

**Fostering sustainable consumption through communication:
Consumers' appreciation of biodiversity-friendly
pasture-based cattle husbandry**

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Declaration

Declaration in accordance with § 8 of the General Provisions for Doctoral Degrees at the University of Kassel dated 14.07.2021.

1. I herewith give assurance that the submitted dissertation
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Declaration of originality

This dissertation is based on review and empirical research carried out within the consortium research project “GreenGrass” funded by the German Federal Ministry of Education and Research (BMBF), grant number 031B0734, as part of the BMBF initiative “Agricultural Systems in the Future (Agrarsysteme der Zukunft)”. The idea of the part of this project carried out at the University of Kassel was developed by Prof. em. Dr. Ulrich Hamm who supervised it until March 2020. Starting April 2020, Prof. Dr. Katrin Zander took over the supervision of this project and provided advice and feedback throughout the research process. The title of the dissertation is “Fostering sustainable consumption through communication: Consumers’ appreciation of biodiversity-friendly pasture-based cattle husbandry”. This work contains three scientific articles written by me as the first author. All articles have been published in peer-reviewed journals, all listed in Web of Science by Clarivate Analytics:

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List of abbreviations

SDG Sustainable Development Goal

TAP Think aloud protocol

WTP Willingness to pay

Summary

Considering dramatic environmental changes, there is an evident necessity of a transition to more sustainable animal production that caters to societal demand for ethical production and consumption. The slow but steady shift in consumer demand for animal-friendly, environmentally, and socially responsible animal products has been well documented over the past years. The overarching goal of this dissertation is to provide insights regarding consumer perceptions, acceptance, preferences and communication of biodiversity-friendly pasture-based cattle husbandry and products derived from it. The main objectives of the dissertation concern the consumer communication potential of a biodiversity-friendly cattle grazing system based on virtual fencing and the potential of communicating biodiversity conservation as a valuable aspect of pasture-based production. The objectives of the dissertation were approached with three consecutive studies. A systematic review of scientific literature examined the state-of-the-art consumer research on pasture-raised livestock products and identified research gaps in the existing literature on consumers' attitudes and preferences regarding pasture-raised products. The empirical data for this dissertation were collected using qualitative methods of consumer research during two studies that took place in Germany. First, twenty verbal protocols elucidated German consumers' opinions on innovative cattle grazing practice. Second, six online focus groups with a total of forty participants allowed an insight into consumers' perception of a labeling scheme for biodiversity-friendly cattle products. The dissertation emphasizes the importance of communicating relevant attributes in a way easily understandable to consumers as precondition for more sustainable consumption. Regarding the main goal of this dissertation, the findings suggest that, (i) consumers value pasture-based production but have little knowledge about animal husbandry and biodiversity, which makes biodiversity a challenging topic for communication; (ii) the application of innovative grazing technologies in cattle farming is a too complex and controversial topic to be successfully used in consumer communication on pasture-based production; (iii) a multi-level labeling scheme for biodiversity conservation in grazing-based systems is perceived as too complex and excessive; a binary grazing label provides sufficient information to consumers; and (iv) efforts to facilitate more direct communications between consumers and farmers might be an effective alternative to the introduction of a new label. This alternative may yield additional opportunities to reestablish consumers' connection to animal food production, engage citizens more actively in the environmental consequences of their behavior, and therewith foster sustainable choices. On the basis of these findings, the implications for stakeholders are discussed. This work contributes to building a basis for the development of effective communication strategies and will be of interest for the farmers and marketers of pasture-raised products alike.

Zusammenfassung

Ein Übergang zu einer nachhaltigeren Tierproduktion, die der gesellschaftlichen Notwendigkeit nach ethischen Produkten gerecht wird, ist angesichts der dramatischen Umweltveränderungen unerlässlich. Der langsame, aber stetige Wandel in der Verbrauchernachfrage nach tier- und umweltfreundlichen sowie sozial verantwortlichen tierischen Erzeugnissen ist in den letzten Jahren gut dokumentiert worden. Das übergeordnete Ziel dieser Dissertation ist es, Erkenntnisse über die Verbraucherwahrnehmung, -akzeptanz, -wertschätzung und -kommunikation von biodiversitätsfreundlichen Weideprodukten zu gewinnen. Die Hauptziele der Dissertation betreffen das Kommunikationspotenzial eines artenvielfaltfreundlichen, auf virtuellen Zäunen basierten Weidesystems, und das Potenzial, die Erhaltung der Artenvielfalt als einen wertvollen Aspekt der Rinderweidehaltung zu kommunizieren. Die Ziele der Dissertation werden mit drei aufeinander aufbauenden Studien angegangen. In einer systematischen Literaturrecherche wurde der Stand der Verbraucherforschung zu Produkten aus Weidehaltung überprüft und Forschungslücken zu den Einstellungen und Präferenzen der Verbraucher:innen in Bezug auf Produkte aus Weidehaltung identifiziert. Die empirischen Daten wurden mit qualitativen Methoden der Verbraucherforschung im Rahmen von zwei in Deutschland durchgeführten Studien erhoben. In zwanzig Denke-Laut-Protokollen wurden die Meinungen der deutschen Verbraucher:innen zur innovativen Weidehaltung von Rindern ermittelt. Sechs Online-Fokusgruppen mit insgesamt vierzig Teilnehmenden ermöglichten einen Einblick in die Verbraucherwahrnehmung eines Kennzeichnungssystems für biodiversitätsfreundliche Rinderprodukte. Die Dissertation unterstreicht die Bedeutung der Kommunikation von für die Verbraucher:innen relevanten und verständlichen Eigenschaften auf dem Weg zu einem nachhaltigeren Konsum. Die Ergebnisse dieser Dissertation deuten darauf hin, dass (i) die Verbraucher:innen die Weidehaltung schätzen, aber wenig Wissen über die Tierhaltung oder die biologische Vielfalt haben, was die Kommunikation zum Thema Biodiversität schwierig macht; (ii) die Nutzung innovativer Weidetechnologien in der Rinderhaltung ein zu komplexes und kontroverses Thema ist, um erfolgreich in der Verbraucherkommunikation über die weidebasierte Produktion eingesetzt zu werden; (iii) ein mehrstufiges Kennzeichnungssystem für die Erhaltung der Artenvielfalt in weidebasierten Systemen angesichts des geringen Wissensstands der Verbraucher:innen über die biologische Vielfalt als zu aufwendig und komplex von ihnen empfunden wird; und (iv) die Verbesserung einer direkteren Kommunikation zwischen Verbraucher:innen und Landwirt:innen eine wirksame Alternative zur Einführung eines neuen Kennzeichnungssystems darstellen könnte. Diese Alternative könnte zusätzliche Möglichkeiten bieten, die Verbindung der Verbraucher:innen zur tierischen Lebensmittelproduktion wiederherzustellen, die Bürger:innen aktiver für die ökologischen Folgen ihres Verhaltens zu sensibilisieren und damit nachhaltige Kaufentscheidungen zu fördern.

1 Introduction

1.1 Background of the study

The definition of sustainable consumption proposed in 1994, at the Oslo Symposium for Sustainable Consumption, contained the concept of ensuring better quality of life through satisfying basic human needs while minimizing resource use and pollution and protecting the need fulfillment of future generations (Ofstad et al., 1994). Nearly three decades later, agricultural productivity is reaching the limits of productive capacity, while the environmental footprint of food production and consumption, damage to the environment, resource depletion and biodiversity loss are on the rise (FAO, 2021; UN, 2022). On a global scale, household consumption of processed foods and meat cattle products contributes substantially to the global material footprint (Ivanova et al., 2016; Reisch et al., 2013) and is increasingly seen as an ethical and political issue (Chuck et al., 2016). Sustainable consumption of animal products goes hand in hand with future-friendly animal production, as consumers' food choices generate the demand that shapes the supply of food products (Johnston et al., 2014; White and Brady, 2014). A shift in consumer behavior towards more sustainable food choices is urgently important to reach Sustainable Development Goal (SDG) 12 targets and adjust food consumption and production to the planetary boundaries (Macready et al., 2020).

Aware of the detrimental influence of human actions on the environment, ethically concerned consumers seek food products sourced from environmentally and socially responsible production systems (Casais and Faria, 2022). Ethical problems that concern consumers most relate to animal rights and welfare, production processes (e.g., local, organic production, reduced or recyclable packaging), human rights and social issues (Casais and Faria, 2022; Reisch et al., 2013; Sultan et al., 2020). Recent studies have demonstrated consumers' interest in ethical meat and dairy products (Markova-Nenova and Wätzold, 2018; Schulze et al., 2021), which can be regarded as a step towards sustainable consumption behavior that is more respectful of the environment (Font-i-Furnols and Guerrero, 2014; Gassler et al., 2018; Vega-Zamora et al., 2019).

According to previous research, the main factors driving consumer preference towards ethical meat and dairy products are positive quality perception, higher animal welfare standards employed, and environmental concerns (Bir et al., 2020; Gassler et al., 2018; Zander and Hamm, 2010). Consumers associate increased animal welfare with superior product quality as well as better taste and healthiness (De Graaf et al., 2016a). A meta-analysis of consumers' and citizens' opinions on labeling of animal husbandry practices shows that substantial consumer segments are willing to pay higher prices

for meat and dairy from production systems with higher animal standards (Janssen et al., 2016). Intensive large-scale livestock farming, on the contrary, is especially criticized by consumers (Heise and Theuvsen, 2017), some of whom would rather refrain from meat consumption than buy conventional stall-based beef (Risius and Hamm, 2018).

Satisfying the demand for beef and dairy products in Europe has been possible through intensification of animal agriculture and a growing number of large-scale farms practicing year-round indoor housing (Reijs et al., 2013). With no access to pasture, intensive cattle production entails the use of croplands for feed production (Foley et al., 2011) which leads to food-feed competition and biodiversity loss caused by the cultivation of monoculture crops and associated use of chemical fertilizers and plant protection agents (Kruse et al., 2016). Using grasslands for livestock production allows effective use of areas unsuitable for food crops production, enables provision of ecosystem services and contributes to biodiversity conservation (Isselstein and Kayser, 2014; Leroy et al., 2018; Mottet et al., 2017; Plieninger et al., 2006; Rook et al., 2004). Pasture grazing has a substantial positive effect on animal welfare (Wagner et al., 2017; Crump et al., 2019) as it allows cattle to express natural behavior and interactions within a herd (Beaver et al., 2020). Considering the environmental and animal welfare benefits of pasture grazing, consumer preferences for sustainable livestock products open up a market opportunity for pasture-raised beef and milk from biodiversity-friendly cattle husbandry.

Despite the latest positive trends in ethical food consumption, the market shares of sustainable food products such as animal welfare meat or organic food remain quite low in Germany (Umweltbundesamt, 2022). On the one hand, this makes promotion of sustainable food consumption ever more important to stop the devastating impact of unsustainable production patterns. On the other hand, this leaves enough market room for such promotion, especially among consumers caught in the so-called attitude-behavior gap, who demonstrate ethical values and preferences for higher environmental or animal welfare standards and yet fail to channel them into ethical purchase behavior (Casais and Faria, 2022; Harper and Henson, 2001; Vanhonacker et al., 2010; Vermeir and Verbeke, 2006; Vigors, 2019). Whereas consumers are interested in agricultural topics, their levels of knowledge and trust may interfere with their sustainable food choices (Harper & Makatouni, 2002; Sultan et al., 2020). To facilitate a behavioral change towards more sustainable consumption, raising consumers' awareness through communication is one of the crucial elements. Gaining insights into the way the information about biodiversity-friendly pasture-based husbandry is perceived will be helpful to define the foci of consumer communication and develop effective strategies to bring consumers closer to sustainable consumption behavior. Therefore, scientific understanding of consumers' associations with, knowledge

about, and perceptions of pasture-based cattle husbandry and its outcomes for the environment is necessary for effective consumer communication fostering sustainable consumption.

1.2 Sustainable consumption and consumer communication

Consumers' intention to purchase ethical food products, which is a prerequisite for a transition to sustainable consumption, is often hindered by various factors such as lack of trust in the food chain actors, insufficient information, and low knowledge levels (Harper & Makatouni, 2002; Macready et al., 2020; Sultan et al., 2020).

Consumers' awareness and knowledge about the impact of sustainably produced livestock products on the environment are essential for sustainable purchase behavior (Daugbjerg et al., 2014). Recent research shows rather low levels of German consumers' knowledge about agricultural practices next to moderate awareness of climate-friendly agricultural production (Heise and Theuvsen, 2017; Peschel et al., 2016; Weible et al., 2016). At the same time, consumers' knowledge about biodiversity is quite low: while 56 % of German respondents claim to know the meaning of "biological diversity", only 13 % are able to define it correctly, as one representative study reports (Böhm and Frey, 2022). Yet, many consumers demonstrate an interest in agricultural topics and actively inform themselves using mass media (Heise and Theuvsen, 2017).

Information seeking and knowledge gained from the newly obtained information affect consumers' attitudes which, given favorable contextual factors, lead to particular purchase behavior (Zepeda and Deal, 2009). Yet when consumers are less involved in the topic and have little knowledge about it, the context of the information provision and the source of the message may affect consumers' attitudes more than the content of the information (Vega-Zamora et al., 2019). For instance, low awareness about agricultural production practices does not inhibit consumers' critical perception of animal welfare conditions in cattle production, a phenomenon that may be attributed to the broad discourse on intensive cattle farming in the media (Heise and Theuvsen, 2017; Hirsch et al., 2019). Furthermore, mere information provision aimed at increasing consumers' objective knowledge about agricultural practices is not sufficient for promotion of sustainable consumption (Eden et al., 2008).

The information provided to consumers can influence their buying behavior, yet this is only one of many factors affecting consumer behavior (Pfeiffer et al., 2021; Zepeda and Deal, 2009). Although informing consumers about sustainable product options is an important step in empowering consumers on the way to sustainable consumption (Vermeir et al., 2020), information provision does not necessarily increase consumers' understanding and trust, since communicated information can be differently

interpreted and validated and may have negative effects (Eden et al., 2008). However, lack of reliable, trustworthy information on the production practices or inability to extract it in the context of general information overload undermine the effectiveness of information provision and force consumers to resort to habitual, heuristics-based decision making (Heise and Theuvsen, 2017; Vanhonacker et al., 2010; Vega-Zamora et al., 2019; Vermeir and Verbeke, 2006). Consumers' trust in the sources of products and information is crucial for sustainable purchase behavior (Daugbjerg et al., 2014; Vega-Zamora et al., 2019).

Purchasing sustainable food products requires consumers' confidence in that they are undoubtedly sustainably produced, and their higher prices serve the purpose of supporting, for example, animal welfare and environmentally friendly production (Macready et al., 2020; Weinrich et al., 2014). As consumers increasingly lack trust in farmers, governments, and retail, the credibility of an information source is essential for its ability to persuade (De Graaf et al., 2016a; Heise and Theuvsen, 2017; Vega-Zamora et al., 2019). Lack of consumers' trust is not only problematic for the producers and marketers of sustainable food products but hinders the transition to sustainable consumption and food systems fit for the future (Macready et al., 2020). Consumer trust in food chain actors bolsters their relationships with producers, especially in short supply chains, reduces confusion and can compensate for poor knowledge of agricultural production (De Jonge et al., 2008; Giampetri et al., 2018; Macready et al., 2020). Whereas it should be noted that consumers' sustainable choices depend on multiple factors, trust empowers consumers to act on their values and choose ethical products (Macready et al., 2020).

Consumers cannot see or verify authenticity, sustainability, or the direct effects of environmentally responsible cattle husbandry when purchasing or consuming beef and dairy products. Thus, both agricultural practices and their benefits for the environment or animal welfare can be considered credence attributes that must be communicated by a trustworthy supply chain actor (Fernqvist and Ekelund, 2014; Nunes and Riyanto, 2005; Sultan et al., 2020). Whereas in short supply chains, primary producers can serve as trustworthy information sources (Giampetri et al., 2018), consumers purchasing their products from a retailer must rely on eco-labeling to ensure the products derive from production systems with the desired ethical or environmental attributes (Daugbjerg et al., 2014; Sultan et al., 2020).

In case of credence attributes, product labeling, traceability, and authentication are crucial to generate consumers' trust in responsible production systems they intend to support with their purchase decisions (Henchion et al., 2017). Various governmental and private certification and (eco-)labeling schemes exist to assure consumers and inform them about products' origin from production systems

adhering to particular ethical and environmental standards, thereby enabling conscious choices (Daugbjerg et al., 2014; Janssen and Hamm, 2014). Whereas a universal, legally binding definition of pasture-raised milk and meat is missing, private certification labels for pasture-raised products have been recently introduced in the German beef and dairy market (Holzenkamp and Jäger, 2021). To be effectively used in purchase decisions, an eco-label must be recognized, understood, and trusted, meaning it must be simple, clear, wide-spread, and promoted by trustworthy actor, (Fernqvist and Ekelund, 2014; Janssen and Hamm, 2014; Thøgersen, 2000). While a label informs consumers about particular production attributes, consumers must be aware of the standards behind the label to understand the meaning of this information (Daugbjerg et al., 2014; Thøgersen, 2000). A better knowledge of the attributes of a label, combined with higher trust in it, positively affects purchase decisions for ethical food, whereas missing or false knowledge prevents consumers from using a label as an aid in decision making (Daugbjerg et al., 2014; Hoogland et al., 2007; Sultan et al., 2020). For example, the positive effects of grazing on biodiversity may remain unknown to consumers when they see a mere grazing label and possess no knowledge about the certification standards related to this label.

For ethical products, communication is important because of the associated environmental and social outcomes that are not visible or in any other form perceivable by consumers. These are credence attributes (Caswell and Anders, 2011) in which consumers have to trust. If improperly or not all communicated may impede consumers' purchase intention and behavior (Sultan et al., 2020). In particular, adequate communication is relevant for sustainable transformation of food cultivation and production through the implementation of new agricultural practices that are often encountered with skepticism both on the sides of consumers and farmers (Eastwood and Renwick, 2020). This makes addressing the concerns through proper communication essential for the adoption and acceptance of food products from environmentally responsible, innovative systems. Finding a balanced amount of information suitable for the target consumer groups is crucial to evoke consumers' interest and satisfy their curiosity while minimizing uncertainty and skepticism (Ziamou and Ratneswar, 2002). Providing information on the potentials of digital farming technologies, e.g. the use of sensors or robotics for animal monitoring and management, with regard to animal welfare and environmental protection might generate positive consumer responses (Pfeiffer et al., 2021), in line with consumers' expectations (Krampe et al., 2021). If consumers can easily link production practices to their personal values and preferences, they are more likely to purchase a product from these production systems (Daugbjerg et al., 2014; Grebitus et al., 2015). Therefore, to develop effective communication strategies to stimulate consumption of

products derived from environmentally responsible agricultural systems, a good understanding of consumers' preferences and perception of agricultural production and the related aspects, such as their environmental impacts or the outcomes for animal welfare, is necessary.

1.3 Research objectives and approach

The goal of this dissertation was to provide insights regarding consumer perceptions, acceptance, preferences and communication of biodiversity-friendly pasture-raised livestock products. To achieve this goal, this dissertation deals with two main objectives: (i) to explore the consumer communication potential of a biodiversity-friendly cattle grazing system based on virtual fencing; (ii) to explore the potential of communicating biodiversity conservation as a valuable aspect of pasture-based production. Three consecutive studies were conducted to reach these objectives.

First, "Consumer perceptions, preferences, and behavior regarding pasture-raised livestock products: A review" aims to analyze and summarize the state of the art in consumer research on pasture-raised livestock products and to identify research gaps in the existing literature on consumers' attitudes and preferences regarding pasture-raised products. This study addresses the following research questions:

- What are consumers' perceptions and preferences regarding pasture-raised products?
- What factors influence consumers purchase behavior regarding pasture-raised products?

Second, "Insights into German consumers' perceptions of virtual fencing in grassland-based beef and dairy systems: Recommendations for communication" aims to elucidate consumers' perceptions, understanding and assessment of information on virtual fencing. This study explores consumers' knowledge of and associations with such aspects of pasturing as biodiversity, environment and landscapes, animal welfare and product quality. The study investigates the potential of communicating the value of pasture-raised products through the effects of virtual fencing technology on these aspects and answers these research questions:

- How do consumers perceive and comprehend information about virtual fencing?
- What do consumers think about accepting virtual fencing in beef and dairy livestock systems?
- What do consumers think about supporting – with their purchase decisions – sustainable beef and dairy livestock systems that use virtual fencing?

Third, "Backing biodiversity? German consumers' views on a multi-level biodiversity-labeling scheme for beef from grazing-based production systems" aims to explore consumers' perceptions of a

multi-level biodiversity labeling scheme and add to the knowledge on labeling of different aspects of sustainability to enable improved consumer communication through labeling. The following research questions were addressed in this study:

- How do consumers understand grazing, pasture-raised products, and biodiversity?
- How do consumers perceive a multi-level biodiversity labeling system?
- What recommendations can be given regarding biodiversity labeling?

The objectives of the first study were addressed by conducting a systematic literature review of scientific articles published in peer-reviewed scientific journals until 30 June 2019. The empirical data for this dissertation were collected using qualitative methods of consumer research during two studies that took place in 2019 and 2020 in Germany, as part of the research project GreenGrass within the initiative “Agricultural Systems of the future” funded by the German Federal Ministry of Education and Research. The primary advantage of this study is comprehensive explorative data based on twenty individual verbal protocols and six online focus groups with a total of forty participants that enable insights into the mindsets of German consumers regarding an innovative topic of virtual fencing and an underexplored topic of biodiversity communication through labeling. This work provides clues for the development of effective communication strategies and will be of interest for producers and marketers of pasture-raised products.

