food sector and the wider public.

But the medial agenda-setting effect for sustainability topics has limits. Even though in some cases the medial depiction of aquaculture aspects was very similar to the perceptions of the participants, in other cases, like, for example, with the use of antibiotics, the statements differed when looked at in

more detail. In the case of the use of antibiotics and other ‘artificial’ additives in aquaculture, concerns about potential misuse of antibiotics, other pharmaceuticals and other ‘artificial’ additives were mostly emphasized while none of the participants expressed to be aware of the reduction of the use of antibiotics. This difference between the medial presentation and participant’s perception points out a drawback of the medial sustainability communication: Positive information transported by the media has less chance to get memorized by consumers than negative information. Also negative information is weighted more heavily by consumers than positive information (Froehlich et al. 2017; Hallahan 1999). As a consequence, consumers might refrain from purchasing sustainable products based on negative information they retained about this product, even though this information is outdated.

In the case of the perceptions about RAS, the differences between the studied media and the participant’s statements reveal another limit of sustainability communication. While the media mostly described RAS as sustainable, many consumers in the focus groups tended to refuse RAS as sustainable because this assumption did not fit with one of their mental frames. Many consumers have a mental frame, which equates a high closeness to nature with a high degree of sustainability and reflects the longing for naturalness in food (e.g., Cox 2013; Gaskell 2010). Given this, an important moderator of sustainability communication is pointed out: Existing beliefs. Individuals tend to fit new information with their preexisting conceptual structures and, thus, to patterns of interpretation, which consumers use to understand reality – the so called mental frames. In this way information can lose its intended meaning because it is reinterpreted in line with the individual mental frames (Cox 2013; Gustafson and Rice 2016).

Another limit of sustainability communication via media is that the media coverage is dominantly event-driven. Dramatic and new upcoming topics are preferred over topics which take a long time to develop their significance and are complicated in nature and, thus, hard to visualize as it is frequently with sustainability issues (Hansen 2010).

6.2 Potentials and limits of sustainability labels and claims on food

6.2.1 Potentials

The research undertaken in this thesis clearly shows that product information on sustainability supports some consumers in voluntarily shifting to more sustainable choices. One central indication for this is shown by the revealed WTP for carbon footprint labels and other sustainability indications (organic, locally produced, climate-friendly claim) in this thesis. The findings in the studies about sustainable aquaculture and about carbon labels highlight that consumers demand sustainability com-

munication tools such as sustainability labels and claims even though they do not always actively consider them in their purchase decisions. They have become expected indications for sustainable product choices. They serve as guidance to those consumers, who are interested in more information and, thus, who wish to actively engage in sustainable choices.

The results found for carbon labels, sustainability labels and claims for aquaculture products revealed that claims and labels have the potential to motivate consumers to act sustainably if they connect to preexisting ideas and expectations and thus to mental frames (see also Cox 2013). Therefore, claims and labels should target consumers' existing mental frames and avoid meaningless as well as negatively associated words (see also Clayton et al. 2015; Cox 2013). But connecting to these mental frames and defining the mental frames to which a concrete sustainability issue should be related to can be quite challenging. Identifying relevant mental frames requires the understanding of consumer's perceptions and needs which do differ according to lifestyle (Cox 2013; Eden 1993; Reisch and Bietz 2011).

Additionally, the findings of this thesis underline that in particular labels can enhance trust in sustainable products especially if the compliance with the respective sustainability standards is controlled by an independent body (Golan et al. 2001). However, sustaining the trust in a label demands constant efforts in ensuring the compliance and even might involve a steady advancement of the underlying standards in order to sustain consumers trust and to ensure sustainability. In order to raise awareness and to sustain trust, claims and labels have to be concise and easy to comprehend.

In line with Young et al. (2010) the results of this thesis show that sustainability labels have the potential to be used by consumers as a key short cut for decision making and are thus a valuable tool in supporting consumers in making sustainable choices. But the results for the sustainability labels and claims for aquaculture products and for carbon labels stress that some consumers favor one unified sustainability label due to the information overload felt by many consumers and the complexity of trading-off the different sustainability attributes. Such a unified sustainability label is expected to include an evaluation of how sustainable a product is with respect to all three dimensions of sustainability. The provision and design of such a unified label, however, poses some challenges with regard to its content and understandability. For instance, the questions have to be answered which sustainability attributes to include and how to weight them against each other. The risk arises that a unified sustainability label might oversimplify the complex trade-offs between different sustainability issues. Also an oversimplification can hinder consumers in making choices in line with their preferences since they might not be able to find the specific sustainability attribute they are looking for.

6.2.2 Limits

One very important barrier for sustainable consumption, which is targeted by sustainability communication, is low consumer knowledge about sustainability in food and about how to act upon information received about sustainability (see also Vanhonacker et al. 2013; Laureati et al. 2013; Young et al. 2010). Important instruments of sustainability communication to inform and enable consumers are food labeling and claims (e.g., Cox 2013; Onozaka et al. 2015). The results found for sustainability labels and claims show that these instruments have a limited impact on consumers' consumption behavior of sustainable food. Most of the consumers in the study about sustainable aquaculture were unaware of sustainability labels on aquaculture products. However, they recognized some of the labels from other food categories. Some consumers had no need for additional information about sustainable aquaculture even though they had limited knowledge. Therefore, sustainability labels and claims on aquaculture products had thus far little success in supporting consumers in making sustainable choices. Likewise, consumers were mostly unaware of carbon labels on foods and they struggled to define climate-friendly food. Although most consumers were interested in climate-friendly behavior they acknowledged that they might not switch to labelled products if they were provided.

One important reason for this limited impact is that consumers are overstrained by the information available and by making complex trade-off decisions with respect to sustainability. For example, how should an individual know how to weight a carbon footprint versus a fair trade label or an organic one? Therefore, providing consumers with all the different sustainability options on products might be confusing to them and not really help them to make sustainable decisions (see also Altintzoglou and Nøstvold 2014; Verbeke et al. 2008; Vermeir and Verbeke 2008; Yates 2008). Instead consumers might feel helpless and might even refuse products.

Changing individual behavior frequently necessitates more knowledge, more (or different) skills. Since the acquisition of both relies on spending time and sometimes money, consumers have to be willing to do so for sustainable food consumption. But consumers frequently state that they lack time and money. Also, in line with the structural approach of De Bakker and Dagevos (2012), it needs to be taken into account that behavior changes are influenced by social structures. Given this, sustainable food consumption has to be considered in combination with other aspects of individual lifestyles and, thus, has to be embedded in enabling structures (Kruse 2011; Seyfang 2005; Reisch and Bietz 2011; Voget-Kleschin 2015; Yates 2008; Young et al. 2010).

The limits of consumers' responsibility to act sustainably have to be acknowledged. Consumers in the studies undertaken for this thesis, on the one hand, took over responsibility for a sustainable devel-

opment and, on the other hand, refused to take the main responsibility. They perceived the task to reach a more sustainable world as a shared obligation between individual and society. That is also the reason why the participants in the research underlying this thesis had a tendency to attribute a bigger share of the responsibility for sustainable development to other parties, like the government and the retail, which they perceived to be more empowered to act (see also Middlemiss 2010).

These results show that consumers do not want to be judged and to be pushed into action. Ensuing guilt if people fail to perform in an expected manner demotivates people in the long run to live more sustainably (Middlemiss 2010). Since individuals recognize that sustainability comprises collective efforts it is important that strategies for sustainable development are embedded in a structure which acknowledges the collective and individual responsibility simultaneously. Individuals have to be supported and feel as being part of a bigger movement also in order to perceive their actions as meaningful and thus effective. Consumers should not have the main responsibility for making these complex trade-offs, instead, going along with the change of choice conditions approach, governments and business should support consumers in taking away some of the complexity. Retailers, for example, could introduce higher minimum standards which increase the sustainability over the whole product range (Yates 2008). Also the retail should offer a wide variety of sustainable product choices in order to enable consumers to choose sustainable products (see also Young et al. 2010).

7 Limitations of the present research and further research needs

The present section discusses the limits of the present research and further research needs.

As with other methods for WTP estimation and preference elicitation working with stated preference data, choice experiments can only provide proximate estimations for WTP values and preferences due to the hypothetical nature of the experiments (Miller et al. 2011). Compared to other survey techniques CE show the lowest hypothetical bias and thus yield the most realistic estimates for consumers' preferences and WTP (Hensher et al. 2015). In order to reduce the influence of the hypothetical bias in CE, estimations for preferences were based on mixed logit models which take account for preference heterogeneity and allow for correlation of unobservable influences on choice making. Further, the hypothetical bias was reduced by estimating the WTP with generalized mixed logit models and using cheap talk to introduce participants to the choice task. All three measures have been found to result in more realistic purchase decisions (Hensher et al. 2015). Additionally, qualitative face-to-face interviews were conducted in a next step in order to explore the reasoning consumers apply in real markets. Combining the results of both research steps resulted in a more realistic answer to the question of whether carbon labels are an appropriate communication tool to foster climate-friendly behavior.

In the present thesis we used milk as the target product for eliciting preferences and WTP for carbon labels and other sustainability indications. But Grunert et al. (2014) show that sustainability considerations differ between product categories. Therefore, further studies with other products are needed in order to explore preferences and WTP for climate-friendly labeled food further. In this context, the feasibility of a CE with a large number of products has to be considered since valid results for each considered product require a large amount of choice tasks. Hence, the more products are tested, the more participants and the more time for estimating the results are needed. Given this, the researcher always faces the tradeoff between the number of products, the validity and reliability of the experiment and the time and financial budget of a research project.

The qualitative face-to-face interviews, which aimed to elicit preferences for climate-friendly food further, were conducted in three out of the six countries included in the preceding quantitative research step, following a case study approach. France, Germany and UK were selected. The choice of countries ensured obtaining insights from countries with and without preexisting food carbon labels. Another important criterion of selection was that all interviews were to be conducted by the same interviewer so that cross-case comparability was maximized. Given that the results of the quantitative research step revealed some differences between countries, it would be interesting to look fur-

ther into cultural differences and to conduct qualitative face-to-face interviews in Norway, Spain and the UK.