1.4 Outline of the dissertation

The rest of this dissertation is structured as follows.

Chapter 2 *Methodological background* gives an overview of the methods applied in the three research articles and justifies the choice of these research methods for addressing the objectives of this dissertation.

Chapter 3 *Consumer perceptions, preferences, and behavior regarding pasture-raised livestock products: A review* presents the first published article, a systematic review of the literature on consumers’ perceptions, preferences and behavior regarding pasture-raised products. This study illuminates the state-of-the-art consumer research on pasture-raised products, identifies the research gaps, and critically evaluates the Alphabet Theory as a tool to explain consumers’ purchase behavior.

Chapter 4 *Insights into German consumers’ perceptions of virtual fencing in grassland-based beef and dairy systems: Recommendations for communication* displays the second published article, a report on a think aloud (verbal protocol) study. This study aimed to explore consumers’ perception of the

information on virtual fencing, consumers' perceptions and knowledge about pasture grazing, and different foci in communicating the advantages of pasture grazing to consumers. It provided recommendations for different actors on transmitting the value of biodiversity-friendly cattle husbandry to consumers.

Chapter 5 *Backing biodiversity? German consumers' views on a multi-level biodiversity-labeling scheme for beef from grazing-based production systems* recounts the third published article which describes the results and the findings of the online focus group study. This study focused on the consumers' perception of a multi-level biodiversity labeling and explored the perspectives of such labeling and some challenges to its introduction. It presented possible solutions to overcoming the challenges and communicating biodiversity through a practicable and understandable labeling.

Chapter 6 *Discussion* provides a critical reflection of the main results of the conducted studies in the context of sustainable, ethical consumption. Consumers' perspective on pasture grazing and perception of virtual fencing are discussed as well as the perspectives of biodiversity labeling for ethical livestock products. Lastly, the merits and limitations of this dissertation are discussed and promising directions for future research are outlined.

Chapter 7 *Conclusions and recommendations* presents the implications of the findings for different actors of beef and dairy supply chains. The perspectives of biodiversity communication through labeling are outlined and recommendations are provided.

2 Methodological background

A combination of a literature review and exploratory research methods implemented in the course of three consecutive studies was applied to address the objectives of this dissertation. In the first study, a review of the scientific literature was conducted to gain insights into consumer perceptions and preferences for pasture-raised products and inform the subsequent exploratory studies. In the exploratory studies following the literature review, the data collection was carried out using different methods of qualitative research. In the first qualitative study, the data on consumer perceptions of virtual fencing in biodiversity-friendly grazing-based cattle production were collected using think aloud (verbal) protocols. The second qualitative study applied online focus groups to gain data on consumer perceptions of a multi-level labeling scheme for pasture-raised beef from production systems that foster biodiversity. The analysis of the data generated in the two qualitative studies was conducted using qualitative text analysis (Kuckartz, 2014). This chapter explains the selection of the research methods and provides background details on the research approach of each study. First, the applied qualitative data collection methods are addressed; then, the use of qualitative text analysis is described.

2.1 Data collection methods

2.1.1 Systematic literature review

Reviewing the literature accumulated on a particular subject is an essential part of proper research (Saunders et al., 2009). “A research literature review is a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners” (Fink, 2019, p. 6). Literature reviews provide the basis for research by helping to summarize the existing knowledge and stimulate the development of new ideas (Seuring et al., 2005). Another purpose of critically reviewing the literature is to identify research possibilities and gaps in the current knowledge that substantiate one’s own research objectives (Saunders et al., 2009).

As a part of this dissertation, a review of the current state of knowledge on consumers’ perceptions, preferences, and behavior regarding pasture-raised products was conducted. The focus of the review was laid on pasture-raised products from cattle, sheep, and goat farming. The rationale behind this choice is that the “pasture-raised” aspect of sustainable animal farming has not been explicitly addressed by the previous research which mainly focused on such production attributes as organic, local, and animal-friendly. At the same time, as can be gathered from the introduction to this work, pasture-

or grazing-based production is a valued by consumers aspect as well as an important practice to secure environmental protection and animal wellbeing as well as farmers' livelihoods. Therefore, the state-of-the-art consumer research on pasture-raised products was synthesized in the initial phase of this work to construct a solid basis for the ensuing research steps. Subchapter 3.4 provides a detailed description of the systematic literature review process.

2.1.2 Qualitative data collection

Qualitative research is the first choice in addressing research questions on previously unexplored subjects. This type of research prioritizes words and their meanings over quantitative assessments expressed in numbers (Bryman, 2016). There are many types of qualitative data collection methods, e.g. qualitative interviews, focus groups, observations, verbal protocols, collecting documents, images, sounds and media data (Ericsson and Simon, 1993; Flick, 2018). The data for this dissertation were collected using think aloud protocols and online focus groups.

2.1.2.1 Think aloud protocols

The method of collecting think aloud protocols (TAPs), or verbal protocols, is based on the verbalization of the participants thoughts during (concurrent) or after (retrospective) performing a particular task, e.g., reading a text, searching for information, solving a problem (Buber, 2009; Ericsson and Simon, 1993; Willis, 2005). The participants' understanding of and opinion on the topic can be elicited from the verbalized thoughts (Payne and Ragsdale, 1978). TAPs are often applied in software and website usability testing, in translation research (e.g., Jääskeläinen, 2010), and in learning and reading research (e.g., Charters, 2003). Designs of the studies applying TAPs vary greatly (Boren and Ramey, 2000). In consumer studies, TAPs were applied in research on purchase behavior (Chase et al., 2003; Reicks et al., 2003); awareness of and preferences for sustainable aquaculture products (Risius et al., 2017; Zander et al., 2018); use of nutrition and allergen label information (Higginson et al. 2002; Barnett et al., 2011); search for corporate social responsibility information (Gider and Hamm, 2019); willingness to pay for an environmental regulation concerning conservation of migratory waterfowl (Schkade and Payne, 1994). The analysis of the TAPs can be performed using qualitative or quantitative coding strategies (Hoppmann, 2009).

As mentioned above, there are two possible ways to conduct verbal protocols depending on the temporal allocation of the task and the respondent's thoughts verbalization, concurrent TAPs and retrospective TAPs. Concurrent protocols usually provide fuller data than retrospective ones (Ericsson and Simon, 1996; Hoppmann, 2009). Concurrent verbalization helps to avoid false recall (van Someren

et al., 1994). Furthermore, concurrent TAPs are less prone to different types of bias that affect the validity of retrospective protocols (Ericsson and Simon, 1996; Schkade and Payne, 1994). Besides, TAPs generate very raw data without delays (van Someren et al., 1994) and assumedly provide insights into the thought process as it is happening (Hoppmann, 2009).

TAPs have significant advantages over other comparable methods, e.g., structured interviews. Through concurrent thought verbalization, TAPs provide a glimpse into the process of information perception, in contrast to structured interviews (Reicks et al., 2003). Compared to structured interviews, TAPs provide more freedom to the participants, allowing to explore the test object at their own pace and in their own words (van Someren et al., 1994). Considering the test objects used in this work, namely, information brochures (see Subchapter 4.4.1), freedom to explore is crucial because it allows to observe which brochures and which pictorial or textual elements of them attract the initial attention. In a structured interview, administering the brochures one by one to the participants instead of enabling independent choices leads to a risk of bias, even if randomization is applied, because it is only possible to elicit the preferences by providing a freedom of choice, as, for instance, in TAPs.

As every research method, concurrent TAPs also have several limitations. For instance, thought verbalization may lag behind the participants' thoughts which leads to incomplete verbalization and, therefore, information loss (van Someren et al., 1994). Additionally, the simultaneous process of solving a complicated task and verbalizing it may lead to a cognitive overload and a protocol interruption (Hoppmann, 2009). Such events require an intervention from the interviewer which should be done very sparsely. A combination of small sample size that is usual for studies applying TAPs (Hoppmann, 2009) and of the fact, that the method is less suitable for some participants than for the others (Benbunan-Fich, 2001) may lead to incomplete data and render the data ungeneralizable. One and the same participant may be less or more verbal depending on their mood or contextual factors, such as speech recording (Yom et al., 2007). A helpful way to enrich the TAP data is retrospective questioning as well as proactive probing for extra information (Charters, 2003; Boren and Ramey, 2000).

Due to the novelty of the topic of consumers' perception of virtual fencing in pasture grazing, no previous studies investigating this issue were available. Considering this gap in research and the explorative nature of the TAP methodology, this approach was found appropriate to gain the insights into the process of perception of information on an unfamiliar to consumers technology. Data collection using concurrent TAPs was adjudged more suitable than retrospective TAPs, since the primary interest was an immediate perception of the information, as it would probably happen when a consumer picks up a brochure or a flyer in a supermarket. The undisturbed flow of participants thoughts allowed a

deeper understanding of consumers' concerns about the virtual fencing technology and its implications for the relevant to the consumers areas. The advantages provided by this method were pivotal for the choice of TAPs to explore consumers' perceptions of information provided in the crafted brochures.

As for the procedure preceding the main study using TAPs, a two-phase pre-test was conducted to assess the comprehensibility of the brochures' texts and their design. In the first phase, collegial feedback was collected using a paper survey. Criteria for the assessment of the texts were based on the literature on consumer behavior and sustainability communication (Kroeber-Riel und Gröppel-Klein, 2013), considering the factor of comprehensibility in marketing communication (Demarmels et al., 2016). Following that, the texts and partially the brochures' design were revised and used in the second phase of a pre-test. In this second phase, a complete TAP procedure was conducted. Four persons with no relation to agriculture and food industry were invited to express their thoughts while reading the brochures. To account for attention saturation of the participants, the order in which the brochures were presented to the participants was randomized. To probe for additional information, a single retrospective question was posed in this study ("Thinking about what you have said, do you want to add anything to your words?"). Conducting the pre-test allowed estimate the duration of a single verbal protocol and to adjust the procedure as well as the brochures later used in the main test.

The information brochures used in the TAP study as well as the screening and closing questionnaires can be found in the Appendices A.1 through A.3 to this dissertation.

2.1.2.2 Online focus groups

Focus groups are a method of simultaneous interviewing of several participants in a rather unstructured way (Bryman, 2016). Focus groups are often applied in marketing research to explore consumers' perceptions, motivations, attitudes and preferences (Bryman, 2016; Stewart and Shamdasani, 2014). A focus group session is guided by a moderator who aims to extract the participants' perspectives on predefined topics (Bryman, 2016; Morgan and Hoffman, 2018). To stimulate the discussion and help the moderator to maintain the focus on the desired topic, a semi-structured guideline is usually used (Bryman, 2016). Focus groups studies consist of eight to fifteen focus groups with four to ten participants each (Bryman, 2016; Stewart and Shamdasani, 2014).

When choosing a qualitative data collection method, focus groups are often compared against one-on-one in-depth interviews and group interviews (O.Nyumba et al., 2018). The major distinctive trait of focus groups and their advantage lie in the interaction between the participants that enables the participants to question each other's views. This allows the researcher to understand the reasons behind

the participants' opinions and obtain more comprehensive data (Bryman, 2016; Morgan and Hoffman, 2018). The role of the moderator in focus groups, who subtly controls the flow of the discussion without major interference, is different from the role of an interviewer in a group or one-on-one interview, who actively investigates the subject by posing questions to the interviewees (O.Nyumba et al., 2018). This creates an open atmosphere in the group which leaves enough space for unexpected views, free exploration of ideas and creation of the meaning of the discussion content (Morgan and Hoffman, 2018).

Among different ways of conducting focus groups, face-to-face focus groups are the most common. Online focus groups have become more relevant during the COVID-19 pandemic. Online data collection methods using focus groups allows to gather a group of participants in a safe environment without hygienic constraints or concerns while also providing spatial, temporal and financial flexibility (Guerrero and Xicola, 2018; Lobe et al., 2020). In the comfort of their homes, the participants may be more relaxed and more open for a conversation with strangers online, especially since they can use pseudonyms to conceal their identity (Bryman, 2016; Lobe, 2017). Furthermore, participants from different geographical regions can be reached at the same time without any expenses for travelling (Bryman, 2016).

Online focus groups can be conducted in a synchronous or asynchronous manner. Synchronous online focus groups are similar to traditional in-person focus groups and allow spontaneous interactions since the researcher and all of the participants join the discussion simultaneously (Bryman, 2016; Guerrero and Xicola, 2018). This reduces the risks of participants researching the subject on the internet during the discussion, which positively contributes to the reliability of the results, compared to asynchronous focus group (Guerrero and Xicola, 2018). Further limitations of audio-only focus groups include possible technical issues or connection problems during the session as well as distractions of the participants of which the moderator cannot be aware (Bryman, 2016). An online setting allows to overcome some of the limitations of the focus groups, such as, for instance, certain group effects: shy participants may find it easier to speak up and interact with the others (*ibid.*). To facilitate moderation of synchronous online focus groups, the number of participants between four and six is seen as the most appropriate (Lobe, 2017). The synchronous focus groups can be conducted in chat form, as a video conference or as an audio-only conversation (conference calls). The merits of the audio-only approach include lower equipment and internet bandwidth requirements and no relevance of keyboard skills (Bryman, 2016). The anonymity of the audio-only online groups protects the participants' privacy and may have a positive effect on their openness of the opinions (Bryman, 2016; Stewart and Shamdasani, 2014; Woodyatt et al., 2016). The downside of such anonymity is a reduced interaction between the participants due to the lack of non-verbal signals and facial expressions (Stewart and Shamdasani,

2014). Another limitation of audio-only focus groups is that their moderation can also be challenging due to the difficulty of keeping track of all participants while only seeing their microphone activity but no body language or non-verbal signals (Bryman, 2016; Stewart and Shamdasani, 2014). Overall, however, online audio focus groups were found a solid alternative to face-to-face focus groups (Cheng et al. 2009; Reid and Reid, 2005).

Seeing the lack of previous research on consumers' perception of a multi-level biodiversity labeling for pasture-raised products, focus groups were found suitable to gain the first insights into this subject. Considering the merits of audio-only online focus groups and the external factors like the COVID-19 pandemic, this explorative method was adjudged appropriate for data collection in the second qualitative study, presented in Chapter 5. Another reason for choosing audio-only focus groups was privacy protection provided by the focus on verbal information exchange.

Online focus groups took place on weekdays in the afternoon or evening. All groups were moderated by the same female researcher. In all of the discussion groups, the moderators' intervention was limited to posing the guiding questions and occasionally encouraging certain participants to join the discussion. The interactions between the participants, undisturbed by the moderator, enabled the researcher to better understand individual reasons behind the participants' use of labeling for purchase decisions and their interest in information about ethical attributes of animal products or the lack thereof. However, it is difficult to estimate the extent to which the interactions were hindered by the audio-only nature of the discussions. Audio-visual online discussions could have probably rendered richer data in terms of facial expressions and non-verbal signals, which would have also facilitated the moderation.

The online focus group guide can be found in the Appendix A.4 of this dissertation.

2.2 Qualitative text analysis

A number of qualitative analysis methods exist to draw the meaning of the content created in focus groups or think aloud protocols, e.g. semiotics, discourse analysis, and qualitative text analysis (Bryman, 2016; Flick, 2018; Onwuegbuzie et al., 2009; Payne, 1994). Semiotics is an approach to the document analysis that aims to highlight the deeper meaning of the content and to uncover the processes of meaning creation (Bryman, 2016). Discourse analysis focuses on the language use in communication to understand how it frames the understanding of the objects (Onwuegbuzie et al., 2009). Qualitative text analysis, or thematic analysis, targets a detailed analysis of the text and is based on structuring and summarizing the data using a category system (coding frame) consisting of categories (codes) to

determine core themes in data (Bryman, 2016; Kuckartz, 2014). This technique is often applied to analyze documents, such as newspaper articles, as well as transcripts of qualitative interviews and focus groups (Kuckartz, 2014). The transcription of the interviews or focus groups is performed verbatim (Bryman, 2016).

The development of categories can be concept-driven, data-driven or mixed (Kuckartz, 2019). Concept-driven, or deductive, categories are derived from a theory, from the literature or from the research question. Data-driven, or inductive, categories are developed step by step through open coding, continuous systematization of the codes and the creation of subcodes. During the mixed development of concept- and data-driven codes, the development of a coding frame consisting of concept-driven codes is succeeded by inductive coding of all data (Kuckartz, 2019).

A clear and reliable coding frame and a transparent coding procedure make replication of the research feasible (Bryman, 2016). The coding of the data is the process of assignment of the categories to the parts, or units, of the data called segments, e.g., sentences or paragraphs of the text material. Data coding is performed by trained coders who refer to a coding manual. The coding manual defines the rules according to which the codes can be objectively, unambiguously assigned to the units of analysis. This is a pivotal point to the reliability of the analysis that can be assessed by calculating intercoder and intracoder agreement (Kuckartz, 2019; Schreier, 2012). Intercoder reliability describes the degree to which the codes assigned by different coders to the same text material are congruent; intracoder reliability is the degree of consistency of the codes assigned by one coder who performs coding of the same data at different time points (O'Connor and Joffe, 2020). Inter- and intracoder reliability is quantified using specific reliability tests manually or with the help of specialized qualitative analysis software (Kuckartz, 2014; O'Connor and Joffe, 2020).

Qualitative text analysis was used to reduce the complexity of the data and distil concise information from the data collected in both empirical studies that form the core of this dissertation. In both cases, mixing a concept-driven and data-driven development of codes was applied in the iterative process of the creation of a coding frame. Using the same method to analyze the data from the two studies allowed to generate comparable coding frames. This facilitated the subsequent discussion of the participants' argumentation and reflections on the subjects of virtual fencing and biodiversity conservation in pasture grazing.

3 Consumer perceptions, preferences, and behavior regarding pasture-raised livestock products: A review

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3.1 Abstract

Intensive cattle production is one of the primary causes of biodiversity loss. Pasture-based animal husbandry has the potential to reverse this negative trend. Pasture-raised livestock products represent a premium niche with an extra value through a cleaner environmental footprint and care for animal welfare, including wildlife. This review focuses on recent scientific findings in consumer behavior regarding pasture-raised products. A systematic literature search was conducted in online databases using a fixed search term. Thirty-nine relevant consumer studies published between 2000 and 2019 in the English language were selected for the review. The Alphabet Theory was applied as a theoretical framework to analyze the findings. Consumer behavior regarding pasture-raised products is largely defined through health and environmental attitudes and depends substantially on the context of a purchase decision. There are a variety of consumer groups willing to pay a premium for a pasture-raised attribute even on top of an organic price premium. Consumer knowledge of the subject is rather low and confusion exists regarding the terminology: consumers often mistake the production system behind pasture-raised products for organic or conventional. This calls for communication of the environmental and social benefits of pasture-based production and the importance of individual food choices. This article is the first to review scientific consumer studies on perceptions, preferences, behavior regarding and willingness to pay for pasture-raised products. Further research, especially research based on real market data, is recommended to explore the effect of specific environmental attributes, social and personal norms, informational content, and product types on consumer preferences and willingness to pay for pasture-raised products.

Keywords: *Alphabet theory; beef; grass-fed; milk; pasture-based; willingness to pay*

3.2 Introduction

In 2009, around 40 % of German dairy cows had access to pasture (Federal Statistical Office, 2011). Although no newer data are available, experts predict a rapid decline in the share of cows having access to pasture to a much lower level of 5 % in 2025 (Reijs et al., 2013). This entails further growth of year-round indoor housing of cattle which contributes the most to soil erosion, water pollution, and biodiversity loss through food and feed production (Gerber et al., 2013; UN Environment, 2019). An evaluation of alternative beef and dairy cattle production systems according to their environmental impact is the first step on the way to environmentally friendly livestock production (French et al., 2015; Gwin, 2009). Sustainable intensification of agricultural production depends to a great extent on biodiversity (FAO, 2019). Biodiversity provides a number of ecosystem services essential for successful agriculture in the long term and subsequent food security for the growing population (ibid.). Broad diversity of species can mitigate the side effects of agricultural food production through soil formation and preservation, pollination, nutrient cycling, maintenance of the water supply, and climate regulation (Bailey et al., 2014; FAO, 2019). A way to protect and restore biodiversity on pastures and adjacent areas is moderate grazing by cattle or sheep, the positive effect of which is amplified by particular breeds (Pauler et al., 2019; Scimone et al., 2007).

For farmers to let the cows graze freely, pasturing with the goal of biodiversity conservation must be more attractive than less cost-intensive indoor animal housing. One of the solutions to this problem involves agricultural policy measures, e.g. subsidies for biodiversity-enhancing activities. Such measures lie beyond the scope of this paper. Another solution requires strong support from consumers expressed through an additional value placed on pasture-raised production systems and their products. To create such appreciation, effective messages must be tailored to specific consumer groups and specific products, since consumers value different ethical attributes in different products (Carlsson et al., 2005; Elbakidze and Nayga, 2012). Whereas a large share of consumers refuses to reduce or refrain from meat consumption for environmental reasons (Austgulen et al., 2018), certain consumers would rather not buy any meat than buy conventional beef produced in year-round indoor housing (Risius and Hamm, 2018). To satisfy the demands of both of these groups, pasture-raised products may be a viable solution. Pasture grazing is valued as the most natural, species-appropriate way to keep cattle as it is beneficial both for animal and human health as well as for the environment (Cardoso et al., 2016; Getter et al., 2015; Heerwagen et al., 2013; Leroy et al., 2018; Lusk and Parker, 2009; McCluskey et al., 2005; Schuppli et al., 2014). Moreover, consumers exhibit a greater willingness to pay (WTP) for pasture-

raised milk than for conventional milk, supporting a trend towards products with additional value beyond organic (Janssen et al., 2009). So far, there is no comprehensive knowledge on the background of the attitudes leading to this behavior. For marketing tools to successfully reach consumers, a knowledge of their values and motives is crucial.

In a recent review of consumer perspectives on beef quality attributes, Henchion et al. (2017) revealed the rising importance of credence cues. According to their ranking of quality attributes, the production system or feeding of the cattle places third after origin and animal welfare. Naturalness, healthiness, and safety can be deduced from the conditions under which the animal was raised which explains their ranking below the production system (Henchion et al., 2017). An overview of studies on consumer preferences and behavior regarding meat (Font-i-Furnols and Guerrero, 2014) states that consumers prefer grass-fed beef and lamb products raised on pasture to those fed on concentrate. However, the results of research on general meat and milk consumption cannot be generalized to the consumption of niche products which is what pasture-raised products currently are. In view of an upward trend in the number of pasture-raised milk brands on the market (Kühl et al., 2017) and growing public concern about the impact of agricultural practices on the environment (European Commission, 2017), a review of the literature exploring perception of pasture-raised products presents an academic stimulus as well as a potentially useful tool for developing marketing strategies for pasture-raised meat and dairy products. This review aims to analyze the approaches to effective marketing of pasture-raised products and the possibilities of promotion measures for pasture grazing and biodiversity. To achieve this goal, this article accumulates and analyses the findings of consumer studies on attitudes towards pasture-raised products and other factors that influence WTP for and buying behavior regarding these products.

To conceptualize literature findings on consumer purchase intentions and behavior regarding pasture-raised livestock products, this review applies the Alphabet Theory (Zepeda and Deal, 2009). This theory was originally developed to explore organic food purchase behavior. Recently, this framework has been receiving increasing attention. It was successfully applied to synthesize literature findings and explain consumer behavior regarding local food (Feldmann and Hamm, 2015), sustainable wine (Schäufele and Hamm, 2017), and artisanal foods (Rivaroli et al., 2020).

The review is organized in the following manner: First, a brief description of the theoretical framework is provided. Then, the applied methodology is presented, followed by an overview of the selected studies. Next, the findings of the reviewed articles are structured in accordance with the Alphabet Theory framework. Finally, the suitability of the theoretical framework is discussed and concluding recommendations are given.

3.3 Theoretical framework

Over the past decades, various scientific attempts were made to explain pro-environmental behavior. As a result, the influence of both internal and external factors was synthesized in several dozen behavioral theories. Earlier theories often served as a basis for the newer ones. For instance, the frequently applied Theory of Planned Behavior (TPB) is defined by its authors as “an extension of the theory of reasoned action” by the addition of perceived behavioral control (Ajzen, 1991, p. 181). Ajzen (1991) admits the importance of external factors that may influence a person’s behavior, yet stresses the perception of behavioral control as being of “greater psychological interest” (Ajzen, 1991, p. 183). However, consumer purchase behavior always takes place in a specific context and can vary depending on the external conditions (Groening et al., 2018). So, the Attitude-Behavior-Context (ABC) Theory (Guagnano et al., 1995) posits that behavior is dependent on external conditions (context), i.e. “all external sources of support or opposition to behavior, whether physical, financial, legal, or social” (Guagnano et al., 1995, p. 702). The formation of attitudes, in turn, is explained in the Value-Belief-Norm (VBN) Theory (Stern et al., 1999) based on the socio-psychological factors described earlier in the Norm Activation Theory (Schwartz, 1977), in the Value Theory (Schwartz, 1994), and in the New Ecological Paradigm (Dunlap and Van Liere, 1978). A relatively recent attempt to explain pro-environmental behavior resulted in a combination of VBN and ABC theories in a single framework of the Alphabet Theory (Zepeda and Deal, 2009). Apart from combining these two theories, the framework was amended with demographics (D), knowledge (K), information seeking (IS) and habits (H) (see Figure 3.1). Supplementing the framework with potentially influential factors provides an instrument which allows for a more comprehensive explanation of consumer behavior.

Information seeking, according to the Alphabet Theory, contributes to consumer knowledge. A broader knowledge of a subject of interest affects attitudes towards it through formation of certain beliefs and prejudices as well as comparison of the products with personal and social values and norms. Attitudes, in their turn, affect further information seeking or initiate it in the first place. Thus, greater knowledge about, for example, organic production practices results in a higher likelihood of purchasing organic food products (Zepeda and Deal, 2009). As many consumers associate pasture-raised production methods with organic production (Conner et al., 2008a; Harper and Makatouni, 2002), consumer behavior regarding pasture-raised products can be explained in parallel terms (Gassler et al., 2018). Therefore, it can be expected that consumers consider pasture-raised livestock products to be different from other animal products on the market. This may or may not motivate consumers to actively seek confirmation or disapproval of this belief through information.

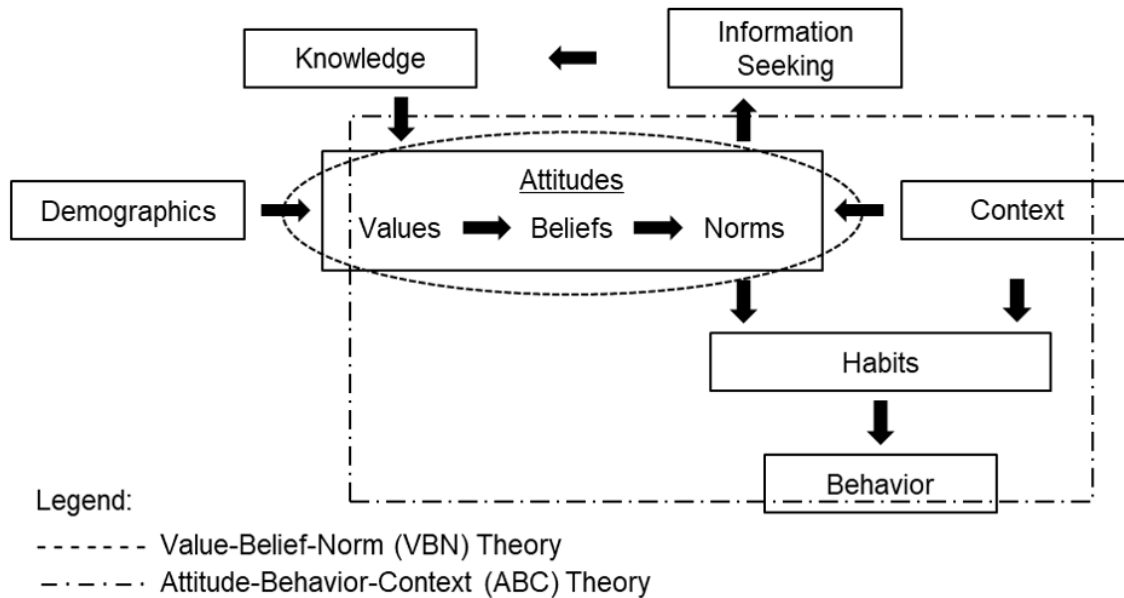


Figure 3.1: The Alphabet Theory framework by Zepeda and Deal (2009), adapted by Schäufele and Hamm (2017).

Since buying food is necessarily a repetitive action, the role of habits should be included in explaining consumer behavior. For instance, cooking and dietary habits have an impact on organic food purchases (Zepeda and Deal, 2009). Furthermore, consumer values, beliefs, and norms affect habitual shopping locations. Purchase behavior also forms new habits (Zepeda and Deal, 2009). Lastly, consumer behavior is indirectly determined by demographics through their effect on the formation of the attitudes.

3.4 Methodology and overview of the reviewed studies

3.4.1 Definition of the search term

The terms ‘pasture-raised’, ‘meadow-grazed’, ‘grass-finished’ or ‘grass-fed’, when referring to milk or beef, are not defined at the legislative level, neither in the USA nor in the EU where most of the studies have been conducted. In the EU, only ‘hay milk’ is protected as a traditional specialty under Commission Implementing Regulation (EU) No 2016/304. However, ‘hay milk’ must be differentiated from ‘pasture-raised milk’ because feeding hay does not necessarily mean access to pasture and consumers associate ‘hay milk’ with stall keeping (Busch et al., 2018). In this review, for the purpose of clarity and similar to Conner et al. (2008a), ‘pasture-based’ will refer to production systems and ‘pasture-raised’ will describe animals and livestock products from these production systems. Both of these terms are used as umbrella terms for those listed above, except for ‘hay’ which has been deemed beyond the scope of this study. The usage of umbrella terms is justified by an assumption that feeding

grass or finishing on grass are necessary, albeit insufficient attributes of pasture-raised products. 'Pasture' is a more comprehensive, yet at the same time ambiguous, term relevant to the exploration of a range of attitudes based on both altruistic and egoistic values (e.g. support of pasture-based production because of its positive impact on biodiversity, animal welfare or on personal health). The term 'grass-fed', in turn, refers more closely to a contextual attribute of 'taste' or a belief about the appropriate fodder for cattle.

A number of keywords were included in the search term to capture a wider range of studies, following a procedure similar to that outlined by Henschion et al. (2017). The first part of the Boolean term concentrates on actors relevant for consumer studies. The second part determines the scope of the products in question. Products from cattle and small ruminants are relevant both for consumer research and for pasture grazing promotion. The third part of the query places the focus of the search on products derived from pasture-based systems and on livestock fed grass. The terms 'forage' and 'ranch' were not included since they are used in other research fields more often than in consumer studies. No terms related to psychographic characteristics were included in the query to avoid the limitation of the search results to a possibly incomplete set of pre-selected factors. In the end, the following Boolean query was used:

(consumer OR buyer OR citizen) AND (meat OR beef OR lamb OR goat OR dairy OR milk OR cattle OR livestock OR sheep OR mutton) AND (pasture OR grazing OR free range OR grass)

3.4.2 Search procedure

A literature research was performed in several online databases: Web of Science, ScienceDirect, AgEcon Search, and EconPapers. Original studies and conference papers from the past 20 years, January 1, 2000 – June 30, 2019, published in the English language, were included. Since ScienceDirect's database search does not support wildcards and the number of Boolean connectors is limited to eight per search field, a generalized query was used: (consumer OR buyer OR citizen) AND (pasture OR grazing OR free-range OR grass). First, all records meeting the inclusion criteria (Boolean query, time span, language) were found and pooled to remove duplicate records. Next, the titles of the remaining records were manually screened to extract relevant consumer studies, excluding papers from other research fields and review articles. Then, the abstracts and full texts of the remaining 137 articles were skimmed to assess their eligibility based on their research motivations. Consumer studies where pasture-raised or grass-fed products were the main subject or a part of a model were considered eligible. Sensory studies were only included when psychographic or other factors were examined in addition to sensory attributes. Articles based on the same research data were excluded. Additional records were

found by tracking the references and citations of the 32 eligible articles (n = 924 and n = 507, respectively). The flow chart in Figure 3.2 visualizes the search process and results. In the end, 39 articles were selected for the review. The articles are listed in Table 3.1 of the Annex, supplemented with the key data on country of origin, sample size, methodology, and research focus. Table 3.1 maintains the product terminology used in the studies.

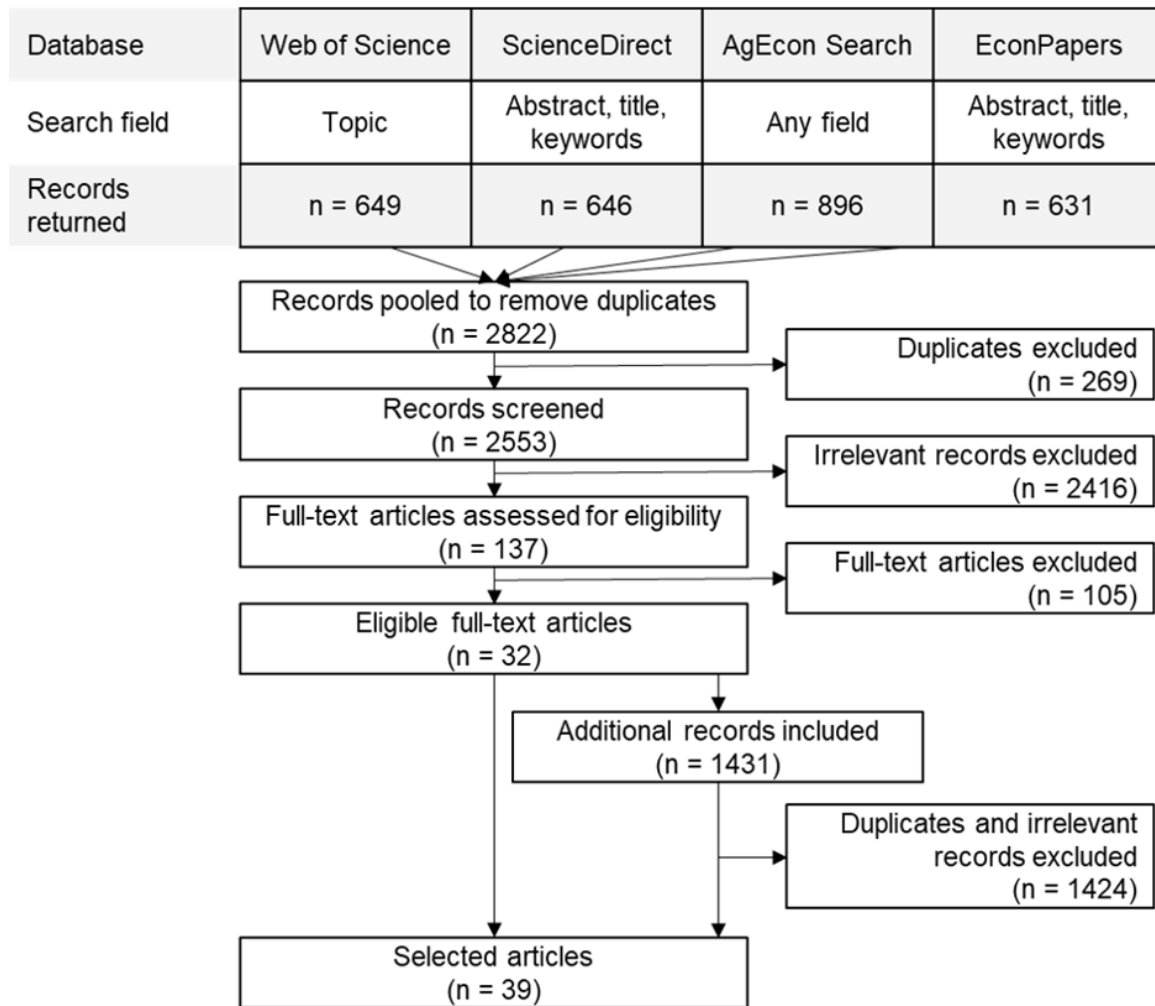


Figure 3.2: Search and selection process, adapted from Henschion et al. (2017).

3.4.3 Overview of the reviewed studies

The number of studies published between 2000 and 2019 varied between zero and five per year, with no recognizable trend. Most of the studies, 20 out of 39, originated from the USA; one study took place in South Africa and one in Chile. Of the remaining 19 studies, six were conducted in Germany and the rest in eight other European countries. Four studies employed a cross-national approach collecting the data in two or more countries. As regards product focus, sixteen studies concentrated solely on beef, twelve studies focused on cow milk, five studies – on goat milk or lamb meat, while the other

six examined beef and dairy products together or among a number of other animal or plant products. As for production systems, ten studies clearly covered pasture-raised products. Further 15 studies contained ‘pasture-raised’, ‘pasture-based’, ‘raised on pasture’, ‘pasture-fed’ or ‘access to pasture’ as a product attribute. The rest concentrated on grass-fed or grass-finished products. All the studies that used the terms ‘grass-fed’ or ‘grass-finished’ were published between 2002 and 2018 in the USA. Between 2007 and 2016, a US voluntary standard for a grass (forage) fed livestock marketing claim was in force (AMS, 2007; AMS, 2016) and established that “animals must graze live pasture during the growing season as a requirement of the grass (forage) fed standard as it is inherent to the term ‘grass (forage) fed’” (AMS, 2007, p. 58635). Besides, one study explicitly defined ‘grass-fed’ as a practice “that requires cows to remain on the pasture their entire lives and allowed to roam freely” (Wong et al., 2010, p. 77). Under the assumption that these definitions reflect the meaning of ‘grass-fed’ as it is commonly understood by US consumers, the choice of the ‘grass-fed’ characteristic as a proxy for ‘pasture-raised’ in this review is further justified.

Sample sizes varied from 20 to 1500 participants, whereas most of the studies, 17 out of 39, stated sample sizes between 300 and 1000. Out of eight studies with a sample size over 1000, seven applied an online survey for data collection while the largest sample was obtained in a study based on a face-to-face convenience survey (McCluskey et al., 2009). One of the studies did not report sample size except for acknowledging “a very small sample” (Gwin et al., 2012, p. 107). With regard to the research methods, the majority of studies (36) applied a quantitative approach and three studies used mixed methods. Eight of the studies were based on or included a sensory evaluation. Data collection methods varied from online, phone, mail, and face-to-face surveys to in-store experiments, experimental auctions, sensory studies, and focus groups. Most studies elicited consumer purchase intention based on stated preferences and WTP. However, the hypothetical approach often leads to overestimation of the stated WTP that does not match stated preferences. Such a gap between attitudes and behavior appears to be commonplace in sustainable product consumption (Vermeir and Verbeke, 2006). One study analyzed beef sales under a value-based marketing program (Boland and Schroeder, 2002), but none of the newer studies worked with actual market data.

3.5 Results

3.5.1 Demographics

As stated in the Alphabet Theory, demographics have an effect on attitudes, and with that on purchase behavior (see Fig. 3.1). A questionnaire to assess the sociodemographic characteristics of the

samples was applied in all examined studies. Although most of the studies found sociodemographic data useful, some of them questioned their value in explaining attitudes and behavior (De Graaf et al., 2016b). Several studies reported no connection between behavioral intentions and gender (Gassler et al., 2018), age (De Graaf et al., 2016b), or income (Gassler et al., 2018; Getter et al., 2014; Umberger et al., 2002). Whether a variable exhibits an effect on attitudes and behavior, as well as the number of such variables, varied from one study to another.

Women had more positive attitudes towards pasture-raised products in relation to attributes such as ‘animal welfare’, ‘local product’, and ‘raised on a family farm’ (Conner et al., 2008a; Evans et al., 2011; McCluskey et al., 2009) and expressed higher WTP for grass-fed milk (Markova-Nenova and Wätzold, 2018; Wong et al., 2010). Younger US consumers were also predisposed towards pasture-raised products, their positive attitude being related to environmental friendliness and animal welfare (Getter et al., 2014; Thilmany et al., 2006). Although young consumers tended to support pasture-based production for ethical reasons (Gwin et al., 2012; Umberger et al., 2009; Wong et al., 2010), lower income prevented them from transforming intentions into corresponding buying behavior (Gassler et al., 2018; Weinrich et al., 2014). Accordingly, consumers with higher income were willing to pay more for pasture-raised products (García-Torres et al., 2016; Harwood and Drake, 2018; Köhl et al., 2017; Li et al., 2016; Markova-Nenova and Wätzold, 2018; McCluskey et al., 2009; Wong et al., 2010). Unexpectedly, a negative effect of higher income on WTP for grass-finished beef has also been reported for US consumers (Umberger et al., 2009). Authors explained this as a result of high-income consumers’ conviction that the attribute ‘grass-fed’ was unable to add any extra value to the high quality of the meat they already usually bought.

Furthermore, there was a difference between pasture-raised beef and milk: in a retail survey from Colorado, higher household income increased the purchase likelihood for pasture-raised beef, but not for milk (Conner and Oppenheim, 2008a). The authors explained that milk’s base price is much lower, and the amount consumed is higher than that of beef. This means, with greater disposable income, consumers prefer to invest in more expensive products like beef rather than in milk, which is a staple. In many cases, disposable income depends on the household size and the presence of dependent persons, e.g. children. A child’s presence in the household increased the likelihood of purchasing pasture-raised milk, but not beef (Conner and Oppenheim, 2008a) and resulted in a lower WTP for grass-fed beef (Umberger et al., 2009). Yet, on the whole, due to concerns about the health of household members, consumers who lived with other people were willing to pay more for grass-fed beef than those who lived alone (Xue et al., 2010). However, household size itself had a negative effect on the WTP of consumers from the South-African and US samples (Marandure et al., 2016; Xue et al., 2010). As

for education, a negative influence of higher education on the WTP for pasture-raised beef was observed in a US sample (Li et al., 2016), contrary to the findings of Harwood and Drake (2018). Nonetheless, most of the studies report no significant influence of education. On the whole, literature findings on the influence of demographics are quite contradictory. The Alphabet Theory explains such phenomenon through diverse contextual factors, e.g. price or availability, that in different situations have a stronger effect on attitudes than do demographics. Moreover, discrepancies in the findings are a possible aftermath of the heterogeneity of the countries and products in question.

3.5.2 Information seeking and knowledge

3.5.2.1 Influence of knowledge and informational content

Information obtained through previous consumption experience generates knowledge about the product characteristics that is partially responsible for attitude formation. Different experiences form different preferences. This explains contradictory evidence where previous experience positively (Evans et al., 2011) or negatively (García-Torres et al., 2016; Marandure et al., 2016) affect preferences for pasture-raised products. Involvement in agriculture and knowledge about agricultural practices, awareness about pasture-raised products, and previous consumption experience form certain consumer beliefs and assumptions that influence purchase behavior (Umberger et al., 2009). These beliefs are quite strong and remained unchanged by additional information about production practices and benefits for animal welfare and the environment (Conner and Oppenheim, 2008a; 2008b, Gwin et al., 2012). Furthermore, knowledge about pasture-based and conventional production practices is reportedly responsible for certain attitudes that mediate purchase intention and WTP for pasture-raised products (De Graaf et al., 2016b; Gwin et al., 2012; Umberger et al., 2002). Yet the majority of consumers lacked such knowledge (Conner et al., 2008a) which likely resulted in judgements based on false assumptions or associations (De Graaf et al., 2016b). For instance, some consumers erred in considering all cattle to be grass-fed (Getter et al., 2014), and, as a consequence of a belief that pasture grazing is a standard practice, did not see keeping the animals on pasture as important for cattle as for pigs (Carlsson et al., 2005).