For the research focusing on consumers' perceptions of sustainable aquaculture the explorative approach of focus groups was applied since prior to this research little was known about consumers' knowledge and perception of sustainability in aquaculture and about promising ways of communicating these sustainable practices to consumers. The dynamic and interactive nature of this method allowed to discover the unexpected and to gain deeper insights into consumers' perceptions by letting them freely exchange thoughts and opinions (Blank 2007; Halkier 2010; Wilson 1997). However, being explorative by nature focus groups do not allow for a generalization of the findings. Given that, there is a need to quantify the variety of perceptions found in the focus groups in a future research step.

The research on the media coverage of aquaculture focused on the print and online versions of the most read German newspapers. The selected newspapers reflect a broad political spectrum from social liberal (SZ) to right-wing populism (BILD) (Baron and Steinwachs 2012). Since other media like television and social media have also an influence on consumers' perceptions of sustainability issues future research should look into the presentation of aquaculture in other media. Especially online content is gaining in importance as information source (Pompper 2016).

8 Conclusions

The results of this thesis highlight that media, labels and claims are important instruments for creating awareness about sustainability in food and for enabling consumers to act. They have the potential to foster sustainable food consumption. But the results also reveal some limits of these different communication instruments and of the empowering approach in general in fostering sustainable food consumption. It is stressed that governments and the retail have to alter choice conditions in order to ensure that consumers can do their share for sustainable development.

Sustainability communication via media puts sustainability issues on the agenda of people's mind set and supports them in understanding complex topics. But sustainability communication via media has its limits. For example, balanced information is less probable to be memorized by consumers than negative news. Therefore, sustainability issues related to risk such as human health risks resulting from the use of pharmaceuticals in aquaculture, have a higher chance to resonate in people's minds. Additionally, in order for a sustainability issue to appear in the media it has to be newsworthy. This criterion makes it hard for complex issues to be taken up by the media. Also, sustainability information in general has to connect to the mental frames of consumers in order to be considered. Otherwise, individuals tend to ignore the offered information or to interpret it out of line with the intended meaning.

Sustainability communication tools like claims and sustainability labels are appreciated by consumers and are even sometimes expected as indications for a sustainable product. They support consumers in voluntarily making sustainable food choices by informing them and enhancing trust in sustainable products. But consumers are frequently overstrained by the multitude of information offered about products. Therefore, some of them tend to ignore the information offered while others take in particular sustainability labels as an indication for quality and for an ethical correct product without further discriminating between the different attributes signaled by different labeling schemes. Additionally, some consumers state a wish for a unified sustainability label in order to decrease confusion.

In light of this, the results of the present thesis point out that consumer's abilities to act sustainably can be enhanced by sustainability communication but that this approach is restricted by the limits of consumer's capacities to actively contribute to sustainable development. The results of this thesis as well as other studies (e.g., Hartikainen et al. 2014; Yates 2008) stress that sustainability becomes only relevant for the purchase decision after more basic attributes such as functionality and other important aspects have been fulfilled. Thus far, changes in the market towards sustainability mostly occurred if structural players such as the retail supported sustainable consumption for example by

taking the most unsustainable products off the shelves (Yates 2008). Even though, consumers buying power can make a difference for sustainable development, the reality shows that consumers have to be supported by other stakeholders like the government and the retail and, thus, by a change of choice conditions (De Bakker and Dagevos 2012; Yates 2008).

Consumers need and demand the support of other stakeholders like governments and the retail in order to act sustainably. Consumers are prepared to take responsibility for sustainable development but it is up to governments and businesses to provide enabling structures, which allow consumers to fulfill this responsibility. Sustainability itself demands an interdisciplinary approach and, thus, the active participation of all parts of society is essential (e.g., Godeman and Michelsen 2011). Examples for opportunities for governments to act are the provision of empowering information (e.g., through consumer oriented government websites), a tax for the least sustainable goods and an adaptation of regulations for production standards in line with sustainable objectives. Retailers have the opportunity to alter choice conditions by for example offering more sustainable products. Without these enabling structures consumers are overburdened with the responsibility put on them and might fail to make a meaningful contribution to sustainable development.

Given the three approaches for the achievement of more sustainable lifestyles - voluntary change of choices by consumers, alteration of choice conditions by governments and businesses, empowering strategies to support voluntary actions of consumers – the present thesis highlights that all three approaches should be implemented simultaneously in order to ensure that consumers can meaningfully contribute to sustainable development. Thus far political decisions for sustainability are slow and businesses in some areas are rather unwilling to change the choice conditions (Orach et al. 2017). One good example for this is the handling of the European fish stocks. Even though a study by the European Commission (2009) showed that 88% of European fish stocks are overfished, the fishing effort has increased and policy makers still struggle to respond to the overfishing problem (Orach et al. 2017). Also retailers around Europe still sell fish originating from overfished populations, even though some retailers make an effort to avoid endangered species.

The present thesis focuses on sustainability communication via media, sustainability labels and claims. It reveals that information provision is an important strategy for fostering sustainable food consumption but also points out the limits of sustainability communication. A clear statement is made that consumers need enabling structures to act sustainably. Given this, nudging strategies might present a promising approach since research (e.g., De Bakker and Dagevos 2012; Hartmann and Siegrist 2017; Reisch and Bietz 2011; Thaler and Sunstein 2009; Yates 2008) showed that such activities like choice editing (taking the most unsustainable product of the shelf or increasing the standards of all products) or sustainable defaults (e.g., the serving of healthy food in canteens unless

another choice is made) are at least as effective as efforts to influence consumers' knowledge, preferences and attitudes via more direct communication tools. Thus, the role of nudging in the support of sustainable food consumption should be further explored.

Another road forward to foster sustainable consumption via sustainability communication is the use of online information tools such as blogs, social media, nonmainstream media and social news aggregators. The internet is of increasing importance as information source and allows for an interactive discourse between consumers and other stakeholders of sustainable development (see also Pomper 2016). Ways to integrate sustainability in formal education and to develop sustainable values also have to be looked into.

Summary

English Summary

Since the Brundtland Report the concept of sustainable development is widely present in everyday life. But thus far, politics, science, the economy and the society in general struggle with the implementation of the concept. Questions remain on how to attain sustainability and on how to engage everyone in the process.

One important area of sustainable development is consumption and in this area food consumption represents an '(un)sustainability hot spot'. Food production has wide environmental, social and economic impacts. Globally, food accounts for 45 to 70% of household impacts on the environment (Ivanova et al. 2016). Given this, changing individuals' food consumption patterns in a more sustainable direction contributes significantly to sustainable development. Different approaches for the achievement of more sustainable lifestyles exist: a) Change of choices – Consumers voluntarily shift to more sustainable consumption patterns, b) Change of choice conditions – Governments, retailers and other subjects can alter the choice conditions, c) Empowering strategies – Measures that support consumers in making sustainable choices. The present thesis in particular explores the approach of empowering strategies.

One way to empower consumers is to increase knowledge and awareness about sustainability issues. This can be accomplished through sustainability communication. While different stakeholders take part in sustainability communication, the present thesis focuses on two stakeholders, the media and consumers. The media engages in sustainability communication by selecting which sustainability topics they present and thus making some topics salient while ignoring others. The media has the potential to set the agenda for public concern about and awareness of sustainability issues. Consumers take part in sustainability communication by, for example, using information about sustainable products and services provided by businesses. Different instruments for the sustainability communication from businesses to consumers exist. The present thesis looks into sustainability labels and claims. The presence of a sustainability label and/or a claim conveys to consumers that the labeled product fulfills specific sustainability standards. In this context, claims and labels have the potential to create awareness and provide basic information to consumers about sustainable choices.

The present thesis focuses on the potentials and limits of sustainability communication as an empowering strategy for supporting consumers in voluntarily changing their food consumption choices to more sustainable foods. Its overarching objective is to reveal the potentials and limits of sustaina-

bility communication via media, labels and claims to foster the consumption of climate-friendly food and sustainably farmed fish. The thesis hereby highlights how far sustainability communication, as an empowering strategy, can support the approach of change of choices. It shows where the voluntary shift of consumers reaches its limits and has to be supported by a change of choice conditions.

The present thesis consists of three studies:

1. “Do carbon labels lead to an increase in climate-friendly consumption? A mixed methods approach in 6 European countries”

The study aims to explore if carbon labels represent an appropriate tool to foster climate-friendly behavior. It investigates the reasons why stated preferences for climate-friendly food do not always show up in real market behavior.

2. “Of earth ponds, flow-through and closed recirculation systems — German consumers' understanding of sustainable aquaculture and its communication”

The study aims to reveal German consumers' perceptions of sustainable aquaculture, related production practices and communication tools (labels and claims).

3. “Aquaculture in the German print media”

The study aims to elicit which issues of aquaculture are addressed by the media and in which manner.

In addition to the objectives of the second and third study, the present thesis compares the agenda setting of the media to consumers' perceptions of sustainable aquaculture.

To address the above-mentioned aims of this thesis a mix of quantitative and qualitative methods was used. A mixed methods approach combining an online survey containing choice experiments with qualitative face-to-face interviews was applied to explore consumers' perceptions of climate-friendly food as well as the limits and merits of a carbon footprint label for fostering climate-friendly consumption. The qualitative approach of focus groups was used to reveal German consumers' perception of sustainable aquaculture and about related sustainability communication instruments (labels and claims). Quantitative and qualitative content analysis was conducted to analyze the media coverage of aquaculture.

Main results of the first study are that the presence of a carbon label increases the purchase probability and that consumers are willing to pay a price premium for a product showing a carbon label in all countries under investigation. But the contribution of a carbon label to a more climate-friendly

consumption might be limited since consumers are frequently overstrained with climate-friendly buying decisions.

A central result of the second study is that consumers, even though they have frequently little knowledge of aquaculture, often have a limited need for information about aquaculture. Consumers are mostly unfamiliar with existing labeling schemes and perceive the presented communication messages as too vague and/or too complex. They want to rely on the aquaculture industry to comply with sustainability standards.

The third study highlights that the media can take over an important role as intermediary translating the complex issues related to aquaculture for their readership. The study shows that the media primarily reports on aquaculture in a positive to neutral tone. Economic benefits of aquaculture dominate the coverage, whereas potential negative aspects of aquaculture receive less attention.

With respect to the overarching objective of this thesis, the results reveal that media, labels and claims are important instruments for creating awareness about sustainability in food and for enabling consumers to act. They have the potential to foster sustainable food consumption. The media coverage has an influence on what consumers think about aquaculture since many topics related to sustainable aquaculture coincided between the studied media coverage and the perceptions of the participants in the focus groups. Similarities were particularly found for the views on environmental aspects, on animal welfare issues, on German aquaculture and on pond as well as organic aquaculture. Labels and claims are appreciated by consumers and are even sometimes expected as indications for a sustainable product. They support consumers in voluntarily making sustainable food choices by informing them and enhancing trust in sustainable products.

But the results also reveal some limits of these different communication instruments and of the empowering approach in fostering sustainable food consumption. A limitation of sustainability communication via media is that negative information is more probable to be retained by readers than out-balanced and positive information. Since issues have to be newsworthy in order to be published by the media, more complex sustainability issues are less probable to be covered. Additionally, information transported via media might fail to reach people if it does not fit with people's preexisting ideas. An important limitation of sustainability labels and claims is that consumers frequently feel overstrained by the information offer about products and by making complex trade-off decisions between sustainability attributes. For example, how should an individual know how to weight a carbon footprint versus a fair trade label or an organic one? As a result some consumers ignore the offered information while others take in particular sustainability labels as an indication for quality and

for an ethical correct product without further discriminating between the different attributes signaled by different labeling schemes.

With respect to the found potentials and limits of sustainability communication as an empowering strategy the thesis stresses that governments and the retail also have to take up responsibility for sustainable development. Opportunities for governments to act are, for example, the provision of information campaigns and an adaptation of regulations for production standards in line with sustainable objectives. Retailers have the opportunity to alter choice conditions by, for example, increasing the number of sustainable products. All three approaches for the achievement of sustainable lifestyles should be followed simultaneously in order to ensure that consumers can meaningfully contribute to sustainable development.

Zusammenfassung

Seit dem Brundtland-Bericht ist das Konzept der nachhaltigen Entwicklung allgegenwärtig. Politik, Wissenschaft, Wirtschaft und die Gesellschaft im Allgemeinen tun sich jedoch bisher mit der Umsetzung des Konzepts schwer. Es ist immer noch offen, wie Nachhaltigkeit erreicht und wie alle Teile der Gesellschaft in diesen Prozess miteinbezogen werden können.

Ein wichtiger Aktionsbereich der nachhaltigen Entwicklung ist Konsum. Innerhalb dieses Feldes ist der Lebensmittelkonsum von besonderer Bedeutung, da dieser als ein "Unnachhaltigkeitsbrennpunkt" gilt. Die Lebensmittelproduktion hat tiefgehende ökologische, soziale und ökonomische Auswirkungen. Weltweit gehen 45 bis 70% der haushaltsbedingten Umwelteinflüsse auf den Lebensmittelkonsum zurück (Ivanova et al. 2016). Dementsprechend trägt eine Veränderung der individuellen Konsummuster, hin zu einem nachhaltigeren Konsum von Lebensmitteln, signifikant zu einer nachhaltigen Entwicklung bei. Für die Erreichung nachhaltiger Lebensstile existieren verschiedene Ansätze: a) Veränderung der Wahlentscheidungen – Verbraucher nehmen freiwillig nachhaltigere Konsummuster an, b) Veränderung des Wahlkontexts – Regierungen, der Handel und andere Subjekte können den Kontext für die Wahlentscheidungen verändern, c) Befähigungsstrategien – Maßnahmen, die Verbraucher dabei unterstützen nachhaltige Entscheidungen zu treffen. Die vorliegende Dissertation beschäftigt sich insbesondere mit den Befähigungsstrategien.

Verbraucher können zum nachhaltigen Handeln befähigt werden, indem Nachhaltigkeitsthemen stärker in das Bewusstsein gerückt und das Wissen zu diesen Themen erhöht werden. Beides kann durch Nachhaltigkeitskommunikation erreicht werden. Verschiedene Akteure sind an der Nachhaltigkeitskommunikation beteiligt, wobei sich die vorliegende Dissertation auf zwei Akteure konzentriert: Medien und Verbraucher. Die Medien beteiligen sich an der Nachhaltigkeitskommunikation, indem

sie auswählen, über welche Nachhaltigkeitsthemen sie berichten und somit welche sie hervorheben. Sie haben das Potential, das Interesse und das Bewusstsein für Nachhaltigkeitsthemen durch ihre Berichterstattung zu beeinflussen. Verbraucher beteiligen sich an der Nachhaltigkeitskommunikation in dem sie beispielsweise Informationen nutzen, die von nachhaltigen Produkten und Dienstleistungen bereitgestellt werden. Für die Nachhaltigkeitskommunikation zwischen Wirtschaft und Verbrauchern werden verschiedene Instrumente genutzt. Die vorliegende Dissertation beschäftigt sich mit Nachhaltigkeitslabeln und Nachhaltigkeitsbotschaften. Das Vorhandensein eines Nachhaltigkeitslabels und/oder einer -botschaft vermittelt Verbrauchern, dass das gekennzeichnete Produkt bestimmte Nachhaltigkeitsstandards erfüllt. Folglich haben Label und Botschaften das Potential, Bewusstsein zu schaffen und grundlegende Informationen über nachhaltige Wahlentscheidungen zu transportieren.

Die vorliegende Dissertation beschäftigt sich mit den Potentialen und Grenzen von Nachhaltigkeitskommunikation, die durch Befähigung Konsumenten bei ihrer freiwilligen Entscheidung für einen nachhaltigeren Lebensmittelkonsum unterstützt. Das übergeordnete Ziel dieser Arbeit ist es aufzuzeigen, welche Potentiale und Grenzen die Nachhaltigkeitskommunikation via Medien, Label und Botschaften birgt, um den Konsum von klimafreundlichen Lebensmitteln und nachhaltig gezüchtetem Fisch anzuregen. In diesem Zusammenhang verdeutlicht die vorliegende Arbeit, inwiefern die Befähigungsstrategie den Ansatz der Veränderung der Wahlentscheidung unterstützen kann. Es wird dargelegt, wo die Grenzen einer freiwilligen Konsumveränderung liegen und wo nachhaltiger Konsum durch das Anpassen des Wahlkontextes unterstützt werden sollte.

Die vorliegende Dissertation besteht aus drei Studien:

1. "Können CO₂-Label den klimafreundlichen Konsum anregen? Ein Mixed-Methods Ansatz in 6 europäischen Ländern"

Die Studie untersucht, ob CO₂-Label geeignet sind klimafreundliches Verhalten zu fördern. Geäußerte Präferenzen für klimafreundliche Lebensmittel werden ermittelt und es wird der Frage nachgegangen, warum sie sich nicht immer im realen Marktverhalten wiederfinden.

2. "Von Erdteichen, Durchflusssanlagen und geschlossenen Kreislaufanlagen – Das Verständnis deutscher Konsumenten von nachhaltiger Aquakultur und ihrer Kommunikation"

Ziel dieser Studie ist es, die Wahrnehmung der deutschen Verbraucher gegenüber nachhaltiger Aquakultur und damit zusammenhängenden Produktionspraktiken und Kommunikationsinstrumenten (Label und Botschaften) zu analysieren.

3. "Aquakultur in den deutschen Printmedien"

Die Studie erforscht, wie das Thema Aquakultur in den Medien dargestellt wird und welche Themen adressiert werden.

Zusätzlich zu den Zielen der zweiten und dritten Studie vergleicht die vorliegende Dissertation das Agenda Setting der Medien mit der Konsumentenwahrnehmung von nachhaltiger Aquakultur. Um die genannten Ziele dieser Dissertation zu erreichen, wurde ein Mix aus quantitativen und qualitativen Methoden eingesetzt. Die Konsumentenwahrnehmung klimafreundlicher Lebensmittel und die Grenzen sowie Vorteile eines CO₂-Labels für die Beförderung eines klimafreundlichen Konsums wurden anhand eines Methodenmix untersucht. Der Methodenmix bestand einerseits aus einer Kombination von Onlinebefragung mit Kaufexperimenten und andererseits aus qualitativen Einzelinterviews. Anhand der qualitativen Methode der Gruppendiskussionen wurde analysiert, wie deutsche Konsumenten nachhaltige Aquakultur und damit zusammenhängende Instrumente der Nachhaltigkeitskommunikation (Label und Botschaften) wahrnehmen. Quantitative und qualitative Inhaltsanalyse wurden kombiniert, um die Medienberichterstattung über Aquakultur zu untersuchen.

Die erste Studie zeigt, dass die Präsenz eines CO₂-Labels die Kaufwahrscheinlichkeit erhöht. In allen untersuchten Ländern sind Konsumenten bereit, eine Preisprämie für ein mit einem CO₂-Label gekennzeichnetes Produkt zu bezahlen. Der Beitrag eines CO₂-Labels zu einem klimafreundlicheren Konsum ist jedoch begrenzt, da Konsumenten häufig mit Kaufentscheidungen für klimafreundliche Produkte überfordert sind.

Ein zentrales Ergebnis der zweiten Studie ist, dass Verbraucher häufig einen geringen Bedarf an Informationen über Aquakultur haben, obwohl sie meistens wenig Wissen über Aquakultur besitzen. Meistens kennen Verbraucher die existierenden Zertifizierungssysteme nicht und die Kommunikationsbotschaften werden als zu abstrakt und/oder zu komplex empfunden. Sie möchten sich darauf verlassen, dass der Aquakultursektor die Nachhaltigkeitsstandards einhält.