To compensate for the lack of knowledge, provision of information on production systems led to purchase intention and WTP a premium for pasture-raised products, even with price sensitive consumers and those who did not strongly disapprove of the conventional practices (Font-i-Furnols et al., 2011; Gwin et al., 2012; Markova-Nenova and Wätzold; 2018, McCluskey et al., 2005; Thilmany et al., 2006; Umberger et al., 2009; Weinrich et al., 2014; Xue et al., 2010). When information on extensive

suckler husbandry was provided, though, the attribute ‘pasture-raised’ was valued less (Risius and Hamm, 2017). Nevertheless, information about pasture-based production practices created an assimilation effect in blind tastings, raising consumer ratings of pasture-raised products towards their expectations (D’Alessandro et al., 2012; Font-i-Furnols et al., 2011, Morales et al., 2013; Musto et al., 2015). Furthermore, addressing personal values by providing health and nutritional information, e.g. benefits of omega-3 fatty acids and higher contents of these in pasture-raised beef, induced higher preferences, likelihood to purchase and WTP for grass-finished beef (Evans et al., 2011; Lusk et al., 2008; Umberger et al., 2009; Xue et al., 2010). Creation of trusting attitude through information on traceability to the farm of origin and absence of growth hormones induced WTP for pasture-raised products (Lusk et al., 2008; Thilmany et al., 2006; Umberger et al., 2009; Wolf, Tonsor, and Olynk, 2011). The effect of information differed depending on the product (Carlsson et al., 2005), e.g. information about pasture-raised beef had an effect on preferences for ground beef but not for steak (Lusk et al., 2008), which reflects the influence of context on preference formation.

3.5.2.2 Influence of the presentation form

Information as a source of knowledge can be provided in different ways and have, therefore, different effects on the consumer (e.g. Getter et al., 2014; Musto et al., 2015; Risius and Hamm, 2017). Insufficient information, in accordance with the Alphabet Theory, causes lower trust in the product and with that a reluctance to buy it. For instance, consumers would be willing to pay a premium for ethically produced milk only if they were provided with traceable information they perceived as credible (Markova-Nenova and Wätzold, 2018). Quality and traceability labels are one way of informing consumers about product features while catering to consumers’ ethical concerns. Information on the labels must be simple and comprehensible, otherwise it can be perceived as untrustworthy (Kühl et al., 2017). In addition to labels, extensive information presented in other forms, e.g., videos with narration, image films or leaflets, helped to convert credence attributes into search attributes and satisfied the need for information (Musto et al., 2015). This motivated consumers to purchase. However, many consumers questioned the trustworthiness of the government, the industry, retail, and farmers as sources of information on dairy cattle welfare, preferring independent veterinarian and animal welfare organizations (De Graaf et al., 2016b). Informational support is necessary for the acquisition of new customers. However, to make consumers return repeatedly, taste must comply with consumer expectations (Umberger et al., 2009). If textual or video communication material presents a product in a pleasant manner, there is a chance that assimilation will occur and consumer liking of the product will adjust to expectations (Musto et al., 2015).

3.5.3 Attitudes

In the Alphabet Theory, attitudes constitute a central element influencing consumer behavior. Consumers' values, beliefs, and norms mold their attitudes towards particular products and greatly contribute to the purchase decision. When a specific product attribute resonates with attitudes, it affects consumer purchase behavior. Studies demonstrate that consumers associate particular attributes with pasture-raised products: environmental friendliness, animal welfare, and raising animals without hormones or antibiotics (Busch et al., 2018; Conner et al., 2008a, 2008b); perceived rich taste and freshness (Getter et al., 2014); healthiness and naturalness (Busch et al., 2018; Hersleth et al., 2012); proper traceability (Umberger et al., 2009); specific place of origin (Bernués et al., 2012); trust in the source and higher price (Tempesta and Vecchiato, 2013); appropriate animal feed (Hersleth et al., 2012; Tempesta and Vecchiato, 2013). Among the attitudes towards pasture-raised products, those related to environmental concerns, animal welfare, health consciousness, perceived product quality, and food safety were found to lead to the purchase of these products.

Environmental consciousness positively mediated purchase intention for pasture-raised products (Li et al., 2016; Xue et al., 2010). Furthermore, belief in the environmental benefits of pasture-based production evoked a higher WTP in consumers who were likely to purchase pasture-raised beef (Conner and Oppenheim, 2008a). However, consumers who supported pasture-based production for environmental or animal welfare aspects reported different priorities in a real shopping situation: quality was the main driver for some while price or time pressure was decisive for others despite supportive attitudes towards cattle pasturing (Kühl et al., 2017; Weinrich et al., 2014). The Alphabet Theory explains this attitude-behavior gap through the constraining effect of context and habits. As for animal welfare, consumers who valued humane production were identified as a highly promising market segment for pasture-raised milk (De Graaf et al., 2016b). Ethical motives related to animal welfare, however, only had an impact on purchase behavior when an intention to purchase pasture-raised milk was already established (Gassler et al., 2018). This means that for some consumers, ethical attributes such as pasture access and freedom of movement influenced purchase behavior not because consumers valued animal welfare as such, but because these attributes signaled product safety and healthiness (Musto et al., 2015). Additionally, conventional consumers with a strong interest in ethical causes also valued the positive impact of pasture-raised production on biodiversity and wildlife preservation and were willing to pay more for these attributes (Kühl et al., 2017; Markova-Nenova and Wätzold, 2018; McCluskey et al., 2009). Lastly, organic consumers highly valued the attribute 'pasture-raised' in milk

as well, further supporting the association of pasture-raised products with more ethical production (Harwood and Drake, 2018).

A healthy lifestyle and dietary consciousness had a positive effect on preference for, purchase intention, and purchase behavior regarding pasture-raised products (Gassler et al., 2018; Harwood and Drake, 2018), since consumers linked them with healthiness (Conner et al., 2008b). Likelihood to purchase and WTP were also positively affected by the belief in the health benefits of pasture-raised beef (Conner and Oppenheim, 2008a; McCluskey et al., 2005). However, Wong et al. (2010) found no significant influence of health attitudes on the choice between organic and grass-fed beef. This strongly suggests that consumers considered both systems equal in terms of product healthiness, possibly due to a lack of knowledge about production practices. Moreover, for consumers with limited means, health and nutritional quality as well as ethical benefits were the least important attributes in purchase decision for beef (Marandure et al., 2016).

Perceived product quality positively affected purchase intention of German consumers (Gassler et al., 2018). Quality-oriented German consumers were willing to pay a premium for pasture-raised milk (Weinrich et al., 2014). Many consumers believed in the higher sensory quality of pasture-raised products (Conner et al., 2008a, 2008b; Getter et al., 2014; Umberger et al., 2009). Xue et al. (2010) even argue that grass-based production was only valuable to US consumers because of its effect on the sensory properties of the livestock products. Another attribute of perceived quality, 'naturalness', is rather controversial, since consumer understanding of naturalness is broad, from association with pastoral landscapes, to animal welfare and environmentally friendly production, to food safety (Busch et al., 2018; Conner et al., 2008b; Font-i-Furnols et al., 2011; Gassler et al., 2018; Weinrich et al., 2014). In a study by Thilmany et al. (2006), price-conscious as well as quality-seeking US consumers valued natural and environmentally friendly practices such as pasture grazing much less than other consumer groups. For Italian and Norwegian consumers, mountain pasture was associated with higher lamb meat naturalness than was lowland pasture and resulted in higher buying probability (Hersleth et al., 2012).

Food safety concerns are closely related to health consciousness and had a similar effect on consumer intention to purchase pasture-raised products (De Graaf et al., 2016b; Getter et al., 2014; Hersleth et al., 2012). US consumers considered grass-finished beef to be safer than beef from conventional production systems (Umberger et al., 2009), although feeding grass does not necessarily mean freedom from hormones or antibiotics. Still, a belief that grass-fed production means higher food safety induced a significant WTP in an online survey with a choice experiment (Wolf et al., 2011). However, US consumers who were confident in the safety of domestic food products were rather unwilling to pay

extra for beef raised on pasture (Li et al., 2016). This means, consumers who believed that the existing system and regulations provided a sufficient level of food safety and quality were less willing to change the status quo of their consumption and switch to a new product with better environmental characteristics (Li et al., 2016). In the context of the Alphabet Theory, this reflects mediation of purchase behavior through habits that will be discussed in 3.5.5.

Social norms positively affected purchase intention and behavior meaning that wide consumer groups may be motivated to buy pasture-raised products when it is seen by the general public as morally good (Gassler et al., 2018). For instance, social responsibility such as support of small local farms was an important factor determining consumer WTP for milk from pasture-fed cows (McCluskey et al., 2009). In a study on Oregon grass-fed beef markets, both regular and natural shoppers had similar attitudes towards farm preservation (Gwin et al., 2012). German consumers were also willing to support small family producers with lower incomes when purchasing pasture-raised milk from outside their region of residence (Markova-Nenova and Wätzold, 2018). At the same time, all regional farmers would benefit from consumers' WTP which apparently springs from the desire to contribute to the local economy and environment by reducing transport (Harwood and Drake, 2018; Markova-Nenova and Wätzold, 2018).

3.5.4 Context

Consumer behavior in a particular situation is determined by the combined influence of attitudes and context. Context and attitudes can top each other in their influence on consumer behavior. Under extreme conditions, attitudes, either favorable or restricting, play a lesser role in predicting behavior. When external conditions are somewhat neutral, the power of attitudes in predicting consumer behavior is at its highest (Guagnano et al., 1995). The influence of external factors appears especially true for niche products such as pasture-raised products. For example, if a product is not available at the usual shopping location, this presents an obstacle even for consumers with stronger environmental or health attitudes towards pasture-raised products. The reviewed studies most often found such contextual factors as price, store type, origin, taste, and availability to have the strongest influence on consumers. The influence of other contextual factors on purchase behavior, e.g., promotion and advertising, packaging, or time pressure, were rarely or never mentioned in the reviewed literature.

Several studies reported a negative effect of price on the perceived utility of pasture-raised milk and consumer purchase intention and subsequent behavior (Gassler et al., 2018; Kühn et al., 2017; Stolz et al., 2011). For certain consumer groups, price remained a critical factor in the food purchase decision,

outmatching attitudes towards health, animal welfare, and environment as well as lowering the likelihood to pay a premium price (De Graaf et al., 2016b; Li et al., 2016; Marandure et al., 2016; Markova-Nenova and Wätzold, 2018; McCluskey et al., 2005). Other studies, on the contrary, noted that the effect of factors other than price like demographics, availability, origin, and feeding system, and past experience, was higher among premium and environmentally or ethically conscious consumers (Fonti-Furnols et al., 2011; Getter et al., 2014; Harwood and Drake, 2018; Risius and Hamm, 2017). Furthermore, US consumers habitually shopping in natural food shops and more familiar with higher prices for food products, associated them with desirable higher quality and were willing to pay significantly more for grass-fed beef compared to conventional beef (Gwin et al., 2012). The opposite was true for price conscious US consumers who were more accustomed to conventional beef available in retail stores and rather unfavorably disposed to products with price premiums (Evans et al., 2011). It must be noted here that, while price is a contextual factor, price premiums consumers are willing to pay represent behavioral intention. The influence of behavioral intention on actual purchase behavior will be explored in 3.5.6. Although often seen as a barrier to purchase of pasture-raised products, price is not the only consideration for most consumers, even those with low income.

Shopping location was also demonstrated to influence consumer purchase behavior. US consumers shopping at a grocery store, compared to a food co-operative, expressed a weaker belief that pasture-raised products were healthier, more environmentally friendly, and better for animal welfare as well as a lower likelihood of purchase and a lower WTP for these products (Conner and Oppenheim, 2008a, 2008b). In a brick-and-mortar store, conventional beef was more often preferred than grass-fed beef which is favored at the farmer's market, whereas the online sales channel for grass-fed beef was less appealing for most US consumers (Lim et al., 2018). A probable reason is that consumers with certain attitudes are more inclined to shop in specific locations that cater best to their demands, i.e. the attitudes behind the store choice provide a better explanation for purchase behavior than the purchase venue itself (McCluskey et al., 2009). This notion is further supported by the finding that when consumer attitudes and knowledge about production methods and nutrition were accounted for in a WTP model, the shopping venue exhibited no significant effect on purchase likelihood (Gwin et al., 2012).

The effect of domestic or local production differed across countries and product groups. The origin was crucial for purchase decision for pasture-raised lamb meat among European consumers from Spain, Italy, and Norway (Bernués et al., 2012; Hersleth et al., 2012). For most of the consumers in Spanish, French and UK samples, the origin of beef was the main driver of purchase decision (Realini et al., 2013). In Germany, preference for domestic products reduced purchase likelihood of pasture-raised milk, whereas among Swiss consumers, this attribute had no significant influence (Stolz et al.,

2011). For Italian consumers, on the contrary, domestic pasture-raised milk had a greater utility (Tempesta and Vecchiato, 2013). For the US consumers preferring local products, a grass-fed steak was significantly more appealing than a grain-fed one (Evans et al., 2011). Where consumers reside also influenced their awareness about beef and dairy production. For instance, in a region where pasture-based systems are the norm, consumers may be less willing to pay a premium (McCluskey et al., 2009). Through the lens of the Alphabet Theory, origin (context) has an influence on beliefs about the quality or safety of a product or reflect certain consumer assumptions related to the origin and based on their knowledge.

Among the sensory attributes, actual taste appears to be the most important, outmatching appearance and overriding the effect of information about production practices and environmental impact of a pasture-raised product (Getter et al., 2014; Musto et al., 2015; Xue et al., 2010). However, in a real purchase situation with no prior chance to taste the product, taste yields to appearance, e.g., grass-fed beef received higher ratings based on visual cues but not on taste or overall acceptability (Xue et al., 2010). So, consumers preferred low marbling, a visible indicator of a lower, healthier fat content (Evans et al., 2011; Morales et al., 2013). In studies based on sensory evaluations, the taste of pasture-raised products negatively disconfirmed consumers' high expectations and had a negative effect on the intention to purchase (D'Alessandro et al., 2012; Font-i-Furnols et al., 2011; García-Torres et al., 2016; Morales et al., 2013; Musto et al., 2015). In several sensory studies all panelists or a part of them were unable to differentiate between samples of beef raised on pasture and in a feedlot (Gwin et al., 2012; Morales et al., 2013; Realini et al., 2013). However, consumers able to differentiate between the flavors of beef cuts from different production system were willing to pay higher prices for their preferred flavor (Umberger et al., 2002).

The effect of availability on consumer behavior regarding pasture-raised products was assessed in only a few studies. It was reported to be difficult to measure because consumers thought they already consumed these products whereas the real availability of these products in the stores was too low to make such statements plausible and actually presented an obstacle for purchase (Conner et al., 2008a; Gassler et al., 2018). Lack of availability was among the reasons most frequently given by US consumers who rarely or never bought pasture-raised products (Conner et al., 2008b).

3.5.5 Habits

According to the Alphabet Theory, formation and expression of habits is affected by attitudes and depends on context. The reviewed studies supported this connection and mentioned interest in cooking, beef and dairy consumption frequency, and responsibility for food purchases as factors of influence on

the likelihood to purchase and WTP for pasture-raised products. For instance, US consumers from the Appalachian region who cooked steak at home more frequently preferred grass-fed beef to grain-fed (Evans et al., 2011). Similarly, concern about the influence of meal planning on health, interest in cooking and trying new recipes, and purchasing lamb directly from a traditional butcher were linked to a greater preference for pasture-fed lamb among Spanish consumers from Aragon (Bernués et al., 2012). US consumers largely responsible for food shopping and more knowledgeable about the food products on the market, showed more interest in environmentally friendly grass-fed milk (Wong et al., 2010). Further, US consumers who habitually cooked and ate beef were more likely to prefer grass-fed beef and more willing to pay a premium for it (Umberger et al., 2002; Xue et al., 2010). However, higher meat expenditures negatively affected the preference for grass-fed beef (Evans et al., 2011). A similar effect was found for milk: Italian consumers buying larger amounts of milk per week were less willing to pay a premium for pasture-raised milk, despite stating that habits had the least influence on milk purchases (Tempesta and Vecchiato, 2013). One could explain this through price (context) as a decisive factor for consumers who habitually buy larger amounts. For instance, the lowest purchase frequency of pasture-raised milk was detected among German consumers more driven by price considerations than concern for animal welfare, environmental protection or higher product quality (Kühl et al., 2017). This result demonstrates a stronger influence of context than that of attitudes on the expression of habits. Another explanation is that habits are a repetitive behavior: consumers who frequently consume certain products may be unwilling to change their behavior and pay more for new products.

In other studies, on the contrary, higher expenditures for meat, especially beef, were associated with a higher WTP for and likelihood to purchase pasture-raised beef (Li et al., 2016; Marandure et al., 2016, Umberger et al., 2009). In this case, high expenditures probably arise from buying more expensive, high-quality products, rather than from the sheer amount or frequency of purchases. Thus, consumers habitually buying premium products may be more open to trying and paying more for new premium products.

As for habits unrelated to food, but disclosing the social values of consumers, previous donations to environmental organizations were also associated with a WTP for pasture-raised beef with a reduced carbon footprint in an online survey of US consumers (Li et al., 2016). Even so, this effect is not unambiguous, since donations to such organizations had no effect on German consumers' preference for animal and biodiversity-friendly milk (Markova-Nenova and Wätzold, 2018).

3.5.6 Intention and behavior

In the end, consumer purchase behavior regarding pasture-raised products depends on the interactions between the elements described above. To analyze consumer behavior, five of the reviewed articles applied a non-hypothetical approach involving transactions with real money in the form of experimental auctions (Conner and Oppenheim, 2008b; Evans et al., 2011; Umberger et al., 2002, 2009; Xue et al., 2010) and one of the studies proposed a non-hypothetical incentive compatible conjoint ranking mechanism (Lusk et al., 2008). A comparison of the WTP values elicited in the reviewed studies is impracticable due to the differences in methods applied, currencies, countries, products under scrutiny, and publication years. This and the fact that none of the studies worked with real market data complicate the elicitation of actual consumer behavior. Nevertheless, selected studies allowed to infer a general interest in and appreciation of pasture-raised products.

Purchase intention for pasture-raised beef or milk was positively affected by awareness about pasture-raised products, previous consumption experience (knowledge), and belief in healthiness (VBN). It was affected negatively by store location, i.e., availability (context) (Conner and Oppenheim, 2008a). In a conjoint analysis study, origin and pasture-based feeding system affected purchase intention for lamb meat more than did price (Font-i-Furnols et al., 2011). In an online survey with conjoint analysis, US consumers of exclusively non-conventional or of both conventional and non-conventional products showed a higher level of agreement with the benefits of pasture-raised milk (attitude), but valued organic milk more in their purchase intention, contrary to conventional consumers who preferred pasture-raised milk (Getter et al., 2014). Pasture-raised products were more attractive for German and Swiss conventional consumers than for those buying organic (Stolz et al., 2011). For organic pasture-raised products, a price premium also seems realistic since in a Spanish study applying conjoint analysis, consumers placed a higher value on pasture-raised organic beef, followed by organic beef fed on concentrate (García-Torres et al., 2016). Similar results are reported for organic pasture-raised milk that had the highest value for US organic consumers in an online survey with adaptive choice-based conjoint analysis (Harwood and Drake, 2018).

Supporting the Alphabet Theory, intention to purchase pasture-raised milk had a positive influence on purchase behavior, as structural equation modeling has confirmed (Gassler et al., 2018). Greater intention to try and purchase pasture-raised milk, combined with a low opinion of the milk processing industry led to the highest WTP in an online study in Belgium applying contingent valuation (De Graaf et al., 2016b). Most of the studies based on choice experiments discovered a higher consumer WTP for pasture-raised products. For instance, in a Swedish mail survey with choice experiments, consumers

showed high WTP for milk from cows kept on pasture rather than in a barn (Carlsson et al., 2005). However, a German in-store survey with choice experiments demonstrated that in a situation where consumers perceive other choice options more animal- or environmentally friendly, e.g. organic or suckler cow husbandry, the attribute 'pasture-raised' achieved the lowest WTP, surpassing only conventional products (Risius and Hamm, 2017). When organic and grass-fed were the only available options for milk, as in a phone survey conducted in the southeastern US, purchase decision was influenced mostly by price considerations (Wong et al., 2010). The results of a German online survey with a choice experiment demonstrated that consumer preferences and WTP for ethical milk production attributes such as 'pasturing' and 'biodiversity preservation' depended predominantly on their price consciousness, gender, and habitual milk consumption (Markova-Nenova and Wätzold, 2018). A discrete choice experiment conducted online in Germany revealed a high WTP for pasture-raised milk with a claim giving consumers an opportunity to directly support pasture-based farmers financially, especially among ethically concerned consumers (Kühl et al., 2017). Production on a family farm also induced a significantly higher WTP of US consumers for grass-fed milk (Wolf et al., 2011).

As for the point of sale, an online survey with a choice experiment found that US consumers were willing to pay a price premium for grass-fed beef at a regular store or a farmer's market, but not online (Lim et al., 2018). Natural food stores were the most promising distribution channel in a US in-store survey with an experimental second-price English auction (Conner and Oppenheim, 2008b). US natural food shoppers had higher preferences and WTPs for grass-fed beef and were more accustomed to higher prices in this kind of store (Conner and Oppenheim, 2008b; Gwin et al., 2012; McCluskey et al., 2005).

A significant influence of the sensory attributes 'appearance' and 'taste' on consumer WTP for grass-fed beef was confirmed in three US studies applying experimental auctions paired with sensory evaluation (Evans et al., 2011; Umberger et al., 2002; Xue et al., 2010). In a sensory consumer test followed by a choice-based conjoint analysis, respondents displayed a higher WTP for grass-fed ground beef compared to conventional grain-fed ground beef (Gwin et al., 2012). The preference of grass-fed beef based on visible cues was attributable to its leaner appearance, especially valued in steak (McCluskey et al., 2005). Furthermore, a hedonic price analysis of pasture-fed and organic cornfed beef sold through a value-based marketing program showed that leanness and tenderness had the highest value for US supermarket consumers (Boland and Schroeder, 2002).

A gap between consumer attitudes and purchase behavior regarding sustainable products was fully relevant for German consumers of pasture-raised products, i.e., higher price or lower availability (context) deterred consumers from a purchase despite their positive attitude towards pasture-based cattle husbandry (Weinrich et al., 2014). An online survey with contingent valuation revealed that US consumers concerned about the environment, supporting environmental regulation in agriculture, and purchasing local and organic products were willing to support emerging programs aimed at sustainable cattle husbandry, e.g., beef production with a reduced carbon footprint (Li et al., 2016). However, they were unwilling to pay a premium for such products, possibly because they thought they were already making environmentally friendly choices (ibid.). Similar findings were reported for an in-store survey conducted among South-African consumers who were willing to buy pasture-raised beef but not to pay a premium for it (Marandure et al., 2016). Such behavior was formed under the influence of sociodemographic factors, preferences, and habits. A lower WTP for pasture-raised products is quite a reliable sign that in a real shopping situation, consumers are unlikely to purchase a product priced above the usual price they pay. Still, most consumers are not driven exclusively by price considerations (Thilmany et al., 2006).

3.6 Concluding discussion

3.6.1 Theoretical framework

Several critical issues have emerged during the literature analysis using the Alphabet Theory framework. First, the framework is composed of a large number of constructs which naturally increases its explanatory power. Still, the question arises whether its predictive power is also as high. The efficacy of the Alphabet Theory in predicting consumer behavior may be tested in a future study using, for instance, panel data. Since such data most likely do not include pasture-raised products, other comparable product categories could be tested. Second, the allocation of certain elements to the framework constructs is vulnerable to criticism. One can rely on previous research when defining certain constructs (e.g. exploring availability under the ‘context’ construct), the others, however, remain questionable. For instance, several selected studies examined information presentation form. In this review, it is reported under ‘Information seeking and knowledge’. One could argue that this is also an element of the context, yet this leads back to the question of the framework’s parsimony and the definition of its constructs, since many other elements can be related to context. However, this question also refers to the ABC

Theory where the construct of context originally appears. Third, to make the basis for further application of the Alphabet Theory sounder, a practical comparison of the performance of the Alphabet Theory with other behavioral theories, e.g., TPB, may be of interest for future research.

Although the sheer number and definition of the constructs included can be the subject of criticism, the Alphabet Theory allowed a general picture of purchase behavior regarding pasture-raised products to be drawn (see Figure 3.3). Regarding the elements of the ABC and VBN theories in the Alphabet Theory framework, a look at the influence of contextual factors on formation of attitudes was helpful in explaining the attitude-behavior gap regarding pasture-raised products. Furthermore, consumers who have similar attitudes can exhibit totally different purchase intentions and behavior due to the differences in demographics, knowledge, context, and habits. An understanding of the interactions between the elements of the Alphabet Theory leads to practical insights into consumer behavior. Inclusion of demographics in the framework proved useful in consumer segmentation. Information seeking and knowledge provided insights on the content and means of presentation that are valuable for the development of convincing communication material to reach both existing and potential buyers of pasture-raised products. However, in the selected studies, information was provided by researchers, which leaves proactive information seeking and information coming from other sources, e.g., by word of mouth, underexplored. Yet, knowledge originating from information (seeking) was confirmed to have an effect on the formation of attitudes. The connection between certain attitudes and subsequent search for information, although logical, could not be substantially supported by the evidence. This could be a consequence of study design rather than a drawback of the framework. Lastly, habits, although addressed less frequently in the studies, were found to be a helpful intermediary, further contributing to the explanation of the attitude-behavior gap. Whereas the influence of habits on purchase behavior has been confirmed by the findings of the selected studies, the impact of (repetitive) behavior on formation of habits remains unexplored.

With several critical points, the Alphabet Theory framework was found suitable to conceptualize the findings of the literature research. Addressing the criticism of the Alphabet Theory in further research is recommended.

3.6.2 Recommendations

A summary of research findings embedded into a graphical framework of the Alphabet Theory (Figure 3.3) provided a glimpse into the current state of research on the subject and exposed several areas that invite further investigation. A look at the literature findings revealed the key role of attitudes in purchase behavior regarding pasture-raised products. Perceived taste of pasture-raised products is a

strong egoistical motive that translates into a purchase intention and WTP premium prices. Furthermore, perceived health benefits of pasture-raised products are believed to come from a favorable fatty acid composition and from perceived better health of cattle kept on pasture. It must yet be researched whether the fatty acid composition of pasture-raised products meets the requirements of the current EU Regulation No 1924/2006 on nutrition and health claims. Instead of health benefits, which are hard to be used legally in a promotional strategy, emphasis can be put on emotional response, altruistic values, and norms. As for the normative component of the attitudes, it could have enjoyed more attention. Whereas social norms were mentioned in a few studies, research on the influence of personal norms (e.g., expectations to oneself regarding reduction of environmental impact) was found to be missing in the corpus.

Greater awareness and knowledge about the impact of conventional and alternative methods of beef and dairy production on the environment, animal welfare, and human health proved to positively affect consumer attitudes and to motivate for the purchase of pasture-raised products. Finding ways to increase consumer interest in production systems and desire to learn more about the origin of their food and its environmental impact is a promising strategy to increase sales. Small producers of pasture-raised products provide such information on their websites or directly in their farm shops. For a broader reach, different information formats can be used on the internet or in larger store chains, for instance videos with narration which seem to be effective for people with no agricultural background. Depicting the benefits of pasture-based production is probably most effective against an informational background related to conventional production, to emphasize the differences that may be non-evident for a large segment of potential consumers. Clearly, pasture-raised products are valued more than conventional. However, considering the lack of consumer knowledge about what production systems entail, a question of positive differentiation of pasture-raised products from other products with ethical attributes, such as derived from organic or extensive suckler cow husbandry systems, should be tackled in further research. Since these products are nearly identical in the eyes of the average consumer, engaging consumers in proactive information search about the unique benefits of pasturing at their own pace is a crucial challenge in marketing strategy. Information seeking may be stimulated by provision of QR codes or using gamification techniques. Biodiversity conservation, although valued by consumers, is still an underexplored subject in relation to pasture-raised products. Yet, this attribute can provide extra value for conventional and organic consumers.

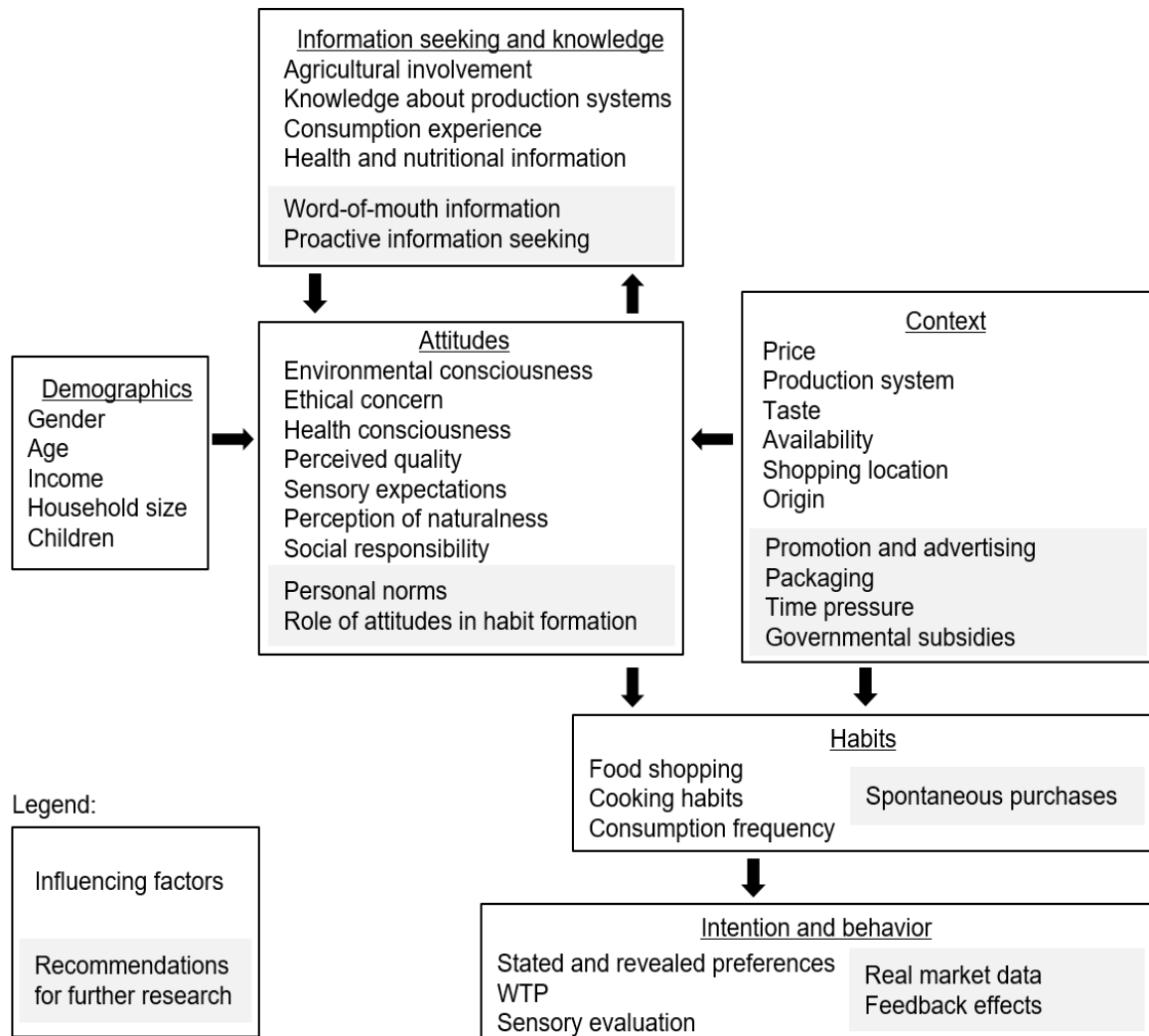


Figure 3.3: Summary of findings on factors that influence consumer behavior regarding pasture-raised products and some recommendations for further research.

Contextual attributes were found to greatly influence consumer behavior. A connection exists between specific consumer groups buying pasture-raised products at particular locations. The reason for this connection, though, presumably lies in the common attitudes driving consumers to the stores which correspond to their values but not in the shopping venues as such. This calls for further research on the influence of external factors on consumer groups with different attitudes and sociodemographic data. Moreover, the actual taste of pasture-raised products poses a problem for expanding the target group beyond those advocates of environmentally friendly food choices who do not refrain from meat completely. The taste of pasture-raised products, especially beef, can be new to consumers accustomed to grain-fed products, or does not meet their high expectations, or differs depending on the season and botanical composition of the pasture (Kamihiro et al., 2015). Yet, a consumer can be influenced by the actual taste of the products only after having experienced their taste at least once. Therefore, promoting

pasture-raised products as appetizing seems only fully substantiated to reach those consumers who already intend to repurchase them. As for broader contextual attributes, governmental support for farmers in the form of subsidies or direct payments, apart from its immediate effect, is likely to create a context which reinforces consumers' intention to support pasture-based production. Additionally, the area of residence and product type had an influence on consumer perception of pasture-raised products and must be accounted for in marketing strategies. That said, the influence of the product type requires further investigation to compare beef and dairy, as well as fresh and processed products. Regarding other external attributes, research on the influence of packaging design and even packaging material made out of grass seems promising. Besides, further research is needed on the influence of attitudes and context on the formation and expression of habits, as this effect can only be inferred from the findings, yet has not been sufficiently tested. For instance, placing high value on family time may have an effect on cooking habits and with that on purchasing habits.

Shopping habits were also useful for the understanding of consumer behavior. Consumers habitually remain loyal to the most conveniently located stores that suit their requirements. In addition, different types of consumers can be reached at the same venue. Therefore, marketing efforts for pasture-raised products should be tailored to fit the ambience of the shopping venue and convey a message broad enough to reach most shoppers. A message projecting the benefits of pasture-raised products for biodiversity conservation or keeping small farms in production should reflect the core values and habits of the target group as well as consider the purchase context and current legislation. Therefore, such messages can appeal to responsibility towards future generations. Research on consumers' intentions and behavior based on real market data on sales in different purchase locations is still lacking. Besides, seeing that no legal accordance exists regarding the exact definition of pasture-raised products, research in real market conditions seems problematic at this point. This review only explored publications in the English language which explains why nearly half of the selected studies originated from the USA, but may also indicate a bias in the synthesized findings and the following conclusions. Since the area of residence was found to have an influence on the awareness of consumers about pasture grazing, it is possible that the extent of grazing in a particular country has a similar contextual effect which requires further research. However, in the current situation, one notion is universally applicable: consumer support and carefully managed pasture grazing backed by technological developments are essential contributors to biodiversity conservation and with that, to climate change mitigation.

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3.8 Appendix

Table 3.1: Summary of reviewed publications

Author(s), year	Title	Study focus	Element of the Alphabet Theory	Methods	Product	Sample size	Country
Bermués et al. 2012	Consumer segmentation based on convenience orientation and attitudes towards quality attributes of lamb meat	meat consumer profiles and their characterization according to socio-economic characteristics, place of purchase and preferences quality cues	attitudes, context, habits,	mail survey	lamb meat	343	Spain
Boland and Schroeder 2002	Marginal value of quality attributes for natural and organic beef.	marginal value of natural and organic beef quality attributes to consumers	purchase behavior	hedonic price analysis	natural and organic beef	478 beef carcasses	USA
Busch et al. 2018	Consumer expectations regarding hay and pasture-raised milk in South Tyrol	consumer attitudes towards pasture-raised and hay milk and perception of these terms in South Tyrol	attitudes	online survey with an open-ended question	hay and pasture-raised milk	171	Italy
Carlsson et al. 2005	Consumer preferences for food product quality attributes from Swedish agriculture	differences in marginal WTP for quality attributes across agricultural product groups	knowledge, purchase intention	mail survey with a choice experiment	chicken, ground beef, pork chop, egg, milk, flour	710	Sweden
Conner et al. 2008a	Consumer preferences for pasture-raised animal products: Results from Michigan	consumer attitudes towards claimed attributes of pasture-raised animal products	demographics, attitudes, context	phone survey	pasture-raised meat and dairy products	988	USA
Conner et al. 2008b	Value in the values: Pasture-raised livestock products offer opportunities for reconnecting producers and consumers	opportunities and obstacles of pasture-based livestock production and marketing from stakeholder perspective; shared values existing between producers and consumers regarding pasture-based products	attitudes, context	in-depth interviews phone survey	pasture-raised meat and dairy products	16 farmers; 988 consumers	USA
Conner and Oppenheim 2008a	Demand for pasture-raised livestock products: Results from Michigan retail surveys	consumer awareness and perceptions of as well as behavior regarding pasture-raised products; effectiveness of informational messages in relation to purchase likelihood and WTP a premium	attitudes, information seeking, context, purchase intention	in-store survey	pasture-raised meat and dairy products	253	USA
Conner and Oppenheim 2008b	Demand for pasture-raised livestock products in Michigan: Results of consumer surveys and experimental auctions	consumer awareness and perceptions of as well as behavior regarding pasture-raised products; effectiveness of informational messages; likelihood to purchase and WTP a premium for pasture-raised products	knowledge, purchase intention, chase behavior	in-store survey; experimental second-price English auction	pasture-raised milk	253; 63	USA

Author(s)	Year	Country	Product	Methodology	Knowledge, context	Findings
D'Alessandro et al.	2012	Italy	meat of lambs raised with milk from mothers fed reared on grass or on stall	sensory evaluation	knowledge, context	effect of maternal feeding system on the meat quality of suckling lambs and consumer expectations deriving from the information about feeding system (lambs fed with maternal milk from mothers reared on grass versus lambs fed with maternal milk from mothers reared on stall) and effect of this knowledge on hedonic ratings
De Graaf et al.	2016b	Belgium	animal-friendly milk	online survey; contingent valuation	attitudes, information seeking, demographics	consumer segmentation to evaluate market opportunities for animal-friendly milk
Evans et al.	2011	USA	grass-fed beef products	in-store experiment, non-hypothetical Becker-DeGroot-Marschak auction, sensory evaluation	demographics, context, attitudes, purchase behavior	consumer perceptions of and WTP for grass-fed beef; market opportunities for grass-fed beef products in the retail sector and implications for the producers
Font-i-Fumols et al.	2011	Spain, France, UK	lamb meat	conjoint analysis; sensory evaluation	demographics, context, purchase intention	effect of extrinsic cues (production system, origin, price) on consumers' intention to purchase lamb meat
García-Torres et al.	2016	Spain	grass- and concentrate-fed organic beef	sensory evaluation; conjoint analysis	context, purchase intention	consumer preferences for grass- and concentrate-fed organic beef in comparison to conventional beef
Gassler et al.	2018	Germany	pasture-raised milk	online survey	demographics, attitudes, context, purchase intention, purchase behavior	driving forces of pasture-raised milk purchases
Getter et al.	2014	USA	pasture-raised milk	online survey; conjoint analysis	demographics, attitudes, context, purchase intention	investigation of the market for milk and identification of consumers segment with attitudes, behaviors and perceptions favorable for the purchase of pasture-raised milk
Gwin et al.	2012	USA	grass-fed beef	sensory evaluation; choice-based conjoint analysis	knowledge, attitudes, context, purchase intention	consumer interest in purchasing grass-fed beef in bulk; WTP for grass-fed beef relative to conventional beef; impact of taste preferences on WTP

Harwood et al. 2018	Identification and characterization of fluid milk consumer groups	identification of the drivers of liking for milk, purchase motivation for non-conventional products, consumer segmentation	demographics, attitudes, context	online survey with adaptive choice-based conjoint analysis, MaxDiff scaling, and Kano analysis	milk	1407	USA
Hersleth et al. 2012	Lamb meat—importance of origin and grazing system for Italian and Norwegian consumers	importance of grazing system and geographic origin of lamb meat for consumers	information seeking, attitudes, context	focus groups with sensory evaluation; online survey with a conjoint experiment	lamb meat	16, 18; 189, 193	Norway, Italy
Kühl et al. 2017	Labeling strategies to overcome the problem of niche markets for sustainable milk products: The example of pasture-raised milk	consumer willingness to purchase and pay for different labelling strategies for pasture-raised milk	demographics, attitudes, purchase intention	online survey with a discrete choice experiment	pasture-raised milk	1065	Germany
Li et al. 2016	Consumer willingness to pay for beef grown using climate friendly production practices	feasibility of a third-party voluntary labeling program for beef with reduced carbon footprint through evaluation of consumer WTP	attitudes, purchase intention	online survey; contingent valuation	beef from prescribed grazing systems	806	USA
Lim et al. 2018	Point-of-sale specific willingness to pay for quality-differentiated beef	role of purchase location in consumer WTP for quality-differentiated beef	context, purchase intention	online survey with a choice experiment	local, organic and grass-fed beef	1036	USA
Lusk et al. 2008	An incentive compatible conjoint ranking mechanism	implementation of incentive compatible conjoint ranking method to elicit consumer preferences for beef attributes	information seeking, purchase intention	incentive compatible conjoint ranking	pasture-raised beef	515	USA
Marandure et al. 2016	Beef traders' and consumers' perceptions on the development of a natural pasture-fed beef brand by smallholder cattle producers in South Africa	views of beef traders and consumers on the development of a naturally produced beef brand by smallholder cattle producers	attitudes, context	face-to-face interview; in-store survey	pasture-fed beef	18 beef traders; 155 consumers	South Africa
Markova-Novoa et al. 2018	Fair to the cow or fair to the farmer? The preferences of conventional milk buyers for ethical attributes of milk	preferences of conventional consumers for ethical attributes of milk: pasture access and biodiversity conservation, among others	attitudes, context, purchase intention	online survey with a choice experiment	milk with ethical attributes	1040	Germany