Die dritte Studie zeigt, dass die Medien eine wichtige Vermittlerrolle einnehmen können, indem sie komplexe Zusammenhänge der Aquakultur für Ihre Leserschaft herunterbrechen. Die mediale Berichterstattung über Aquakultur hat hauptsächlich einen positiven bis neutralen Ton. Ökonomische Vorteile der Aquakultur beherrschen die Berichterstattung, während potentiell negative Aspekte weniger Beachtung finden.

Hinsichtlich des übergeordneten Ziels dieser Dissertation zeigen die Ergebnisse, dass Medien, Label und Botschaften wichtige Instrumente sind, um Bewusstsein für Nachhaltigkeit in Lebensmitteln zu schaffen und um Konsumenten zum Handeln zu befähigen. Alle drei haben das Potential, den nachhaltigen Lebensmittelkonsum anzuregen. Die mediale Berichterstattung beeinflusst was Verbraucher über Aquakultur denken, da die untersuchte Berichterstattung zur nachhaltigen Aquakultur und die

Wahrnehmung der Gruppendiskussionsteilnehmer bei vielen Aspekten übereinstimmt. Übereinstimmungen finden sich insbesondere bei der Sicht auf Umweltaspekte, auf Tierwohlthemen, auf die deutsche Aquakultur und auf Teich- sowie ökologische Aquakultur. Label und Botschaften werden von den Verbrauchern geschätzt und manchmal sogar als Hinweis auf ein nachhaltiges Produkt erwartet. Beide Instrumente unterstützen Verbraucher in ihrer freiwilligen Entscheidung für nachhaltige Lebensmittel, indem sie informieren und das Vertrauen in nachhaltige Produkte stärken.

Die Ergebnisse zeigen aber auch, dass die drei Kommunikationsinstrumente sowie der Befähigungsansatz nur begrenzt in der Lage sind, den nachhaltigen Lebensmittelkonsum zu unterstützen. Eine Grenze der Nachhaltigkeitskommunikation via Medien ist, dass negative Informationen mit einer höheren Wahrscheinlichkeit im Gedächtnis verbleiben als ausgewogene und positive Informationen. Da Themen berichtenswert sein müssen, um von den Medien veröffentlicht zu werden, haben komplexere Nachhaltigkeitsthemen eine geringere Chance publiziert zu werden. Außerdem können medial vermittelte Informationen daran scheitern, Menschen zu erreichen, wenn diese Informationen nicht mit den bereits existierenden Vorstellungen der Empfänger zusammenpassen. Eine wichtige Grenze von Nachhaltigkeitslabeln und Botschaften ist, dass Verbraucher häufig überlastet sind von den verfügbaren Produktinformationen und davon komplexe Abwägungen zwischen Nachhaltigkeitseigenschaften zu treffen. Beispielsweise gilt es, einen CO₂-Fußabdruck gegenüber einem Fairtrade-Label oder einem Bio-Label abzuwägen. Im Kontext dieser Problematik entscheiden sich manche Konsumenten, die angebotene Information zu ignorieren. Andere hingegen interpretieren Nachhaltigkeitslabel als Hinweis auf Qualität und auf ein ethisch korrektes Produkt, ohne weiter zwischen den verschiedenen Eigenschaften, die durch das Zertifizierungssystem ausgewiesen werden, zu differenzieren.

Die dargestellten Potentiale und Grenzen von Nachhaltigkeitskommunikation als eine Befähigungsstrategie machen deutlich, dass auch Regierungen und der Handel Verantwortung für nachhaltige Entwicklung übernehmen müssen. Handlungsmöglichkeiten für Regierungen sind beispielsweise die Durchführung von Informationskampagnen und eine Anpassung der gesetzlichen Grundlagen für Produktionsstandards an entsprechende Nachhaltigkeitsziele. Händler haben die Möglichkeit, den Entscheidungskontext zu verändern, indem sie beispielsweise das Angebot an nachhaltigen Produkten erweitern. Alle drei Ansätze zur Erreichung nachhaltiger Lebensstile sollten gleichzeitig verfolgt werden, um sicherzustellen, dass Verbraucher sinnvoll zur nachhaltigen Entwicklung beitragen können.

References

- Aaker, D.A., Kumar, V., Day, G.S., Leone, R.P., (2011). *Marketing research*. 10 ed. John Wiley & Sons, Hoboken.
- Aarset, B., Beckmann, S., Bigne, E., Beveridge, M., Bjørndal, T., Bunting, J., McDonagh, P., Mariojouis, C., Muir, J., Prothero, A., Reisch, L., Smith, A., Tveteras, R., Young, J., (2004). The European consumers' understanding and perceptions of the "organic" food regime: The case of aquaculture. *British Food Journal*, 106, 93–105.
- AGOF, Arbeitsgemeinschaft Online Forschung, (2014). *Angebotsranking—Angebote im Oktober 2014: Übersicht gesamt*. Available from: <http://www.agof.de/angebotsranking/>, accessed 26.01.2015.
- Akaichi, F., Nayga Jr, R.M., Nalley, L.L., (2017). Are there trade-offs in valuation with respect to greenhouse gas emissions, origin and food miles attributes?. *European Review of Agricultural Economics*, 44, 3-31.
- Albersmeier, F., Schulze, H., Spiller, A., (2010). System dynamics in food quality certifications: Development of an audit integrity system. *International Journal of Food System Dynamics*, 1, 69–81.
- Altintzoglou, T., Einarsdottir, G., Valsdottir, T., Schelvis, R., Skara, T., Luten, J., (2010b). A voice-of-consumer approach in development of new seafood product concepts. *Journal of Aquatic Food Production Technology*, 19, 130–145.
- Altintzoglou, T., Verbeke, W., Vanhonacker, F., Luten, J., (2010a). The image of fish from aquaculture among Europeans: Impact of exposure to balanced information. *Journal of Aquatic Food Production Technology*, 19, 103–119.
- Altintzoglou, T., Nøstvold, B.H., (2014). Labelling fish products to fulfil Norwegian consumers' needs for information. *British Food Journal*, 116, 1909-1920.
- Amberg, S.M., Hall, T.E., (2008). Communicating risks and benefits of aquaculture: A content analysis of US newsprint representations of farmed salmon. *Journal of the World Aquaculture Society*, 39, 143–157.
- Amberg, S.M., Hall, T.E., (2010). Precision and rhetoric in media reporting about contamination in farmed salmon. *Scientific Communication*, 32, 489–513.
- Andersen, L.M., (2011). Animal welfare and eggs — Cheap talk or money on the counter?. *Journal of Agricultural Economics*, 62, 565–584.

- Backhaus, J., Breukers, S., Mont, O., Paukovic, M., Mourik, R., (2012). Sustainable lifestyles: Today's facts and tomorrow's trends. Available from https://www.sustainable-lifestyles.eu/fileadmin/images/content/D1.1_Baseline_Report.pdf, accessed 12.05.2017.
- Baldo, G., Marino, M., Montani, M., Ryding, S.-O., (2009). The carbon footprint measurement toolkit for the EU ecolabel. *International Journal of Lifecycle Assessment*, 14, 591-596.
- Baron, C., Steinwachs, B., (2012). "Faul Frech Dreist" Die Diskriminierung von Erwerbslosigkeit durch BILDLeser*innen. Edition assemblage, Münster.
- Beattie, G., Sale, L., (2009). Explicit and implicit attitudes to low and high carbon footprint products. *The International Journal of Environmental, Cultural, Economic and Social Sustainability*, 5, 191-206.
- Berry, T., Crossley, D., Jewell, J., (2008). Check-out carbon: The role of carbon labelling in delivering a low-carbon shopping basket. Available from: <http://www.forumforthefuture.org/sites/default/files/project/downloads/check-out-carbon-final300608.pdf>, accessed 06.04.2014.
- Bergleiter, S., Meisch, S., (2015). Certification standards for aquaculture products: Bringing together the values of producers and consumers in globalised organic food markets. *Journal of Agricultural and Environmental Ethics*, 28, 553–569.
- BILD, (2012). Alle Fakten zur BILD—Auflage, Redaktionen, Journalisten. Available from: <http://www.bild.de/digital/bildzeitung-druck/bild-druck/alle-fakten-redaktionen-journalisten-19083750.bild.html>, accessed 23.01. 2015.
- Blank, R., (2007). Gruppendiskussionsverfahren. In: Naderer, G., Balzer, E. (Eds.), *Qualitative Marktforschung in Theorie und Praxis*. Gabler, Wiesbaden, pp. 279-301.
- Boardman, B., (2008). Carbon labelling: Too complex or will it transform our buying?. *Significance*, 5, 168-171.
- Bonfadelli, H., (2010). Environmental sustainability as challenge for media and journalism. In: Gross M., Heinrichs, H. (Eds), *Environmental sociology — European perspectives and interdisciplinary challenges*. Springer, Heidelberg, pp. 257-278.
- Bonfadelli, H., Friemel, T. N., (2011). *Medienwirkungsforschung*. 4 ed. UVK Verlagsgesellschaft, Konstanz.
- Boulus, P., Dowding, K., (2014). The press and issue framing in the Australian mining tax debate. *Australian Journal of Political Science*, 49, 649–710.