McCluskey et al. 2005	U.S. grass-fed beef: Marketing health benefits	consumer preferences for grass-fed beef as a product with benefits for health	attitudes, knowledge, purchase intention	in-store survey; choice-based conjoint analysis	grass-fed beef	509	USA
Morales et al. 2013	Beef acceptability and consumer expectations associated with production systems and marbling	effect of extrinsic (production system) and intrinsic (marbling) cues of beef on consumer acceptability and expectations	knowledge, context	sensory evaluation	beef	204	Chile
Musto et al. 2015	Influence of different information presentation formats on consumer acceptability: The case of goat milk presented as obtained from different rearing systems	effect of information presentation format on acceptability of goat milk from different rearing systems	information seeking, attitudes, context	sensory experiment	goat milk	140	Italy
Realini et al. 2013	Spanish, French and British consumers' acceptability of Uruguayan beef, and consumers' beef choice associated with country of origin, finishing diet and meat price	importance of origin, feed and price for consumer purchase decisions regarding beef, consumer segmentation	context	sensory evaluation, conjoint analysis	beef	100, 99, 93	Spain, France, UK
Risius and Hamm 2017	The effect of information on beef husbandry systems on consumers' preferences and willingness to pay	perspectives of husbandry labelling for beef; effect of husbandry labeling on consumer preferences and WTP	information seeking, context, purchase intention	in-store survey, choice experiment	beef	676	Germany
Stolz et al. 2011	Preferences and determinants for organic, conventional and conventional-plus products – The case of occasional organic consumers	preferences of occasional organic consumer and determinants of these preferences regarding conventional, organic and conventional-plus products	attitudes, context, purchase behavior	laboratory purchase simulation; choice experiment	milk from pasture-raised cows; free from artificial additives and flavors yogurt; apples with reduced use of pesticides	150, 143	Switzerland, Germany
Tempesta and Vecchiato 2013	An analysis of the territorial factors affecting milk purchase in Italy	consumer WTP a premium for milk differentiated based on origin, production area and rearing method	attitudes, context, habits	in-store survey with a choice experiment	milk	400	Italy
Thilmany et al. 2006	Strategic market planning for value-added natural beef products: A cluster analysis of Colorado consumers	consumer segmentation based on their interest and WTP for natural beef products varied by production practices and public good	demographics, attitudes, purchase intention	online survey; contingent valuation	value-added natural beef products	1288	USA

Umberger et al. 2002	U.S. consumer preference and willingness-to-pay for domestic corn-fed beef versus international grass-fed beef measured through an experimental auction	consumer preferences and WTP for beef; effect of demographic variables on taste preferences and WTP	demographics, knowledge, context, habits, purchase behavior	sensory evaluation; second-price Vickrey auction	grass-fed beef	248	USA
Umberger et al. 2009	Role of credence and health information in determining US consumers' willingness-to-pay for grass-finished beef	intrinsic and extrinsic attributes and consumer characteristics potentially useful in prediction of consumer preferences and premiums for grass-finished beef	information seeking, attitudes, purchase behavior	sensory evaluation; random n ^b -price auction	grass-finished beef	213	USA
Weinrich et al. 2014	Consumer attitudes in Germany towards different dairy housing systems and their implications for the marketing of pasture raised milk	importance of cattle housing systems for consumers; consumer-citizen gap regarding pasture-raised products	attitudes, demographics, purchase intention	online survey	pasture-raised milk	1009	Germany
Wolf et al. 2011	Understanding U.S. consumer demand for milk production attributes	milk market segmentation based on consumer preferences for milk production process attributes	attitudes, purchase intention	online survey with a choice experiment	milk	1007	USA
Wong et al. 2010	Consumer premiums for environmentally friendly grass-fed and organic milk in the Southeast	determinants of consumer demand for organic and grass-fed dairy products	attitudes, demographics, purchase intention	phone survey	grass-fed and organic milk	655	USA
Xue et al. 2010	Consumer preferences and willingness to pay for grass-fed beef: Empirical evidence from in-store experiments	consumer preferences and WTP for grass-fed beef; effect of nutrition knowledge and information on nutrients on consumer WTP	information seeking, knowledge, attitudes, habits, purchase behavior	in-store experiments; non-hypothetical Becker-DeGroot-Marslak auction; sensory evaluation	grass-fed beef products	404	USA

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4 Insights into German consumers' perceptions of virtual fencing in grassland-based beef and dairy systems: Recommendations for communication

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4.1 Simple summary

Pasture-raised beef and dairy products are valued by consumers for their taste and higher animal welfare standards. Pasture grazing can be optimized using virtual fencing technology. The use of virtual fencing to guide cattle on pasture can contribute to biodiversity conservation by protecting environmentally sensitive areas. Concerns exist about consumers' acceptance of virtual fencing in beef and dairy production. To explore consumers' perception of virtual fencing, German consumers' responses to information material about virtual fencing were analyzed. The results showed respondents' uncertainty about the implementation of the technology with regard to its effects on animal welfare and possible social impact. Respondents showed readiness to support pasture grazing with their purchase decisions, yet struggled to see their personal advantages from the use of a specific grazing management practice. Thus, practitioners should consider keeping the focus in communication with consumers not on the technology but on tangible benefits, such as quality of pasture-raised products. Furthermore, state support is argued to be necessary to encourage livestock practitioners to adopt virtual fencing in cattle grazing for biodiversity conservation.

4.2 Abstract

The share of cattle grazing on grassland is decreasing in many European countries. While the production costs of intensive stall-based beef and dairy systems are usually lower per kg product, grazing-based systems provide more ecosystem services that are valued by consumers. Innovative grazing systems that apply virtual fencing technology can improve animal welfare, optimize grassland use as pasture, and contribute to biodiversity conservation. Although consumer demand for pasture-raised prod-

ucts could promote animal-friendly practices, consumer perception of virtual fencing remains unknown. To address this gap in research, this study developed information brochures with different lines of argumentation and tested the responses of German consumers using concurrent think aloud protocols. The results demonstrated ambivalence in consumers' attitudes to virtual fencing. The participants supported the idea of cattle pasturing to promote animal welfare and foster biodiversity declaring a willingness to contribute not only by paying price premiums for pasture-raised products but also through seeking other possibilities of action and participation. However, participants raised concerns about the effects on animal welfare and the social ramifications of the technology. The study offers recommendations for addressing these issues in communication and further contributes to the understanding of consumers' perceptions of innovation in animal production.

Keywords: *agricultural innovation; animal husbandry; animal welfare; biodiversity communication; conservation marketing; consumer attitude; verbal protocol*

4.3 Introduction

Further decline in pastureland and dairy cattle grazing in the EU is expected in the coming years (European Commission, 2019a; van den Pol-van Dasselaar et al., 2020). It proceeds in spite of evidence that the traditional use of grasslands for grazing contributes significantly to improved animal welfare (Crump et al., 2019), biodiversity and cultural landscape conservation (Plieninger et al., 2013), and the attractiveness of life in rural areas (OECD, 2001; de Vries et al., 2015). To counteract the decrease in the share of pastureland in total grassland, it will be important to ensure governmental support in motivating farmers to adopt sustainable grazing practices and compensating them for the higher production costs incurred in adhering to higher animal welfare standards and conserving biodiversity (Crowley et al., 2019). While a range of governmental policy instruments can be applied, such as taxes and subsidies, an alternative mechanism involves creating markets by providing information to consumers (Nunes and Riyanto, 2005). Given that increasing consumer demand for pasture-raised beef and dairy products could contribute to the sustainable use of grasslands and the conservation of their ecosystem services (European Commission, 2019a), it is important to explore consumers' perceptions of grazing-based livestock production.

For grazing to be economically viable, it requires active management. Compared to continuous grazing, rotational grazing management systems that involve splitting pasture into paddocks allow more effective use of fodder and can enhance insect biodiversity (Ravetto Enri et al., 2017). One of the

developing technologies aimed at optimizing grazing management is virtual fencing, which is an automated instrument for cattle herding based on restricting movement through audio warning tones and electric signals in the absence of tangible boundaries (Campbell et al., 2019). Virtual fencing can be potentially used for cattle management in the areas where traditional fencing is not possible and for conservation of environmentally sensitive areas within pastures, to protect the nests of endangered birds and rare plant species located there (Marini et al., 2015; Campbell et al., 2020). At the same time, virtual fencing can reduce costs related to the installation, maintenance and relocation of electric fences (Lee et al. 2018), thereby enabling farmers to expand pasture grazing for their cattle or to adopt it in the first place. Current solutions employ a combination of GPS technology to track animals in the landscape with an electronic neckband worn by cattle that emits warning signals. Research in the field of virtual fencing has so far been limited to technical aspects, animal ethology and welfare (e.g., Lee et al., 2018; Markus et al., 2014). Consumers' perspectives on virtual fencing are as yet unclear, though concerns exist as to its socio-ethical acceptability (Eastwood et al., 2019). This finding is supported, for example, by the results of a study of Dutch citizens' views on modern farming that indicates a preference for a rather traditional, natural dairy farming (Boogaard et al., 2011). Whereas the attitudes of consumers to agricultural innovations have been explored in relation to more established fields, such as genetically modified organisms and automatic milking systems (e.g., Butkowski et al., 2020; Millar et al., 2002), the road to understanding consumers' perceptions of virtual fencing in pasture grazing systems has yet to be paved.

Research on agricultural innovation suggests that the use of virtual fences could be a contentious socio-ethical issue, on the one hand, perceived as beneficial for animal welfare and biodiversity but also seen as being 'unnatural' and overly technical (Eastwood et al., 2019). Contrary to these latter concerns, however, it has been shown that the welfare and behavior of cattle in grazing systems that use virtual fencing is no different than in systems that use electric fencing (Campbell et al., 2019), while pasture grazing itself positively affects cattle welfare (Crump et al., 2019). These facts are not known by most consumers, however, as there is a widespread lack of public knowledge about agricultural practices and animal welfare (Heise and Theuvsen, 2017; Weible et al., 2016). In the absence of such knowledge, consumers have been found to weigh up the acceptable and unacceptable aspects of a technology rather than clearly stating an attitude (Millar et al., 2002). Efforts to address this by providing excessive information on the new technology and on conservation may prove counterproductive, however, actually serving to increase consumer uncertainty and confusion (Strother and Fazal, 2011; Ziamou and Ratneswar, 2002). Nevertheless, many consumers do show an interest in agricultural topics and actively seek and obtain information on these topics from mass media (Heise and Theuvsen,

2017; Köhl et al., 2019), which in its turn can shape consumers' attitudes and, thereby, affect their behavior (Zepeda and Deal, 2009).

Addressing consumers' values underlying their behavior is crucial for successful marketing of products from an innovative grazing system. Whereas the advantages of the new technology and biodiversity conservation may seem somewhat abstract to many consumers, pasture-based systems also provide tangible benefits in form of high-value food products. As a recent review has shown, consumers appreciate the improved animal welfare and lower environmental impact of pasture-raised products (Stampa et al., 2020a). They associate improvements in animal welfare with better product quality, taste and healthiness (De Graaf et al., 2016a). This motivates substantial consumer segments to be willing to pay higher prices for meat and dairy from ethical production systems with lower environmental impact and better animal welfare (Janssen et al., 2016; Weinrich et al., 2014). Furthermore, landscape attributes, such as the presence of grazing animals, provided by grasslands used for grazing are likely to be appreciated by consumers (Schaak and Mußhoff, 2020). German consumers also support measures aimed at animal welfare improvement, the creation of innovative forms of financing for nature conservation, and an expansion of nature protection areas (European Commission, 2019b; Markova-Nenova and Wätzold, 2018). For many consumers, however, it may prove difficult to change their consumption habits and behavior, despite their understanding the competitive disadvantages arising for farmers from the adoption of pasture grazing, stricter animal welfare standards, and biodiversity conservation measures (Becker et al., 2018; Busch et al., 2012). Consumers' behavior regarding pasture-raised products from the new grazing system is likely to be affected by factors, such as sense of own self-efficacy, social norms, feelings, and cognition, as well as perceived personal benefits, personal relation to food production, the associated costs of the products, and their availability (Demarmels et al., 2015; Gassler et al., 2018; Harper and Henson, 2001; McAfee et al., 2019; Tinch et al., 2018; White et al., 2019). Addressing at least some of these factors using effective targeted communication and appealing visual and textual materials can increase the inclination of consumers to consciously perceive and process information on pasture-raised products and their propensity toward pro-environmental behavior (Demarmels et al., 2015; McAfee et al., 2019; Tinch et al., 2018; White et al., 2019). Seeing that European consumers agree on the importance of better communication and information provision on the issues of animal welfare and biodiversity (European Commission, 2019b; Vanhonacker et al., 2010), there is considerable potential for livestock producers to market pasture-raised products for higher prices and thereby gain the support of consumers for sustainable agricultural innovations.

The influence of different communication approaches and textual and visual information have been previously studied with regard to consumers' perceptions of animal husbandry and welfare (e.g.,

Hirsch et al., 2019; Köhl et al., 2019; Risius and Hamm, 2018; Vigors, 2019). However, considering consumers' possible ethical concerns regarding animal welfare in virtual fencing systems, it is of interest to explore the communication potential of its aspects related to nature conservation. While a few recent studies have addressed different aspects of communication of biodiversity conservation (Kidd et al., 2019; Ryan et al., 2020; Schaffner et al., 2015; Weinstein et al., 2015), no studies (to the authors' knowledge) have yet explored communication of biodiversity conservation through the lens of beef and dairy production, especially in the context of innovative practices in animal husbandry. Given the identified research gaps, insights from a closer exploration of consumers' perception of the innovative grazing system can be useful to inform practitioners' decisions when developing communication strategies. The aim of this study was thus to explore consumers' perceptions, understanding, and acceptance of virtual fencing in pasture-based livestock production, focusing on aspects related to the technology, animal welfare, pasture-raised products, and environment and biodiversity. The research objectives and questions are presented in Figure 4.1.

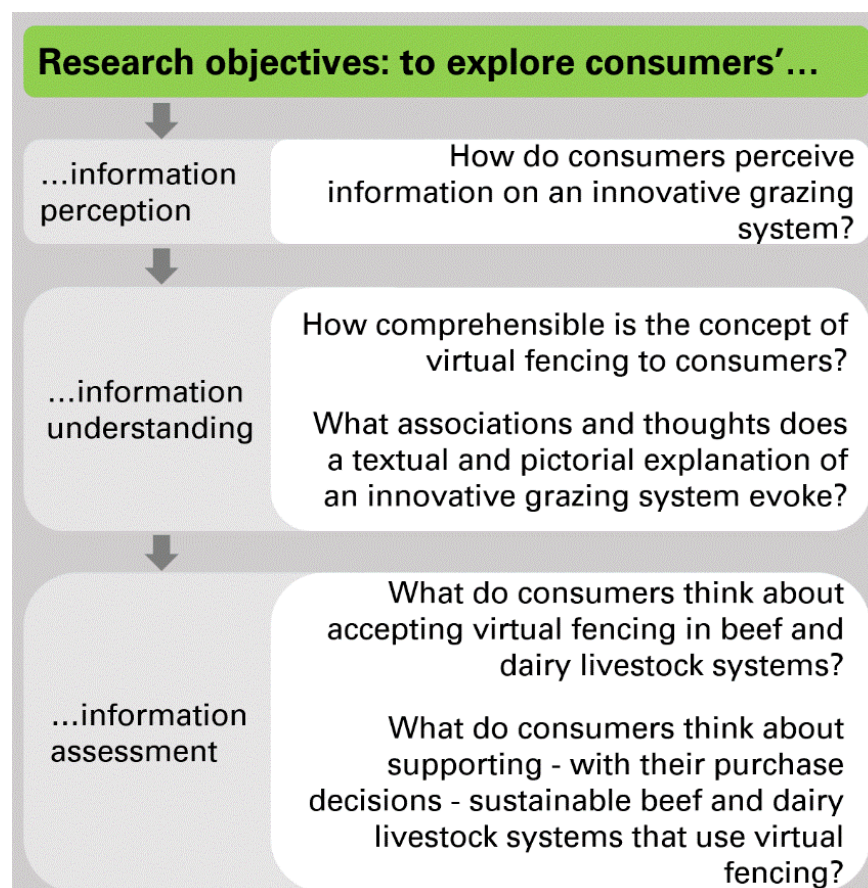


Figure 4.1: Research objectives and research questions.

4.4 Materials and methods

The postpositivist research paradigm was adopted in the preparation, conduct and reporting of this study. Figure 4.2 depicts the study design. The study is reported in adherence to the standards for reporting qualitative research (O'Brien et al., 2014).

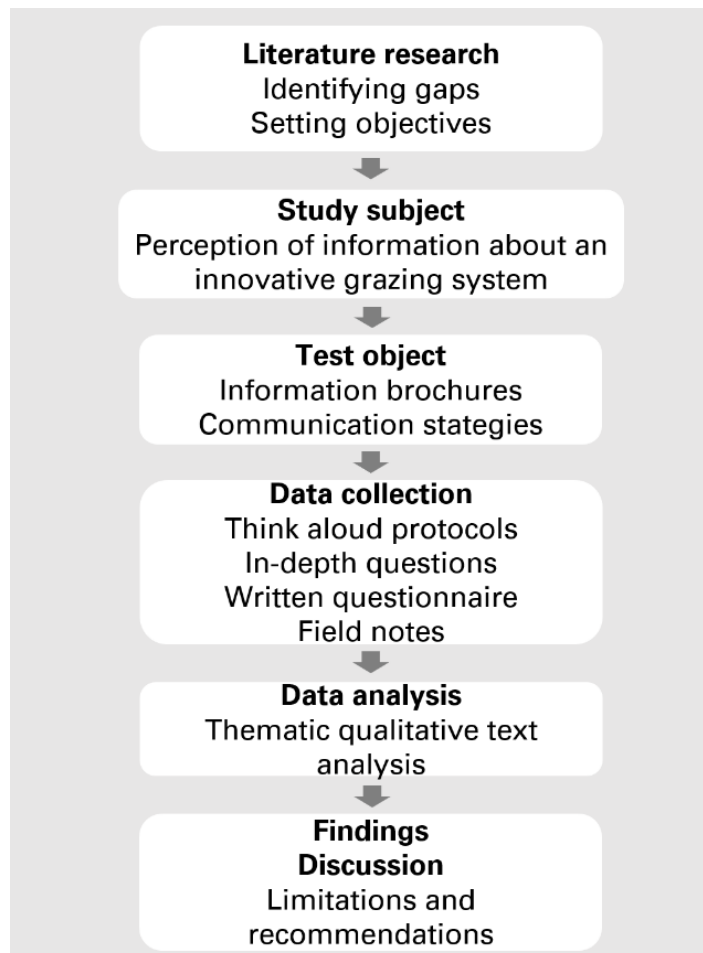


Figure 4.2: Study design.

4.4.1 Test object

Since flyers and folded brochures serve as an information source for large consumer segments prior to their purchase of meat products in German supermarkets (BMEL, 2018; Hirsch et al., 2019), information brochures were used to stimulate consumers' reflection on the novel concept. Four tri-fold brochures were crafted, all entitled (in German) 'Pasture Cattle Farming'. Each brochure had a separate topic announced on the cover and a different cover image to illustrate the topics: 'Good for animals and humans', 'Promoting animal welfare', 'Conserving biological variety', and 'Conserving natural landscapes'.

Drawing on the recent findings in conservation communication and the work of Schaffner et al. (2015), several communication approaches were used. A cognitive-informational approach was realized through both declarative knowledge (facts, trends, arguments) and procedural knowledge (possibilities of action, suggestions, advice) strategies. In terms of the emotional-experiential approach, positive emotionalization (positive emotion strategy) was attempted using visual stimuli, including appealing motifs of nature, animals, and people, and a bright pallet of blue, green, and white. An effort was made to provide balanced or neutral textual information. The negative emotion strategy was omitted. In terms of benefit strategy, each brochure included suggestions of the personal benefits of biodiversity conservation and animal welfare. Two of the brochures also highlighted the individual contribution of consumers. The moral norm strategy appealed to consumers' responsibility for nature and for future generations.

Varying levels of argumentation about animal welfare, sensory enjoyment, biodiversity, landscape, farmers, product quality, and virtual fencing were selected to evoke a wider array of associations and to reduce the impact of specific designs on participants' responses. The term 'biodiversity', previously found unsuitable in German language for communication (Bantle and Hamm, 2014), was only mentioned in contact information, while 'biological variety' was used throughout the texts.

4.4.2 Data collection

4.4.2.1 Think aloud protocols

To provide insights on consumer perception, explorative data were collected using concurrent think aloud protocols (TAPs). This method draws on the verbalization of participants' thoughts during the performance of tasks, such as reading texts in order to provide insights into thought processes as they are happening (Ericsson and Simon, 1993; Hoppmann, 2009). Compared to structured interviews, TAPs allow participants to explore the test object at their own pace and to go beyond any assumption on the part of the researcher (van Someren et al., 1994). Regarding the test object in this study, freedom to explore is essential because it allows to observe which visual or textual elements provoke consumers' response. This method also provides fuller data than retrospective TAPs (Ericsson and Simon, 1993; van Someren et al., 1994) and helps to avoid false recall (Hoppmann, 2009). The limitations of the method of concurrent TAPs are susceptibility to lack of realism, lack of generalizability and possible data incompleteness due to cognitive overload and small sample sizes of 10 to 30 (Hoppmann, 2009; van Someren et al., 1994). TAPs have been used in consumer studies, inter alia, to explore consumer awareness of sustainable aquaculture products (Zander et al., 2018) and motivation to engage with the

labeling of food products (Tanner et al, 2019). On the basis of the observed benefits and the versatility of this method in different study designs, concurrent TAPs were used in this study to collect explorative data on participants' perceptions of information.

4.4.2.2 Test procedure

A two-phase pre-test was conducted to assess the comprehensibility and design of the brochures and to test the interview guide. After final revision, the brochures were typeset and printed by an external professional. The TAPs were recorded in November–December 2019 in three German cities: Osnabrück (North-West), Cottbus (East), and Augsburg (South). These cities were selected on the basis of their average purchasing power index (MB-Research, 2019), their population, and their location in areas of widespread pasture grazing. The study participants were recruited from pedestrian streets in the city centers. Purposive quota sampling was applied, with equal quotas set for participants aged 18–49 years and for participants aged 50 years and older in accordance with the median age of the German population at between 18 and 80 years of age (Destatis, 2019). The quota of female participants was set to two-thirds on the basis that women in Germany are more often responsible for the purchase of food in private households (BMEL, 2008).

In the first stage of recruitment, a trained recruiter systematically approached every third passer-by. The screening criteria included regular consumption of beef and dairy products and no personal affiliation to agriculture or the food industry. The participants who fulfilled these criteria were invited to an interview and informed about the study background, the interview recording, the anonymity of data handling, and the amount of monetary compensation for their time. As the data collection progressed, the recruiter only approached passers-by to fill the missing quota.

All the TAPs were conducted by the first author, a female researcher trained in qualitative data-collection and analysis. The only persons present during the TAPs were this researcher and a single participant at a time. Once the participants had given their oral consent, the researcher switched on a voice-recorder and a camera focused on the brochures. The study began with a training phase to acquaint participants with the method; after that, a task was given to examine the four brochures, presented in randomized order. Participants were asked to verbalize every thought that came to their mind, to read aloud each text they were currently reading, and to vocally refer to the images they were looking at. Interactions between the researcher and the participants during the TAPs were minimized and aimed solely at encouraging continuous verbalization. Subsequently, a brief interview was conducted to elicit

any thoughts the participants wished to add to their verbalizations, their understanding of virtual fencing, and their assessment of the TAP method. A pen-and-paper questionnaire was used to collect demographic data and the participants' experience of pasture-raised products.

All research steps were thoroughly documented and the audio and video recordings of the TAPs were supplemented with the interviewer's fieldnotes from each TAP session and the data from the brief interviews conducted after each TAP. The fieldnotes focused on the participants' observable behavior and were used in both the protocol transcriptions and in the composition of case summaries.

4.4.2.3 Sample description

The total sample of 20 participants comprised twelve women and eight men, equally distributed between age groups, with the age of the participants ranged between 22 and 66 years old (see Table 4.1). The share of female participants deviated slightly from the initial quota. Six persons were recruited in the East, and seven participants each in the North-West and the South. Most participants in this study were university graduates.

Most of the participants had purchased pasture-raised products in the past or had tried them on occasions of out-of-home consumption. Some participants were uncertain about their previous consumption of pasture-raised products, while only a few were certain of never having purchased or tried these products.

Table 4.1: Socio-demographic characteristics of the study participants.

Socio-demographic characteristics	Total (n = 20)		Region		
	n	%	North- West	East	South
Gender					
Female	12	60	4	4	4
Male	8	40	3	2	3
Age					
18–49 years	10	50	3	3	4
50+ years	10	50	4	3	3
Average age	46.6		46.4	45.2	48.0
Education					
Still in education	0	0			
Incomplete schooling, currently not in education or training	1	5		1	
Primary or secondary education	1	5			1
University entrance qualification or completed vo- cational training	7	35	2	3	2
University	11	55	5	2	4

4.4.3 Data analysis

All data were transcribed verbatim by two trained assistants according to guidelines based on Kuckartz (2014). The transcripts were managed using MAXQDA 11 software (VERBI GmbH, Berlin, Germany). Thematic qualitative text analysis was employed to analyze the transcripts, a method based on structuring and summarizing data using a coding frame consisting of concept- and data-driven categories (Kuckartz, 2014). Thematic analysis is applied for problem-centered interviews and focus groups, making it suitable for verbal protocols.

An iterative process was used to build the coding frame. Concept-driven categories were extracted from the brochures, while data-driven categories and subcategories emerged from the fieldnotes and from the initial reading of the first transcripts. The categories were defined in a coding manual to ensure unambiguous coding. The smallest coding segment was a sentence. As data collection and transcription progressed, more data-driven categories emerged. In the next stage the first author and a trained assistant independently coded five transcripts, adhering to consensual coding, and subsequently revised the coding frame. The intercoder agreement coefficient, calculated using a MAXQDA built-in tool, exceeded 82 %, thus confirming the reliability of the coding frame (Creswell, 2009). The first author then applied the coding frame to the remaining transcripts.

4.5 Results

The idea of pasture grazing and biodiversity conservation was welcomed by the majority of participants. Virtual fencing, however, raised a number of technical questions, critical remarks and concerns. Biodiversity conservation and animal welfare were often reflected on in relation to the new technology, and the social and individual aspects of the technology were also discussed, while explicitly agricultural topics received comparatively little attention (see Figure 4.3 for the coding frame). Excerpts from the transcripts are translated into English in this paper to illustrate the categories with typical statements. The texts that were read aloud from the brochures are in {curly brackets} and the source (in round brackets) provides the participant's number, gender, their age group, and the passage number in the transcript.

4.5.1 Information perception

Positive emotionalization through visual elements was actively noticed and appreciated by several participants. On the other hand, a few participants referred to the positive presentation of cattle farming as “wishful thinking”, even though they hoped it could become reality. The visual appeal of the cover

images was in many cases decisive in participants' choice of which brochures to read first, with brochures with "the least stimulating" covers examined last. Images of animals and landscapes were found appealing, though even positive depictions of grazing cattle, despite being pleasing, sometimes led to negative thoughts about intensive cattle farming. Images of people, insects, meat, and milk were often disliked and had no positive emotionalization effect (see Table 4.2). Familiarity with the depicted objects and situations had a positive effect on the extent to which participants liked each image:

I think I like these pictures here most because they're more familiar to me. Down there, this picture of a meadow, somehow, I find it very pretty. It's...it's more my thing. (18f_50+; 18)

Table 4.2: Participants' reasons for negative perceptions of images.

Reason	Example	Sample excerpt
Image perceived unsuitable to the topic or the layout	Images of a beef steak and a cow alongside each other: the idea of grilling paired with the presentation of the benefits of pasture grazing	"A bit strange, perhaps, to see cattle and then, well, a steak beside them. But that's how it is." (15f_<50; 33). "Well, this picture [raw beef steak] scares me. [...] I fail to see what that has to do with the subject." (5m_50+; 18)
Image is confusing	The connection between the depicted objects is not obvious	"I don't understand why there's a person with a laptop on the cover. Somehow, I find it confusing." (7f_<50; 13)
Image is found visibly staged, artificial, unrealistic	A lady stroking a cow; a child feeding a cow; a farmer sitting under a tree with a tablet in his hands	"This looks staged to me. That's not reality anymore." (17m_50+; 11) "Yes, I think this profession [farmer] here – it's presented as if it had anything to do with a resting place under a tree. I don't think this [presentation] has anything to do with real life." (5m_50+; 32)

Two participants declared they would use the available QR code (Quick Response code) to access additional information while two other participants said they were unlikely to encounter brochures as a source of information in everyday situations. Thinking about their usual methods of information-seeking, younger participants named the Internet as their preferred information source, while most of the elder participants said they relied on their own experiences, personal communications, and television. Several participants perceived the information provided in the brochures as "food for thought" (5m_50+; 38) and a tool with which to reach out to persons presently unconcerned about their food choices. A few other participants skeptically referred to the brochures as advertising material for virtual fencing and/or pasture-raised products, yet found the information source credible:

Well, you can always present/make a great presentation of so many things in such brochures, and in the end it's nothing more than window dressing [...] Where [the funding body] is given then it's/ then it's scientifically supervised, I find it very good. (1f_50+; 16)

4.5.2 Information understanding

4.5.2.1 Understanding of the virtual fencing concept

Most participants understood the principle of virtual fencing and were able to describe it rather correctly when explicitly asked about their understanding of the concept, though some did admit a lack of comprehension, with one saying “*I don't understand it, but it's also not really important to me*” (18f_50+; 44). The graphic depiction of the virtual fencing principle was found helpful even in cases when a participant's first reaction to it was confusion. The retainment of electric fences along the boundaries of pastures, which is an obligation under current agricultural insurance policies in Germany, was unclear to most participants, leading some to express doubts about the usefulness of virtual fencing. After some reflection, however, several participants did eventually understand the reasons for the current need to combine virtual fences with physical fences.

4.5.2.2 Associations with the new pasture grazing system

All of the participants pondered the possible implications of virtual fencing in grazing systems. Their technical questions referred to the precision of cattle location measurement, the volume of the audio signal, cybersecurity, battery life, loading and changing, GPS and neckband failure management, and the technology's effectiveness to control cattle stampedes. As some of the emerging questions were not immediately answered in the brochures, several participants voiced distrusting attitudes:

And when the cattle get this [signal] and I'm standing right beside them, do I get the electric impulse too or what? I don't really find it so trustworthy. [...] My question is – doesn't it do something to humans, and animals, and so on, in the long run? (4f_50+; 11)

The connection between virtual fencing and biodiversity confused some: “*What does it actually have to do with the biological stuff when everything is being done technologically anyway? I don't get it*” (14m_< 50; 17). The presence of cattle in the landscape was welcomed as “*a nice, pretty picture for people, too, to see the animals grazing in harmony with nature*” (8m_50+; 18). The idea of recreation in nature, however, was regarded by some as “counterproductive” to the goal of biodiversity conservation. Some participants favored expanding protection measures in agriculture beyond animal welfare:

{Conserving natural landscapes}, I would absolutely want that, that's also my concern. This sounds good, but {Promoting animal welfare} – that wouldn't be enough for me. (1f_50+; 12)

Participants' levels of interest in the subject of animal welfare in general were motivated by their dietary habits: “because we eat a lot of beef at home and it would be interesting to know how cows are doing” (2f_<50; 11). The reactions to the facts on the decline of pasture grazing provided in the brochures as part of the declarative knowledge strategy ranged from skepticism to shock. The association of animal welfare with the new grazing system was not obvious to the participants, however, with one commenting that: “If I were to think about animal welfare, I'd probably think of something else, something other than GPS neckbands” (7f_<50; 12). On the other hand, pasture grazing as such was referred to as a “natural”, “normal”, “right”, and “true” form of cattle husbandry, “like it used to be” and “rather rare”. It was associated with freedom of movement for animals by nearly half the participants, who saw it as a necessity for other animals, as well and appealed to moral norms:

It doesn't matter if it's about dairy animals or laying hens [...] space is such a thing for animals that shouldn't be a luxury. (19m_<50; 35)

Although no production systems other than pasture grazing were mentioned, participants often positively distinguished it from intensive animal farming. Pasture grazing was further seen as a solution to food-feed competition, for example, “because it's nonsense to cut down the rainforest to plant soy beans there and then ship them over here” (4f_50+; 14).

4.5.3 Information assessment

4.5.3.1 Readiness to accept virtual fencing in beef and dairy systems

In many cases, instead of thinking about the acceptability of virtual fencing in grazing systems, participants attempted an estimation of its feasibility in Germany and expressed their doubts: “My first thought is that I believe it won't be realized anyway” (7f_<50; 16). The reasons cited for such doubts included a lack of grasslands and available pastures near farms, general consumption patterns, bureaucratic issues, inadequate infrastructure, and low levels of public support. Feasibility was further connected to the implementation costs of the new technology, and, in this regard, the participants often referred to the need for governmental support, especially for small farms.

Participants perceived farmers' work as “very, very hard work” (5 m_50+; 18) and expressed sympathy with farmers for the everyday hurdles and bureaucratic burdens they face. Accordingly, they

were concerned about the implications of the novel grazing system in terms of increased unemployment, governmental surveillance and farmers' workload:

I really don't think that a farmer can actually earn enough money in this way to secure a livelihood.

I think if pasture fences are not used anymore and the cattle graze freely and there's practically nothing to do, then the farmer's profession will go extinct or become a very rare profession [...]

What happens to the farmers who lose their jobs in this way? (5m_50+; 18, 38)

One participant noted that farmers contributing to biodiversity conservation by using new technology might have a positive effect on current discourse: *"Perhaps it'll also help put an end to this silly debate about farmers and agriculture being against nature protection"* (18f_50+; 19).

The trend of digitalization and the use of large agricultural machinery were perceived rather negatively by participants in terms of their effects on the environment, though some opined that *"[a] modern farm cannot do without technology"* (6m_50+; 11). The difference between virtual fencing and the image of machine-intensive agricultural production was noted positively, though some participants said that the remote control implied by virtual fencing was *"far from real life"* and did not fit their view of farming. A tone of submission to digital technologies was also noticeable, however, with one younger male commenting on an image of a farmer with a tablet thus: *"I have a cell-smart stuff myself [...] my god, what else can one do? Everyone has to go along with it, somehow"* (14m_<50; 34). Virtual fences were also perceived as sustainable since they *"can be reused again and again"* (10f_50+; 13).

Participants' concerns and uncertainties that lowered the acceptability of virtual fencing included references to total surveillance and governmental control and the effects on human health of hormones consumed in meat from cattle subjected to psychological stress, as well as presumed effects on humans and insects of transmitted electronic signals and irradiation they associated with the technology. It was mostly elder participants who expressed sorrow about life being *"too technical"* and who voiced doubts as to the necessity of virtual fencing given the ubiquity of traditional fences. Arguments against virtual fencing included adherence to the status quo, e.g., *"it has been this way for centuries"* (10f_50+; 11), as well as concerns about employment in rural areas: *"How about we employ a couple of cowherds again?"* (20f_50+; 24). Safety concerns about virtual fencing referred to the safety of cattle from wild animals and trespassers, as well as to the safety of hikers being potentially endangered by free-roaming cattle, with one participant commenting that *"a cow is not quite harmless"* (12f_<50; 13). On the other hand, electric fences were described as possibly being unsafe for children and wild animals. Like safety, the aesthetic impacts of the system were brought up indirectly in participants' arguments both for and against virtual fencing, with some preferring traditional fencing as being more *"natural"*, e.g., *"When*

I build a fence in a natural way like it used to be done, with wood and stuff, then it's not really that annoying in the landscape, in my opinion" (4f_50+; 11), and others favoring the new system over the unnaturalness of electric fencing, e.g., *"Well, I find electric fences not so pretty, anyway. [...] Such things have nothing to do in nature and I think that [virtual fencing] is a good alternative"* (11f_<50; 11).

Many participants raised issues of animal welfare with regard to electric impulses, though only a few were concerned about audio warnings. Participants compared electric stimuli with shocks from electric fences, seeing them as *"really not so bad"* (16f_<50; 13), while some were ready to condone the use of electric impulses as long as they *"are not so hard on the animals and don't harm them"* (14m_<50; 28), but also suggested a need for "caution" regarding different pain thresholds and the frequency of the signals. Several participants were unconvinced by the weak signal argumentation, *"that's basically the same [as electric fencing]"* (7f_<50; 14), and appealed to naturalness and non-violence in animal control: *"Well, I truly don't know what it has to do with animal welfare when one frightens them [the cattle]. No matter by which means"* (13f_50+; 11). For other participants, biodiversity conservation clearly took priority in the discussion of setting boundaries for animals:

Sure, [cattle] must be enclosed somewhere, otherwise they'll go everywhere. [...] So, it's part of ensuring a variety of species to/ Yeah, to set a limit. Definitely. (16f_<50; 36)

Although the participants associated pasture grazing with better animal health, concerns were raised about the effects of virtual fencing on the health of cattle, especially regarding animals' mental wellbeing. Most participants did not doubt the cognitive abilities of cattle to learn the association between a neckband cue and a boundary, but they emphasized the importance of a "gentle" training phase. Furthermore, animal welfare and environmental benefits were sometimes seen as competing goals:

"Well I do understand that a compromise between cattle welfare and environmental welfare is necessary. But I don't know whether it still harms the one or the other. I don't know that." (3m_<50; 13)

4.5.3.2 Readiness to support beef and dairy systems that use virtual fencing

Thinking aloud about their purchase decisions for beef and dairy products, a few participants confessed that factors, such as biodiversity and a sense of personal responsibility for a better future (as implied by the normative communication approach), were of no importance in their decisions due to

the lack of time. Price premiums also remained a barrier for those who struggled first of all to provide enough food before they could consider purchasing sustainably produced beef or dairy products. Whereas some were concerned about generally rising living costs that left *“not so much money for food”* (2f_<50; 11), others expressed the view that *“we spend too little on food”* (18f_50+; 17). Higher prices were regarded by some as imperative to ensure high levels of animal welfare, though none of the participants connected price with biodiversity conservation measures in virtual fencing systems in their utterances. Many participants also noted that price would not be a major barrier if a high-quality product was consumed in modest amounts and with pleasure. They preferred quality over quantity and declared their willingness to pay higher prices to do something good for their own bodies by obtaining products of trustworthy origin that taste good and are produced under stricter animal welfare conditions. The latter two attributes were named as benefits for consumers by just over a half of all participants. Whereas a quarter of participants positively associated human health with cattle health, the benefits of ecosystem health supported through application of virtual fencing did not resonate with the participants. In general, argumentation for the new system based on personal benefits was mostly found insufficient:

What benefits does it have for myself? Or are they only for cattle? Does it have benefits only for cattle or also for me as a consumer? (5m_50+; 15)

With regard to beef and dairy products' attributes, that may influence the readiness to support grazing systems that use virtual fencing, every single attribute was brought up and discussed by a variable number of the participants, but never by all of them, thus reflecting personal differences in the attribute importance. Over half of the participants reflected on the taste of pasture-raised products and agreed they *“taste better”*, positively associating the grazing of pasture grasses with *“different”* taste and *“better meat”*. While some participants based their judgement on hedonic experiences, others reported altruistic factors as affecting their enjoyment of the product *“because you simply know that the cattle are well nurtured and have a good life”* (15f_<50; 11). However, some doubted they could taste the difference between pasture-fed and corn-fed meat. When thinking about product quality, participants referred to the higher quality of pasture-raised products as an expected benefit. Expectations differed, however, for meat and dairy products. For instance, one participant who appreciated high-quality meat was not as demanding about milk: *“Milk is milk. I don't know/It's all from the same cow anyway, isn't it?”* (14m_<50; 17).

Participants reported a sense of loyalty to their usual shopping locations. Product availability in convenient shopping venues was important to them in choosing between more or less ethical products.

When time pressure was absent, however, participants declared they were ready to literally go the extra mile for more sustainable options and expressed an interest in products from the new grazing system:

The question is where can you get this beef and this milk from? [...] This would be interesting [to know] where, where do you purchase [...] the meat from cattle and [milk] from cows kept this way? (16f_<50; 13)

The participants' interest in products from the new grazing system included the query: "But how do I find them in a supermarket? How are they labeled?" (5m_50+; 16). Several other participants, mostly those who habitually shopped at farmers' markets or at a butcher's, reported having personally communicated with salespersons to get additional information that had increased their trust in the origin of the products they purchased. One such participant remarked that, even when a salesperson is trustworthy, there is still a need for certification and a traceability tool to ensure the transparency of the product's journey from pasture to table:

The problem that most people have, including myself, is that I don't know and not even the sales lady at the butcher's knows where the meat comes from. [...] There must be a law, where/so, this is controlled, the whole process, where the cow had grazed, where it was slaughtered. (12f_<50; 12)

Thinking aloud about their individual contributions to environmental protection, participants mentioned their conscious food choices, with some expressing the view that "as a consumer, it is in fact important to support farmers" (6m_50+; 13). Participants were dissatisfied with the options for action suggested in the brochures as part of the procedural knowledge strategy and wished for more ways to contribute "other than that I really try to buy pasture-raised beef" (7f_<50; 14). Additional options for action brought up by participants included "spreading the word" about pasture-raised products and crowdfunding cattle for personal consumption. Concern about self-efficacy was present in some statements: for example, "I couldn't change anything just by myself" (5m_50+; 17). Nevertheless, many participants agreed that everyone can contribute to a change in production conditions and "everyone should begin with oneself, and me with myself" (20f_50+; 33), since "when there's demand there are people who will try to satisfy this demand, and then it happens so as it is now" (19m_<50; 39). Readiness to change one's own dietary habits was seen by some participants as an initial contribution to environmental protection. Others suggested that biodiversity conservation should begin in one's own backyard:

Yes, this should be not only on a pasture but in private gardens, too. [That is] my opinion. So, this English-type lawn without any flower diversity/ It must begin with private households. (8m_50+; 11)

A few participants talked of the need for reduced consumption in relation to their ideas about the consumption of meat by other citizens and criticized excessive consumption. Individual contribution was also frequently associated with reduced meat and dairy consumption in favor of ethically produced quality products:

Then you drink perhaps a little less milk or eat less meat and then in return you can buy better products that this/ that support this whole, this animal welfare. (15f_<50; 14)

Awareness creation was seen as critical to increase consumers' readiness to support the new grazing system. Two participants expressed the view that awareness creation for sustainable consumption is a political and educational task and must begin at school because adults lack time for individual research and will thus continue acting as usual. Participants also expressed their belief that there was a positive development in conscious approaches to livestock food purchasing:

In the future, there will be ever more people who shop more consciously, who also look where the animal comes from and who don't put [a product] in their shopping baskets in the supermarket simply because it's cheap. (10f_50+; 11)

4.6 Discussion

The first objective of this study has been to explore consumers' perception of the information about the new grazing system. In terms of information communication, the findings suggest that the use of visual elements to evoke positive emotions is a promising strategy for communicating the benefits resulting from the innovative grazing system with virtual fencing. The positive wording and design of the information material was found appealing, which is consistent with previous findings (Schaffner et al., 2015; Tinch et al., 2018). The depiction of the virtual fencing principle and the readable layout of the brochures contributed to most participants' understanding of the term 'virtual fencing', which confirms the suitability of this approach for explaining a complex concept (Demarmels et al., 2015). Interestingly, however, positive pictures of pasture grazing also evoked negative associations with intensive animal farming, which is similar to the findings of Vigors (2019). Negative associations are thus not necessarily caused by information material but can be affected by consumers' individual values, knowledge about, and involvement in the subjects raised (Butkowski et al., 2020; Hirsch et al., 2019;

Kühl et al., 2019). This implies that negative associations are unlikely ever to be completely avoided and must, therefore, be addressed in efforts to promote societal acceptance of virtual fencing.