- Brace, I., (2013). Questionnaire design: How to plan, structure and write survey material for effective market research. 3 ed. Kogan Page Limited, London.
- Breidert, C., Hahsler, M., Reutterer, T., (2006). A review of methods for measuring willingness-to-pay. *Innovative Marketing*, 2, 8-32.
- Brulle, R.J., Jenkins, J.C., (2006). Spinning our way to sustainability?. *Organization and Environment*, 19, 82-87.
- Bryman, A., (2006). Integrating quantitative and qualitative research: How is it done?. *Qualitative Research*, 6, 97-113.
- Bryman, A., (2008). *Social research methods*. 3 ed. Oxford University Press, Oxford.
- Buba, H., Globisch, S., Grötzbach, J., (2009). Anregungen für die Nachhaltigkeitskommunikation aus kulturpolitischer Perspektive — Bausteine eines Orientierungsrahmens zu einem kulturbezogenen Konzept der Nachhaltigkeitskommunikation. Umweltbundesamt, Dessau-Roßlau.
- Burns, A.C., Bush, R.F., (2010). *Marketing research*. 6 ed. Pearson, Boston.
- Burger, E., Meixner, O., Pöchtrager, S., (2010). Carbon Footprint bei Lebensmitteln. Inhaltsanalytische Ermittlung relevanter Berechnungskriterien. Schriftenreihe des Instituts für Marketing und Innovation, 5, Wien.
- Busch, G., Kayser, M., Spiller, A., (2013). "Massentierhaltung" aus VerbraucherInnensicht — Assoziationen und Einstellungen. *Jahrbuch der Österreichischen Gesellschaft für Agrarökonomie*, 22, 61–70.
- Caputo, V., Nayga, R.M., Scarpa, R., (2013). Food miles or carbon emissions? Exploring labelling preference for food transport footprint with a stated choice study. *Australian Journal of Agricultural and Resource Economics*, 57, 465-482.
- Chen, P.Y., Krauss, A.D., (2004). Intracoder reliability. In: Lewis-Beck, M.S., Bryman, A., Liao, T.F. (Eds), *Encyclopedia of research methods for the social sciences*, Vol. 2. Sage Publications, Newbury Park, pp. 445-446.
- Claret, A., Guerrero, L., Aguirre, E., Rincón, L., Hernández, M.D., Martínez, I., Benito Peleteiro, J., Grau, A., Rodríguez-Rodríguez, C., (2012). Consumer preferences for sea fish using conjoint analysis: Exploratory study of the importance of country of origin, obtaining method, storage conditions and purchasing price. *Food Quality and Preference*, 26, 259–266.

- Clayton, S., Devine-Wright, P., Stern, P.C., Whitmarsh, L., Carrico, A., Steg, L., Bonnes, M., (2015). Psychological research and global climate change. *Nature Climate Change*, 5, 640-646.
- Coleman, R., Banning, S., (2006). Network TV news' affective framing of the presidential candidates: Evidence for a second-level agenda-setting effect through visual framing. *Journal of Mass Communication Quarterly*, 83, 313–328.
- Cox, R., (2013). *Environmental communication and the public sphere*. 3 ed. Sage Publications, Los Angeles, London, New Delhi, Singapore, Washington DC.
- Creswell, J.W., Plano Clark, V.L., (2011). *Designing and conducting mixed methods research*. 2 ed. Sage Publications, Los Angeles, London, New Delhi, Singapore, Washington DC.
- Dagevos, H., Voordouw, J., (2013). Sustainability and meat consumption: Is reduction realistic? *Sustainability: Science, Practice and Policy*, 9, 60-69.
- Darby, K., Batte, M.T., Ernst, S., Roe, B., (2008). Decomposing local: A conjoint analysis of locally produced foods. *American Journal of Agricultural Economics*, 90, 476-486.
- De Bakker, E., Dagevos, H., (2012). Reducing meat consumption in today's consumer society: Questioning the citizen-consumer gap. *Journal of Agricultural and Environmental Ethics*, 25, 877-894.
- De Boer, J., de Witt, A., Aiking, H., (2016). Help the climate, change your diet: A cross-sectional study on how to involve consumers in a transition to a low-carbon society. *Appetite*, 98, 19-27.
- De Marchi, E., Caputo, V., Nayga Jr., R.M., Banterle, A., (2016). Time preferences and food choices: Evidence from a choice experiment. *Food Policy*, 62, 99-109.
- Denscombe, M., (2008). Communities of practice: A research paradigm for the mixed methods approach. *Journal of Mixed Methods Research*, 2, 270-283.
- DESTATIS, Statistisches Bundesamt, (2013). *Land und Forstwirtschaft, Fischerei — Erzeugung in Aquakulturbetrieben 2012*. Fachserie 3, Reihe 4.6, Statistisches Bundesamt, Wiesbaden.
- DESTATIS, Statistisches Bundesamt, (2014). *Land und Forstwirtschaft, Fischerei — Erzeugung in Aquakulturbetrieben 2013*. Fachserie 3, Reihe 4.6., Statistisches Bundesamt, Wiesbaden.
- De Witt, C., (2011). Media theory and sustainability communication. In: Godemann, J., Michelsen, G. (Eds.), *Sustainability communication: Interdisciplinary perspectives and theoretical foundation*. Springer, Dordrecht, pp. 79-88.

DG Mare, Directorate General for Maritime Affairs, (2008). Enquête d'image sur la perception des produits de la pêche et de l'aquaculture — Etude 1 dans le cadre du contrat cadre Lot 3 — Etudes relatives à la mise en oeuvre du FEP — Rapport final. Available from: http://ec.europa.eu/fisheries/documentation/studies/study_market/fap_exec_summary_en.pdf, accessed 22.01.2013.

Dillman, D.A., Christian, L.M., Smyth, J.D., (2014). Internet, phone, mail, and mixed-mode surveys: The tailored design method. 4 ed. John Wiley & Sons, Hoboken.

EDEKA, (2014). Nachhaltigkeit liegt uns am Herzen. Available from: https://www.edeka.de/verantwortung/nachhaltigkeit/wwf/edeka_nachhaltigkeit.jsp, accessed 29.10.2014.

Eden, S.E., (1993). Individual environmental responsibility and its role in public environmentalism. *Environment and Planning A*, 25, 1743-1758.

Eder, K., (1996). The institutionalisation of environmentalism: Ecological discourse and the second transformation of the public sphere. In: Lash, S., Szerszynski, B., Wynne, B. (Eds.), *Risk, environment and modernity: Towards a new ecology*. Sage Publications, London, Thousand Oaks, New Delhi, pp. 203-223.

Eurobarometer, (2007). Attitudes of EU citizens towards animal welfare. Special Eurobarometer 270. Available from: http://ec.europa.eu/public_opinion/archives/ebs/ebs_270_en.pdf, accessed 04.04.2013.

Eurobarometer, (2009). Europeans' attitudes towards climate change. Special Eurobarometer 313. Available from: http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_300_full_en.pdf, accessed 05.06.2015.

European Commission, (2009). Green paper - Reform of the Common Fisheries Policy. Available from: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0163:FIN:EN:PDF>, accessed 22.07.2017.

FAO, (2012). The state of world fisheries and aquaculture 2012. Available from: <http://www.fao.org/3/a-i2727e.pdf>, accessed 12.12.2012.

FAZ, (2010). Lachs für die Welt. Freitag, 15. Oktober. Print edition.

FAZ-Online, (2012a). Der WWF ist schizophren. Samstag, 2. Juni. Online edition.

FAZ-Online, (2012b). Die Fisch-Gemüse-WG – oder: Kommt unser Essen bald vom Supermarktdach?. Dienstag, 26. Juni. Online edition.

- Feldmann, C., Hamm, U., (2015). Consumers' perceptions and preferences for local food: A review. *Food Quality and Preference*, 40, 152-164.
- Feucht, Y., Zander, K., (2015). Of earth ponds, flow-through and closed recirculation systems — German consumers' understanding of sustainable aquaculture and its communication. *Aquaculture*, 438, 151–158.
- Finch, H., Lewis, J., (2003). Focus groups. In: Ritchie, J., Lewis, J. (Eds.), *Qualitative research practice*. Sage Publications, London, pp. 170–197.
- Finch, L., Lewis, J., Turley, C., (2014). Focus groups. In: Ritchie, J., Lewis, J., McNaughton Nicholls, C., Ormston, R. (Eds.), *Qualitative research practice - A guide for social science students and researchers*, 2 ed. Sage Publication, London, Thousand Oaks, New Delhi, Singapore, pp. 211-242.
- Fischmagazin, (2015). Undifferenziert, pauschalisiert und falsch — Presseberichte zu Medikamenten in Zuchtfisch. *Fischmagazin*, 5, 48–51.
- FIZ, Fisch-Informationen Zentrum e.V., (2013). *Fischwirtschaft Daten und Fakten*. Available from: http://www.fischinfo.de/pdf/Daten_und_Fakten_2013.pdf, accessed 02.11.2013.
- FIZ, Fisch-Informationen Zentrum e.V., (2014). *Fischwirtschaft Daten und Fakten 2014*. Available from: http://www.fischinfo.de/images/broschueren/pdf/FIZ_DF_2014.pdf, accessed 04.05.2015.
- Freeland, A.M., (2012). Second level agenda setting: An overview of second-level agenda setting and framing. University of North Texas. Available from: http://www.academia.edu/3355260/An_Overview_of_Agenda_Setting_Theory_in_Mass_Communications, accessed 09.07.2015.
- Fritsche, U.R., Eberle, U., Wiegmann, K., Schmidt, K., (2007). *Treibhausgasemissionen durch Erzeugung und Verarbeitung von Lebensmitteln*. Öko-Institut e.V., Darmstadt, Hamburg.
- Froehlich, H.E., Gentry, R.R., Rust, M.B., Grimm, D., Halpern, B.S., (2017). Public perceptions of aquaculture: Evaluating spatiotemporal patterns of sentiment around the world. *Plos One*, 12, 1-18.
- Früh, W., (2011). *Inhaltsanalyse: Theorie und Praxis*. 7 ed. UVK, Konstanz.
- Gadema, Z., Oglethorpe, D., (2011). The use and usefulness of carbon labelling food: A policy perspective from a survey of UK supermarket shoppers. *Food Policy*, 36, 815-822.

- Gaskell, G., (2010). Communication, perception and participation of the consumer. In: Federal Agency for the Safety of the Food Chain (Ed.), *Nanotechnology in the food chain: Opportunities and risks*. Federal Agency for the Safety of the Food Chain, Brussels, pp. 77-84.
- Godemann, J., Michelsen, G., (2011). *Sustainability communication: Interdisciplinary perspectives and theoretical foundation*. Springer, Dordrecht, Heidelberg, London, New York.
- Golan, E., Kuchler, F., Mitchell, L., Greene, C., Jessup, A., (2001). Economics of food labeling. *Journal of Consumer Policy*, 24, 117-184.
- Golan, G.J., Kioussis, S.K., McDaniel, M.L., (2007.) Second level agenda setting and political advertising. *Journalism Studies*, 8, 432–443.
- Gössling, S., Buckley, R., (2016). Carbon labels in tourism: Persuasive communication?. *Journal of Cleaner Production*, 111, 358-369.
- Grunert, K.G., Hieke, S., Wills, J., (2014). Sustainability labels on food products: Consumer motivation, understanding and use. *Food Policy*, 44, 177-189.
- Guenther, M., Saunders, C.M., Tait, P., (2012). Carbon labeling and consumer attitudes. *Carbon Management*, 3, 445-455.
- Gustafson, A., Rice, R.E., (2016). Cumulative advantage in sustainability communication. *Science Communication*, 38, 800-811.
- Haas, M., (2005). „Die geschenkte Zeitung“ — Bestandsaufnahme und Studien zu einem neuen Pressetyp in Europa. LIT Verlag, Berlin.
- Halkier, B., (2010). Focus groups as social enactments: Integrating interaction and content in the analysis of focus group data. *Qualitative Research*, 10, 71-89.
- Hall, T.E., Amberg, S.M., (2013). Factors influencing consumption of farmed seafood products in the Pacific northwest. *Appetite*, 66, 1–9.
- Hallahan, K., (1999). Seven models of framing: Implication for public relations. *Journal of Public Relations Research*, 1, 205–242.
- Hansen, A., (2010). *Environment, media and communication*. Routledge, London, New York.
- Hansen, A., (2011). Communication, media and environment: Towards reconnecting research on the production, content and social implications of environmental communication. *The International Communication Gazette*, 73, 7-25.

- Harrison, G.W., Rutström, E.E., (2008). Experimental evidence on the existence of hypothetical bias in value elicitation methods. In: Smith, V.L., Plott, C.R. (Eds.), *Handbook of experimental economics results*, 1. Elsevier, Amsterdam, pp. 752-767.
- Hartikainen, H., Roininen, T., Katajajuuri, J.-M., Pulkkinen, H., (2014). Finnish consumer perceptions of carbon footprints and carbon labelling of food products. *Journal of Cleaner Production*, 73, 285-293.
- Hartmann, C., Siegrist, M., (2017). Consumer perception and behaviour regarding sustainable protein consumption: A systematic review. *Trends in Food Science and Technology*, 61, 11-25.
- Hensher, D.A., Greene, W.H., (2002). The mixed logit model: The state of practice. Available from: <http://ws.econ.usyd.edu.au/itls/wp-archive/ITLS-WP-02-01.pdf>, accessed 24.09.2015.
- Hensher, D.A., Rose, J.M., Greene, W.H., (2015). *Applied choice analysis: A primer*. 2 ed. Cambridge University Press, Cambridge.
- Hicks, D., Pivarnik, L., McDermott, R., (2008). Consumer perceptions about seafood — An internet survey. *Journal of Foodservice*, 19, 213–226.
- Hites, R.A., Foran, J.A., Carpenter, D.O., Hamilton, M.C., Knuth, B.A., Schwager, S.J., (2004). Global assessment of organic contaminants in farmed salmon. *Science*, 303, 226–229.
- Höijer, B., Lidskog, R., Thornberg, L., (2006). News media and food scares: The case of contaminated salmon. *Environmental Sciences*, 3, 273–288.
- Honkanen, P., Olsen, S.O., (2009). Environmental and animal welfare issues in food choice: The case of farmed fish. *British Food Journal*, 111, 293–309.
- Hughner, R.S., McDonagh, P., Prothero, A., Shultz, 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.
- Hwang, M.I., Lin, J.W., (1999). Information dimension, information overload and decision quality. *Journal of Information Science*, 25, 213–218.
- Ivanova, D., Stadler, K., Steen-Olsen, K., Wood, R., Vita, G., Tukker, A., Hertwich, E.G., (2016). Environmental impact assessment of household consumption. *Journal of Industrial Ecology*, 20, 526-536.
- IVW, Informationsgemeinschaft zur Feststellung der Verbreitung von Werbeträgern, (2015). *Quartalsauflagen 1/2015*. Available from: <http://www.ivw.de/aw/print/qa>, accessed 23.01.2015.

- Jacobs, M., Ferrario, J., Byrne, C., (2002). Investigation of polychlorinated dibenzo-p-dioxins, dibenzo-p-furans and selected coplanar biphenyls in Scottish farmed Atlantic salmon (*Salmo salar*). *Chemosphere* 47, 183–191.
- Jaffry, S., Pickering, H., Ghulam, Y., Whitmarsh, D., Wattage, P., (2004). Consumer choices for quality and sustainability labelled seafood products in the UK. *Food Policy*, 29, 215–228.
- Janssen, M., Hamm, U., (2011). Consumer perception of different organic certification schemes in five European countries. *Organic Agriculture*, 1, 31–43.
- Janssen, M., Hamm, U., (2012). The mandatory EU logo for organic food: Consumer perceptions. *British Food Journal*, 114, 335-352.
- Janßen, D., Langen, N., (2017). The bunch of sustainability labels – Do consumers differentiate?. *Journal of Cleaner Production*, 143, 1233-1245.
- Johnson, R.B., Onwuegbuzie, A.J., Turner, L.A., (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research*, 1, 112-133.
- Kaiser, M., (2012). Why German consumers need to reconsider their preferences: The ethical argument for aquaculture. In: Potthast, T., Meisch, S., (Eds.), *Climate change and sustainable development: Ethical perspectives on land use and food production*. Wageningen Academic Publishers, Wageningen, pp. 321-325.
- Kalshoven, K., Meijboom, F.B., (2013). Sustainability at the crossroads of fish consumption and production ethical dilemmas of fish buyers at retail organizations in the Netherlands. *Journal of Agricultural and Environmental Ethics*, 26, 101–117.
- Kleinschmit, D., (2010). Die Bedeutung der Öffentlichkeit durch Print- und Onlinemedien für eine demokratische Politik – Eine Ernährungspolitische Perspektive. In: Kayser, M., Böhm, J., Spiller, A., (Eds), *Die Ernährungswirtschaft in der Öffentlichkeit — Social Media als neue Herausforderung der PR*. Cuvillier, Göttingen.
- Klinkhardt, M., (2014). Vorurteile, Unwissenheit und schlechte Recherche — Frankfurter Allgemeine Sonntagszeitung zeichnet fragwürdiges Bild der Aquakultur. *Fischmagazin*, 5, 70–71.
- Kruse, L., (2011). Psychological aspects of sustainability communication. In: Godemann, J., Michelsen, G., (Eds.), *Sustainability communication: Interdisciplinary perspectives and theoretical foundations*. Springer, Dordrecht, Heidelberg, London, New York, pp. 69-78.
- Lamnek, S., (2005). *Gruppendiskussion - Theorie und Praxis*. 2 ed. Beltz UTB, Weinheim, Basel.

Lasner, T., (2011). Ökologische Aquakultur: Wie grün ist die blaue Revolution? Der Markt für ökologisch erzeugten Zuchtfisch in Deutschland. *Fischmagazin*, 2, 68–71.

Lass, W., Reusswig, F., (2001). Für eine Politik der differentiellen Kommunikation - Nachhaltige Entwicklung als Problem gesellschaftlicher Kommunikationsprozesse und -verhältnisse. In: Fischer, A., Hahn, G. (Eds.), *Vom schwierigen Vergnügen einer Kommunikation über die Idee der Nachhaltigkeit*. Verlag für akademische Schriften, Frankfurt am Main, pp. 150-174.

Laureati, M., Jabes, D., Russo, V., Pagliarini, E., (2013). Sustainability and organic production: How information influences consumer's expectation and preference for yogurt. *Food Quality and Preference*, 30, 1-8.

Leire, C., Thidell, Å., (2005). Product-related environmental information to guide consumer purchases – A review and analysis of research on perceptions, understanding and use among Nordic consumers. *Journal of Cleaner Production*, 13, 1061-1070.

Lombard, M., Snyder-Duch, J., Campanella Bracken, C., (2010). Practical resources for assessing and reporting intercoder reliability in content analysis research projects. Available from: <http://matthewlombard.com/reliability/>, accessed 24.01.2015.

Lombardi, G.V., Berni, R., Rocchi, B., (2017). Environmental friendly food. Choice experiment to assess consumer's attitude toward "climate neutral" milk: The role of communication. *Journal of Cleaner Production*, 142, 257-262.

Loomis, J., (2011). What's to know about hypothetical bias in stated preference valuation studies?. *Journal of Economic Surveys*, 25, 363-370.

Lorenzoni, I., Pidgeon, N.F., (2006). Public views on climate change: European and USA perspectives. *Climatic Change*, 77, 73-95.

Lorenzoni, I., Nicholson-Cole, S., Whitmarsh, L., (2007). Barriers perceived to engaging with climate change among the UK public and their policy implications. *Global Environmental Change*, 17, 445-459.

Louviere, J.J., Hensher, D.A., Swait, J.D., Adamowicz, W., (2007). *Stated choice methods: Analysis and applications*. 5 ed. Cambridge University Press, Cambridge.

Lüth, A., von Winning, A., Feigs, F., Kölsch, A., Ströbel, M., (2009). Klimaschutz für alle! Klimafreundlicher Konsum als neue Säule für den Klimaschutz. Available from:

https://www.allianz.com/v_1339507806000/media/current/de/presse/news/studien/archiv/downloads/strategiebericht_klimaschutz.pdf, accessed 01.07.2014.

Luhmann, N., (1986). *Ökologische Kommunikation: Kann sich die moderne Gesellschaft auf ökologische Gefährdungen einstellen?*. Westdeutscher Verlag, Opladen.

Macnaghten, P., (2004). Animals in their nature: A case study on public attitudes to animals, genetic modification and 'nature'. *Sociology - The Journal of the British Sociological Association*, 38, 533–551.

Maniates, M.F., (2001). Individualization: Plant a tree, buy a bike, save the world?. *Global Environmental Politics*, 1, 31-52.

Mauracher, C., Tempesta, T., Vecchiato, D., (2013). Consumer preferences regarding the introduction of new organic products. The case of the Mediterranean sea bass (*Dicentrarchus labrax*) in Italy. *Appetite*, 63, 84-91.

Mayring, P., (2010). *Qualitative Inhaltsanalyse - Grundlagen und Technik*. 11 ed. Beltz, Weinheim, Basel.

Mayring, P., (2014). *Qualitative content analysis: Theoretical foundation, basic procedures and software solution*. Available from <http://nbn-resolving.de/urn:nbn:de:0168-ssoar-395173>, accessed 30.03.2017.

McCombs, M., Shaw, D., (1972). The agenda setting function of mass media. *Public Opinion Quarterly*, 36, 176-187.

McFadden, D., (1974). Conditional logit analysis of qualitative choice behavior. *Frontiers in Econometrics*, 105-142.

Meas, T., Hu, W., Batte, M. T., Woods, T. A., Ernst, S., (2015). Substitutes or complements? Consumer preference for local and organic food attributes. *American Journal of Agricultural Economics*, 97, 1044-1071.

Middlemiss, L., (2010). Reframing individual responsibility for sustainable consumption: Lessons from environmental justice and ecological citizenship. *Environmental Values*, 19, 147-167.

Miller, K.M., Hofstetter, R., Krohmer, H., Zhang, Z.J., (2011). How should consumers' willingness to pay be measured? An empirical comparison of state-of-the-art approaches. *Journal of Marketing Research*, 48, 172-184.

- Naylor, R.L., Goldberg, R.J., Primavera, J.H., Kautsky, N., Beveridge, M.C.M., Clay, J., Folke, C., Lubchenco, J., Mooney, H., Troell, M., (2000). Effect of aquaculture on world fish supplies. *Nature*, 405, 1017–1024.
- Neuman, R.W., Just, M.R., Crigler, A.N., (1992). *Common knowledge. News and the construction of political meaning*. University of Chicago Press, Chicago.
- O'Dierno, L.J., Govindasamy, R., Puduri, V., Myers, J.J., Islam, S., (2006). Consumer perceptions and preferences for organic aquatic products: Results from the telephone survey. Rutgers University, Department of Agricultural Food and Resource Economics, P Series. Available from: <http://purl.umn.edu/36743>, accessed 02.05.2013.
- O'Neill, S., Nicholson-Cole, S., (2009). "Fear won't do it": Promoting positive engagement with climate change through visual and iconic representations. *Science Communication*, 30, 355-379.
- Olesen, I., Alfnes, F., Røra, M.B., Kolstad, K., (2010). Eliciting consumers' willingness to pay for organic and welfare-labelled salmon in a non-hypothetical choice experiment. *Livestock Science*, 127, 218–226.
- Olesen, I., Myhr, A.I., Rosendal, G.K., (2011). Sustainable aquaculture: Are we getting there? Ethical perspectives on salmon farming. *Journal of Agricultural and Environmental Ethics*, 24, 381–408.
- Onozaka, Y., McFadden, D.T., (2011). Does local labeling complement or compete with other sustainable labels? A conjoint analysis of direct and joint values for fresh produce claim. *American Journal of Agricultural Economics*, 93, 693-706.
- Onozaka, Y., Hu, W., Thilmany, D.D., (2015). Can eco-labels reduce carbon emissions? Market-wide analysis of carbon labeling and locally grown fresh apples. *Renewable Agriculture and Food Systems*, 31, 122-138.
- Orach, K., Schlüter, M., Österblom, H., (2017). Tracing a pathway to success: How competing interest groups influenced the 2013 EU Common Fisheries Policy reform. *Environmental Science & Policy*, 76, 90-102.
- Ormston, R., Spencer, L., Barnard, M., Snape, D., (2014). The foundations of qualitative research. In: Ritchie, J., Lewis, J., McNaughton Nicholls, C., Ormston, R. (Eds.), *Qualitative research practice – A guide for social science students and researchers*, 13 ed. Sage Publications, London, Thousand Oaks, New Delhi, Singapore, pp. 1-26.

Paquotte, P., (2007). Le marché des produits de la pisciculture en Europe. Paper presented at the Aquaculture Conference of the European Commission 2007, November 15–16, Brussels.

Peattie, K., Peattie, S., (2009). Social marketing: A pathway to consumption reduction?. *Journal of Business Research*, 62, 260-268.

Pieniak, Z., Verbeke, W., Scholderer, J., Brunsø, K., Olsen, S.O., (2007b). European consumers' use of and trust in information sources about fish. *Food Quality and Preference*, 18, 1050–1063.

Pieniak, Z., Verbeke, W., Vermeir, I., Brunso, K., Olsen, S., (2007a). Consumer interest in fish information and labelling: Exploratory insights. *Journal of International Food and Agribusiness Marketing*, 19, 117–141.

Pieniak, Z., Vanhonacker, F., Verbeke, W., (2013). Consumer knowledge and use of information about fish and aquaculture. *Food Policy*, 40, 25–30.

Pompper, D., (2016). Beyond the business case: Building upon traditional approaches and opening new spaces for multiple perspectives on climate and sustainability communication. *Mass Communication and Society*, 19, 543-547.

Prieß, R., (2011). Perspektiven eines klimaverträglichen Konsums jenseits von Konsumverzicht. Beitrag der Plattform Klimaverträglicher Konsum Deutschland. Available from: http://www.pcf-projekt.de/files/1307354666/pkdd2011_perspektiven-klimavertraeglicher-konsum.pdf, accessed 23.06.2014.

Rabiee, F., (2004). Focus group interview and data-analysis. *Proceedings of the Nutrition Society*, 63, 655–660.

Ramme, I., (2009). *Marketing: Einführung mit Fallbeispielen, Aufgaben und Lösungen*. Schäffer-Poeschel, Stuttgart.

Reisch, L.A., Bietz, S., (2011). Communicating sustainable consumption. In: Godemann, J., Michelsen, G. (Eds.), *Sustainability communication: Interdisciplinary perspectives and theoretical foundation*. Springer, Dordrecht, pp. 141-150.

Revelt, D., Train, K., (1998). *Mixed Logit with repeated choices: Households' choices of appliance efficiency level*. MIT Press, 4.

Riffe, D., Lacy, S., Fico, F.G., (2005). *Analyzing media messages - Using quantitative content analysis in research*. 2 ed. Routledge, New York, Oxon.

- Röcklinsberg, H., (2015). Fish consumption: Choices in the intersection of public concern, fish welfare, food security, human health and climate change. *Journal of Agricultural and Environmental Ethics*, 28, 533–551.
- Röös, E., Tjärnemo, H., (2011). Challenges of carbon labelling of food products: A consumer research perspective. *British Food Journal*, 113, 982-996.
- Ryan, K.E., Gandha, T., Culbertson, M.J., Carlson, C., (2014). Focus group evidence: Implications for design and analysis. *American Journal of Evaluation*, 35, 328–345.
- Sanders, J., (2013). Evaluation of the EU legislation on organic farming. Thünen Institute of Farm Economics. Available from: http://ec.europa.eu/agriculture/evaluation/market-and-income-reports/organicfarming-2013_en.htm, accessed 03.11.2014.
- Schenk, M., (2007). *Medienwirkungsforschung*. 3 ed. Mohr Siebeck, Tübingen.
- Scheufele, D.A., Tewksbury, D., (2007). Framing, agenda setting, and priming: The evolution of three media effects models. *Journal of Communication*, 57, 9–20.
- Schlag, A.K., (2010). Aquaculture: An emerging issue for public concern. *Journal of Risk Research*, 13, 829–844.
- Schlag, A.K., (2011). Aquaculture in Europe: Media representations as a proxy for public opinion. *International Journal of Fisheries and Aquaculture*, 3, 158–165.
- Schlag, A.K., Ystgaard, K., (2013). Europeans and aquaculture: Perceived differences between wild and farmed fish. *British Food Journal*, 115, 209–222.
- Schoenbach, K., de Waal, E., Lauf, E., (2005). Research note: Online and print newspapers - Their impact on the extent of the perceived public agenda. *European Journal of Communication*, 20, 245–258.
- Schulze, H., Böhm, J., Kleinschmit, D., Spiller, A., Nowak, A., (2008). Öffentliche Wahrnehmung der Primärverantwortung für Lebensmittelsicherheit: Eine Medienanalyse der Gammelfleischskandale. *Agrarzeitung*, 57, 334–345.
- Seyfang, G., (2005). Shopping for sustainability: Can sustainable consumption promote ecological citizenship?. *Environmental Politics*, 14, 290-306.
- Shao, A.T., Zhou, K.Z., (2007). *Marketing research: An aid to decision making*. Thomson, Mason.

- Spaargaren, G., Oosterveer, P., (2010). Citizen-consumers as agents of change in globalizing modernity: The case of sustainable consumption. *Sustainability*, 2, 1887-1908.
- Spencer, L., Ritchie, J., O'Connor, W., Morrell, G., Ormston, R., (2014). Analysis in practice. In: Ritchie, J., Lewis, J., McNaughton Nicholls, C., Ormston, R. (Eds.), *Qualitative research practice - A guide for social science students and researchers*, 2 ed. Sage Publication, London, Thousand Oaks, New Delhi, Singapore, pp. 295-346.
- Stepchenkova, S., Zhan, F., (2013). Visual destination images of Peru: Comparative content analysis of DMO and user-generated photography. *Tourism Management*, 36, 590-601.
- Solgaard, H.S., Yang, Y., (2011). Consumers' perception of farmed fish and willingness to pay for fish welfare. *British Food Journal*, 113, 997–1010.
- Subasinghe, R.P., Arthur, J.R., Bartley, D.M., De Silva, S.S., Halwart, M., Hishamunda, N., Mohan, C.V., Sorgeloos, P., (2012). Farming the waters for people and food. Proceedings of the Global Conference on Aquaculture, September 22–25, 2010, Phuket, Thailand. FAO, NACA. Available from: ftp://ftp.fao.org/FI/DOCUMENT/aquaculture/aq2010_11/root/global_conference/proceeding_global_conference.pdf, accessed 08.09.2013.
- Swaminathan, M.S., (2012). Aquaculture and sustainable nutrition security in a warming planet - Keynote address 1. In: Subasinghe, R.P., Arthur, J.R., Bartley, D.M., De Silva, S.S., Halwart, M., Hishamunda, N., Mohan, C.V., Sorgeloos, P. (Eds.), *Farming the waters for people and food. Proceedings of the Global Conference on Aquaculture*, September 22–25, 2010, Phuket, Thailand. FAO, NACA, pp. 3–19. Available from: ftp://ftp.fao.org/FI/DOCUMENT/aquaculture/aq2010_11/root/global_conference/proceeding_global_conference.pdf, accessed 08.09.2013.
- SZ, (2011). Lachse statt Flugzeuge. Dienstag, 13. September. Print edition.
- SZ, (2012). Die Grünwäscher. Montag, 2. Juli. Print edition.
- SZ-Online, (2008). Garnelen ohne Antibiotika. Dienstag, 16. Dezember. Online edition.
- SZ-Online, (2010). Fisch aus dem Stall. Montag, 17. Mai. Online edition.
- SZ-Online, (2012). Fische sind die armen Schweine. Donnerstag, 19. Juli. Online edition.
- SZ-Online, (2013). Soja für Seezungen, Raps für Lachs. Montag, 18. März. Online edition.
- Tait, P., Saunders, C., Guenther, M., Rutherford, P., (2016). Emerging versus developed economy consumer willingness to pay for environmentally sustainable food production: A choice experiment

approach comparing Indian, Chinese and United Kingdom lamb consumers. *Journal of Cleaner Production*, 124, 65-72.

Takeshita, T., (1997). Exploring the media's roles in defining reality: From issue-agenda setting to attribute agenda setting. In: McCombs, M., Shaw, D.L., Weaver, D. (Eds), *Communication and democracy: Exploring the intellectual frontiers in agenda-setting theory*. Lawrence Erlbaum Associates, Mahwah, pp. 15-27.

Thaler, R.H., Sunstein, C.R., (2009). *Nudge - Improving decisions about health, wealth and happiness*. Penguin, London.

Thøgersen, J., (2000). Psychological determinants of paying attention to eco-labels in purchase decisions: Model development and multinational validation. *Journal of Consumer Policy*, 23, 285-313.

Thøgersen, J., Hausgaard, P., Olesen, A., (2010). Consumer responses to ecolabels. *European Journal of Marketing*, 44, 1787–1810.

Train, K., Weeks, M., (2005). Discrete choice models in preference space and willingness-to-pay space. In: Scarpa, R., Alberini, A. (Eds.), *Applications of simulation methods in environmental and resource economics*. Springer, Dordrecht, pp. 1-16.

UNFCCC, United Nations Framework Convention on Climate Change, (2016). The Paris agreement. Available from: <http://bigpicture.unfccc.int/#content-the-paris-agreemen>, accessed 09.06.2016.

Upham, P., Bleda, M., (2009). Carbon labelling: Public perceptions of the debate. Summary report. Available from: <http://www.fcrcn.org.uk/sites/default/files/Tyndall%20carbon%20label%20report.pdf>, accessed 05.05.2015.

Upham, P., Dendler, L., Bleda, M., (2011). Carbon labelling of grocery products: Public perceptions and potential emissions reductions. *Journal of Cleaner Production*, 19, 348-355.

Van Loo, E.J., Caputo, V., Nayga, J.R.M., Verbeke, W., (2014). Consumers' valuation of sustainability labels on meat. *Food Policy*, 49, 137-150.

Vanclay, J.K., Shortiss, J., Aulsebrook, S., Gillespie, A.M., Howell, B.C., (2011). Customer response to carbon labelling of groceries. *Journal of Consumer Policy*, 34, 153-160.

Vanhonacker, F., Altintzoglou, T., Luten, J., Verbeke, W., (2011). Does fish origin matter to European consumers? Insights from a consumer survey in Belgium, Norway and Spain. *British Food Journal*, 113, 535–549.

Vanhonacker, F., Van Loo, E.J., Gellynck, X., Verbeke, W., (2013). Flemish consumer attitudes towards more sustainable food choices. *Appetite*, 62, 7-16.

Verbeke, W., Ward, R.W., (2006). Consumer interest in information cues denoting quality, traceability and origin: An application of ordered probit models to beef labels. *Food Quality and Preference*, 17, 453–467.

Verbeke, W., Sioen, I., Brunso, K., De Henauw, S., Van Camp, J., (2007b). Consumer perception versus scientific evidence of farmed and wild fish: Exploratory insights from Belgium. *Aquaculture International*, 15, 121–136.

Verbeke, W., Vanhonacker, F., Sioen, I., Van Camp, J., De Henauw, S., (2007a). Perceived importance of sustainability and ethics related to fish: A consumer behavior perspective. *Ambio*, 36, 580–585.

Verbeke, W., Vermeir, I., Brunsø, K., (2007c). Consumer evaluation of fish quality as basis for fish market segmentation. *Food Quality and Preference*, 18, 651–661.

Verbeke, W., Pieniak, Z., Brunsø, K., Scholderer, J., Olsen, S.O., (2008). Evaluating consumer information needs in the purchase of seafood products. In: Børresen, T. (Ed.), *Improving seafood products for the consumer*. Woodhead Publishing Limited, Boca Raton, Boston, New York, Washington DC, pp. 63–84.

Vermeir, I., Verbeke, W., (2008). Sustainable food consumption among young adults in Belgium: Theory of planned behaviour and the role of confidence and values. *Ecological Economics*, 64, 542-553.

Voelckner, F., (2006). An empirical comparison of methods for measuring consumers' willingness to pay. *Marketing Letters*, 17, 137-149.

Voget-Kleschin, L., (2015). Reasoning claims for more sustainable food consumption: A capabilities perspective. *Journal of Agricultural and Environmental Ethics*, 28, 455-477.

Wägeli, S., Janssen, M., Hamm, U., (2016). Organic consumers' preferences and willingness-to-pay for locally produced animal products. *International Journal of Consumer Studies*, 40, 357-367.

WB, Wissenschaftliche Beiräte für Verbraucher- und Ernährungspolitik sowie Agrarpolitik des Bundesministeriums für Ernährung, Landwirtschaft und Verbraucherschutz, (2011). *Politikstrategie Food Labelling*. Available from: http://www.bmel.de/SharedDocs/Downloads/Ministerium/Beiraete/Agrarpolitik/2011_10_PolitikstrategieFoodLabelling.pdf;jsessionid=979BC2009EE928F51EB946E61E66A56D.2_cid367?__blob=publicationFile, accessed 13.05.2015.

Walling, M.E., Hiemstra, L.D., (2007). Framed salmon: How an ENGO coalition frames the salmon farming issue in British Columbia. *Aquaculture Association of Canada Special Publication*, 12, 26–31.

White, P., Sharp, V., Darnton, A., Downing, P., Inman, A., Strange, K., Garnett, T., (2009). Food synthesis review: A report to the Department for Environment, Food and Rural Affairs. The Social Marketing Practice et al., Defra, London.

Whitmarsh, L., (2009). Behavioural responses to climate change: Asymmetry of intentions and impacts. *Journal of Environmental Psychology*, 29, 13-23.

Whitmarsh, L., Seyfang, G., O'Neill, S., (2011). Public engagement with carbon and climate change: To what extent is the public 'carbon capable'?. *Global Environmental Change*, 21, 56-65.

Whitmarsh, D., Palmieri, M.G., (2011). Consumer behaviour and environmental preferences: A case study of Scottish salmon aquaculture. *Aquaculture Research*, 42, 142–147.

Wilson, V., (1997). Focus groups: A useful qualitative method for educational research. *British Educational Research Journal*, 23, 209–224.

WCED, World Commission on Environment and Development, 1987. *Our common future*. Available from: <http://www.un-documents.net/our-common-future.pdf>, accessed 24.09.2013.

Yates, L., (2008). Sustainable consumption: The consumer perspective. *Consumer Policy Review*, 18, 96-99.

Yeo, A., Legard, R., Keegan, J., Ward, K., McNaughton Nicholls, C., Lewis, J., (2014). In-depth interviews. In: Ritchie, J., Lewis, J., McNaughton Nicholls, C., Ormston, R. (Eds.), *Qualitative research practice - A guide for social science students and researchers*, 2 ed. Sage Publication, London, Thousand Oaks, New Delhi, Singapore, pp. 177-210.

Young, W., Hwang, K., McDoland, S., Oates, C.J., (2010). Sustainable consumption: Green consumer behaviour when purchasing products. *Sustainable Development*, 18, 20-31.

Zander, K., Isermeyer, F., Bürgelt, D., Christoph-Schulz, I., Salamon, P., Weible, D., (2013). *Erwartungen der Gesellschaft an die Landwirtschaft*. Thünen Institut, Braunschweig, Münster.

Zander, K., Zanoli, R., (2013). Consumer perception on organic farming. In: Sanders, J. (Ed.), *Evaluation of the EU—legislation on organic farming*. Available from: http://ec.europa.eu/agriculture/evaluation/market-and-income-reports/organicfarming-2013_en.htm, accessed 03.11.2014, pp. 191-218.

Zander, K., Bürgelt, D., Christoph-Schulz, I., Salamon, P., Weible, D., (2015). Consumers' response to sustainability labelling in wild caught fish. XXII Conference of the European Association of Fisheries Economist, April 28-30, 2015, Salerno, Italy. Available from: http://www.unisa.it/uploads/13606/katrin_zander.pdf, accessed on 22.12.2016.

Zepeda, L., Li, J., (2006). Who buys local food?. *Journal of Food Distribution Research*, 37, 1-11.

Ziemann, A., (2011). Communication theory and sustainability discourse. In: Godemann, J., Michelsen, G., (Eds.), *Sustainability communication: Interdisciplinary perspectives and theoretical foundations*. Springer, Dordrecht, Heidelberg, London, New York, pp. 89-96.