The participants declared that they had low levels of knowledge about agriculture, which is in line with previous research findings (Boogard et al., 2011; Heise and Theuvsen, 2017; Weible et al., 2016). Such a lack of knowledge can hardly be compensated for by providing bare facts within a declarative knowledge strategy. A possible reason for lack of confidence in their knowledge on the part of consumers is that they have been overloaded with pro-environmental information (Strother and Fazal, 2011). Rather than merely presenting facts, therefore, the information can be combined with proposals for action and participation, i.e., by undertaking also a procedural knowledge strategy. This approach was appreciated by the participants of this study, which is consistent with the findings of Carmen et al. (2018). A strategy combining declarative and procedural knowledge, i.e., factual information and suggestions for action, thus seems a more promising approach.

References to norms related to nature and future generations did not resonate well with the participants, although moral norms do reportedly influence preferences for improved animal welfare (Vanhonacker et al., 2010). Instead, participants enquired after personal benefits, in line with findings by White et al. (2019), which often contrasted with public benefits. Furthermore, virtual fencing as a technology was not seen beneficial for individual consumers. Biodiversity conservation supported by livestock systems that use virtual fencing, however, has a potential of being perceived personally valuable. In order to stimulate such perception, moral norms and personal benefits must be mutually linked in communications.

As a second objective, the study assessed the extent of consumers' understanding of the principle of the new technology of virtual fencing and their associations with this innovation in relation to animal welfare, biodiversity, and pasture-based production. The principle of virtual fencing was generally well understood by the study participants. Consumers reflected on the possible ramifications of the system and evinced ambivalent attitudes with regard to the use of virtual fencing in pasture grazing. Skepticism about the feasibility of virtual fencing and concerns about its impact on animal welfare, on the environment and on human lives were expressed alongside hopes for positive developments in these areas, in line with Eastwood et al. (2019). The connection between virtual fencing and biodiversity conservation was not obvious to the participants, which added to doubts about the usefulness of the technology (White et al., 2019). The participants' appraisals of virtual fencing were discussed in terms of the acceptability of specific aspects, such as the strength of electrical stimuli, rather than holistically—a finding also reported in earlier studies on levels of acceptance of modern approaches in dairy farming

(Boogaard et al., 2011; Millar et al., 2002). Concerns about these and other aspects were likely amplified by the perceived insufficiency of the information provided about the technology. As suggested by the findings of Ziamou and Ratneswar (2002), however, the inclusion of more technical descriptions might well have had an opposite effect, raising multiple questions and thereby creating further uncertainty about the technology. For example, the use of the word 'technology' in agricultural contexts evokes ideas of dramatic interventions in nature which are negatively perceived by consumers (Boogaard et al., 2011; Eastwood et al., 2019). Consumers' ideas about the natural control of grazing animals with regular fences and cowherds often reflected a concept of traditional extensive animal husbandry, which they possibly saw as the only natural system in spite of their concerns about electric fences jeopardizing the safety of wild animals. Such views are common among socially-minded consumers, who are typically more concerned about the impact of a technology on the environment than they are interested in its benefits (Boogaard et al., 2011). Virtual fencing can be seen as a subtle adjustment to traditional methods of pasture grazing that retains natural conditions both for cattle and for wild animals, which is a crucial point for consumer segments less accepting of technological innovation (Boogaard et al., 2011). One of the key communication challenges is to impart this idea to consumers, thereby possibly reducing the polarity in consumers' assessments of virtual fencing and increasing the likelihood of their accepting the technology.

Finally, the study has provided insights into consumers' assessments of a grazing system that uses virtual fencing and the products to be derived from it. The findings of the qualitative data collection via TAP are of high value for the development of communication strategies directed to consumers and for marketing of pasture-raised products from novel grazing systems. In regard to consumers' willingness to support grazing systems implementing virtual fencing through the purchase of pasture-raised products from these systems, this study's findings suggest that consumers barely perceive any specific benefits of virtual fencing beyond those of pasture-based production in general. Considering this, the results are largely comparable with previous research on ethical consumption. So, pasture-raised products were positively associated with better animal welfare, higher product quality and benefits to human health (De Graaf et al., 2016a). The obstacles cited by participants to the purchase of pasture-raised products, such as low availability, perceived associated costs, and low self-efficacy, correspond to earlier findings (Gassler et al., 2018; Harper and Henson, 2001). The willingness of some participants to change their own habits to support environmental protection and animal welfare suggests there is potential for marketing pasture-raised products to relatively broad consumer segments, as earlier found

by Weinrich et al. (2014). Future research might usefully focus on the influence of information provision on consumers' preferences and willingness to pay for products derived from grazing systems implementing virtual fencing and aimed at biodiversity conservation.

This study has several limitations. As is typical of qualitative research, the small sample size excludes the statistical generalizability of the results. Furthermore, the prevalence of participants with a university degree might have biased the results due to the likely effect of academic training on information perception, understanding and assessment. The use of audio- and video-recording during the think aloud protocols, as well as the presence of the interviewer, might have affected the participants' utterances in terms of social desirability. The verbal protocol method was found useful to gather initial insights into consumers' perceptions. However, some participants experienced difficulties with concurrent verbalization; in these cases, a structured interview might have been more suitable. Another limitation may have arisen in the way in which the brochures for this study were designed: despite diversifying the information presented using different communication approaches, the topics discussed in the brochures might have had an impact on the categories used in this study. A quantitative investigation based on the findings of this qualitative study may therefore assess the interrelations between consumers' understanding of the idea of the technology, personal characteristics and attitudes, and consumption patterns.

4.7 Conclusions

Consumers' interest in products that help foster animal welfare and biodiversity offers a market perspective for farmers who are considering the introduction of pasturing with virtual fencing. In effort to build consumers' appreciation for such products, product-specific communications should emphasize the link between personal benefits to consumers, such as higher quality products, biodiversity, landscape conservation, and animal welfare. Emphasis must thus be placed on those aspects that consumers positively associate with pasture grazing, such as better taste, healthiness, and improved animal welfare, while any negative associations with grazing systems that apply virtual fencing should be addressed by making detailed information available on request. The information offered should be concise and easily understandable but soundly grounded in numbers and facts and supported by visual material. Attractive brochures or posters may be a promising tool to gain the attention of consumers at the point of sale. Yet, depending on the place of purchase, additional information should be provided either by well-trained sales personnel or on the internet via easy-to-use interactive sites that can be accessed, for example, using QR codes.

In order to increase consumer awareness of the impact of agriculture on biodiversity, landscape and animal welfare, a dialogue should be established and consumers should be given opportunities to experience directly for themselves the effects of their own actions. To address consumers' doubts about the impact of their decisions, practitioners and marketers need to demonstrate the direct effects of each individual contribution and convince consumers of the efficacy of achieving change through a step-by-step approach as opposed to adopting an all-or-nothing attitude. For example, given that consumers sympathize with farmers' hard work but often fail to understand how virtual fencing facilitates its optimization, it would be useful to demonstrate real-life examples as part of participatory communication. One of the aspects to be addressed by policy makers is consumers' concern about the safety of people who may endanger themselves by approaching grazing cattle in the absence of physical fences. Today, German farmers rely on electric fences as safeguards to avoid potential damage caused by their cattle and related obligation to compensate for it. With the advancement of the novel technology, the approach to liability should be harmonized, and the legal basis should provide farmers with the options to reduce the risk of damage and the risk of liability for the damage caused by cattle.

To conclude, the results of this study demonstrate significant challenges entailed in motivating consumers to support specific practices in animal agriculture through their purchasing actions. Calling for consumer action is pointless without providing options for participation to increase engagement. Any initiative will only be successful if it employs well-targeted communication strategies. In most cases, indeed, it will require considerable effort and political action with substantial governmental support to convert ecosystem services provided by the beef and dairy livestock systems implementing virtual fencing into a private good for which markets can be established.

4.8 Author contributions

Author Contributions: Conceptualization, E.S. and U.H.; methodology, E.S. and U.H.; validation, E.S., K.Z. and U.H.; formal analysis, E.S.; investigation, E.S.; resources, K.Z. and U.H.; data curation, K.Z. and U.H.; writing—original draft preparation, E.S.; writing—review and editing, E.S., K.Z., and U.H.; visualization, E.S.; supervision, K.Z. and U.H.; project administration, K.Z. and U.H.; funding acquisition, U.H. All authors have read and agreed to the published version of the manuscript.

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4.9 Appendix

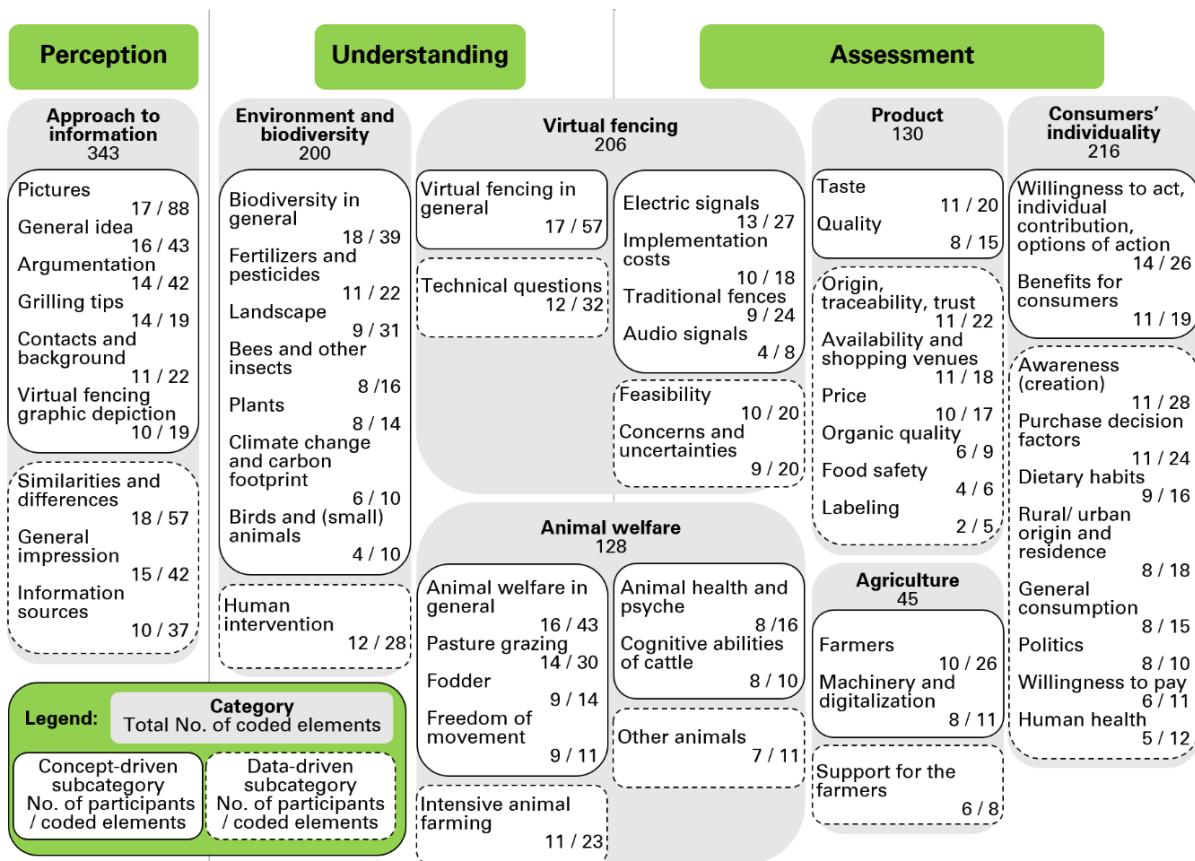


Figure 4.3: Coding frame: categories and subcategories in the participants' perceptions of and associations with virtual fencing.

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5 Backing biodiversity? German consumers' views on a multi-level biodiversity-labeling scheme for beef from grazing-based production systems

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5.1 Abstract

Biodiversity loss driven by intensive livestock farming constitutes a major threat to the resilience of food systems. Grazing-based beef production, by contrast, supports ecosystem services and biodiversity conservation. Communicating these benefits to consumers is vital to stimulate demand for pasture-raised beef, with labels being a key means of conveying such credence attributes. Despite extensive research on eco-labels and sustainability certification, however, we know little about consumer perceptions of labels designed to certify and highlight the biodiversity benefits of cattle products. To address this gap, we conducted six audio-only online focus group discussions with forty buyers of beef in Germany to explore consumer perceptions of a multi-level labeling system of labeling designed to differentiate between the conservation measures applied in pasture-raised beef production. Our findings indicate significant challenges for the implementation of such labeling, including low levels of understanding of biodiversity among consumers. Most participants struggled to discriminate between different levels of biodiversity conservation measures and placed little value on the biodiversity benefits of different products. Gaining trust in certification and control procedures is problematic due to the profusion of labeling schemes on the market, especially given consumers' time pressures. However, our findings also highlight consumers' appreciation for biodiversity conservation at local level and higher levels of trust in short supply chains, suggesting opportunities for selling pasture-raised beef at local level. The differences we identify in consumers' use of labeling can inform further segmentation research and targeted communications to market beef from grazing-based production systems.

Keywords: *animal welfare; biodiversity conservation; consumer perception; multi-level labeling; online focus groups; pasture-raised beef*

5.2 Introduction

Our survival depends on our ability and determination to build resilient food systems. However, we cannot develop sustainable food supply chains without tackling biodiversity loss (Quarshie et al., 2019; Rockström et al., 2020; van Amstel et al., 2008). Today, unsustainable agricultural practices are driving biodiversity loss on a catastrophic scale, meaning wide-ranging changes are urgently needed to transition to sustainable food systems. In addition to actions by governments and private companies, major shifts in consumer behavior are needed to achieve these changes, which entails effective communication to raise public awareness of the importance of preserving biodiversity (Bickford et al., 2012; Chaudhary et al., 2018; Quarshie et al., 2019; van Amstel et al., 2008).

Research on the environmental impacts of different livestock production systems shows that pasture grazing is a sustainable form of cattle husbandry that contributes both to improved animal welfare and the conservation of biodiversity (Angerer et al., 2021; Bragaglio et al., 2020; Dawson et al., 2011; Gjerris et al., 2016; Kok et al., 2020). Research in Central and Northern Europe in particular, as well as in Alpine regions, has documented the overall biodiversity benefits of well-managed cattle grazing in terms of the abundance and richness of plants and such insects as butterflies and ground beetles (Angerer et al., 2021; Tälle et al., 2016). However, the high costs associated with pasture grazing constitute an obstacle to its adoption by farmers (Becker et al., 2018). These costs can be overcome through government subsidies and/or a significant increase in consumer demand and willingness to pay (WTP) for sustainable livestock products.

Numerous policies have been developed to promote sustainable food choices and raise consumer awareness of the importance of preserving European Commission (2019b) report of a significant increase from 2015 to 19 in the proportion of European citizens who recognize the need for urgent actions to stop biodiversity loss. The number of consumers seeking information about the impact of food systems on biodiversity is also growing (Tulloch et al., 2021; Zaharia et al., 2021). Notwithstanding these positive policy efforts and the evidence of increased public consciousness of biodiversity loss, however, science has long established a “citizen-consumer-attitude-behavior gap” between the declared attitudes of consumers and their actual purchase behavior (Gjerris et al., 2016; Vigors, 2018). While recent scientific evidence shows substantial interest in pasture-raised products among consumers and a WTP for these products (Schulze et al., 2021; Stampa et al., 2020a), the question remains whether the link between valuing biodiversity and purchasing biodiversity-friendly meat is sufficiently strong to suggest that raising consumer awareness could be an effective way to drive farmers to implement conservation practices.

Effectively communicating the biodiversity benefits of grazing-based food production to increase consumer demand has been found to involve significant challenges (Markova-Nenova and Wätzold, 2018; Rööös et al., 2014; Spendrup et al., 2017). One key challenge is that these benefits are credence attributes which cannot be directly experienced by consumers before, during or after consumption (Caswell, 1998; Torma and Thøgersen, 2021). Stimulating demand for products whose specific value is based on credence attributes related to process qualities requires transparency and effective information transfer throughout the supply chain. Credence attributes are typically communicated through labeling based on certification schemes such as eco-labeling schemes that evaluate a product's ecological and social characteristics and provide this information to consumers (Nunes and Riyanto, 2005). Encouragingly, a recent nationwide report found that consumers in Germany are paying growing attention to labels and certification schemes (BMEL, 2021). This suggests that trusted sustainability labels can aid consumer decision-making and motivate consumers to make environmentally friendly choices (Edenbrandt and Lagerkvist, 2021; Risius and Hamm, 2018; Torma and Thøgersen, 2021; van Amstel et al., 2008; Zaharia et al., 2021).

Consumer perceptions of eco-labeling are influenced by multiple factors. In addition to levels of consumer trust, knowledge, awareness, motivation and involvement, these factors include the perceived personal benefits, relevance and use value of eco-labels, which are influenced by the design and comprehensibility of the labels and the information they convey (Grunert et al., 2014; Taufique et al., 2019). Initial trust in the source of label information is also essential for consumers to engage with and use a label for purchase decisions (Verbeke, 2008). These factors are closely intertwined and mutually influential, moreover, making consumer perceptions of labeling constitute a complex construct (Taufique et al., 2019). Despite this complexity, there is evidence that increasing consumers' awareness and knowledge about an issue, can increase label use and thereby promote purchase decisions (Peschel et al., 2016). In addition to the perceived importance or personal relevance of the attributes communicated by the labeling, consumers' decision-making about sustainable products also depends on the context of the purchase (Bangsa and Schlegelmilch, 2019; Torma and Thøgersen, 2021). For example, contextual factors such as time pressure and product price may pose barriers to label use (Horne, 2009; Torma and Thøgersen, 2021). The successful implementation of a new biodiversity label would thus need to address all these challenges. In Germany there are various private labeling schemes for food that include biodiversity conservation in their criteria, e.g., the Pro Weideland label for pasture-raised dairy and beef products. At European level, besides regulations on organic production, there are relevant

regulations defining “hay milk” and “mountain products”¹, e.g., for beef from cattle grazing on mountain pastures. Although these regulations make provisions for labeling schemes relevant for pasture-raised products, they do not specifically address biodiversity conservation (Oliveira et al., 2021). Specific biodiversity labeling for pasture-raised products is presently unavailable on the German market. Most existing initiatives make use of “binary labeling”, granting labels only to fully certified products without differentiating between degrees of compliance. There are also various multi-level labeling systems that indicate the different extent to which a product meets certain criteria. In the EU egg market, for example, such a system is used to communicate different levels of animal welfare applied in laying hen husbandry (Janssen et al., 2016). Given their capacity to convey a wider range of attributes and communicate more information than binary systems, multi-level labeling schemes might be more appropriate for marking attributes such as the biodiversity benefits of a product according to different levels of conservation measures applied by farmers (Meyerding et al., 2019; Tonsor and Wolf, 2011; Torma and Thøgersen, 2021; Weinrich and Spiller, 2016a; Weinrich et al., 2016). A multi-level approach to labeling sustainably produced beef would enable consumers to make more informed judgments about the benefits of pasture-raised products, further serving to differentiate pasture-raised products and to justify premium prices (Spendrup et al., 2017; Torma and Thøgersen, 2021). By targeting consumers with different levels of WTP for biodiversity conservation, multi-level labeling could help farmers recoup the additional costs of their conservation measures.

Extensive research has been conducted into the labeling of credence attributes including organic production, local origin, animal welfare, and carbon footprint. Some of this research has touched on issues related to the communication of biodiversity benefits, including consumers’ WTP for products with labels highlighting the valuable ecosystem services supported through the conservation of biodiversity (e.g., Jaung et al., 2019; Li et al., 2018). Biodiversity conservation was identified as a promising characteristic for labels in a study on consumer choice preferences regarding milk with ethical attributes, including support of biodiversity, animal welfare and financial support for small farms (Markova-Nenova and Wätzold, 2018). Little research has focused on biodiversity labeling, however, especially in relation to communicating the biodiversity benefits of pasture-grazing.

¹ Commission Delegated Regulation (EU) No 665/2014 (http://data.europa.eu/eli/reg_del/2014/665/oj) and Commission Implementing Regulation (EU) 2016/304 (http://data.europa.eu/eli/reg_impl/2016/304/oj).

Addressing this gap in the literature, we aimed to investigate the potential advantages of including biodiversity conservation on labels as a positive attribute of grazing-based cattle husbandry. We explored consumer perceptions of a multi-level labeling system for beef from biodiversity-friendly grazing systems to answer the following three research questions: (i) “How do consumers understand grazing, pasture-raised products, and biodiversity?”; (ii) “How do consumers perceive a multi-level biodiversity labeling system?”; and (iii) “What recommendations can be given regarding biodiversity labeling?”.

The following section presents the theoretical background of our study, focusing on multi-level labeling and factors affecting consumer perception of labels. We then present our methodical approach and the empirical results of our explorative study, discussing each finding before spelling out their implications in our conclusion section. We finish by outlining the study's limitations and possible directions for future research.

5.3 Theoretical background

In conveying the environmental benefits of sustainably produced products, a core aim of eco-labeling schemes is to reduce information asymmetry between consumers and producers (van Amstel et al., 2008). Biodiversity is an important element in the criteria of these schemes for assessing the sustainability of food systems (Chaudhary et al., 2018; van Amstel et al., 2008). Although sustainability is a complex and multifaceted concept, consumers often equate this term with general notions of environmental protection (Grunert et al., 2014). The lack of specificity in current environmental discourse has opened the way for large companies to create their own sustainability labels as a means of differentiating themselves from competitors and appealing to consumers' different environmental concerns (Taufique et al., 2019; van Amstel et al., 2007), including concerns about biodiversity loss (Skogen et al., 2018). Numerous multi-level labeling schemes have thus been introduced as a way of communicating differences between particular sustainability attributes valued by consumers, albeit mostly in non-food sectors to date (van Amstel et al., 2008; Weinrich et al., 2016).

Our study proceeds from the premise that adopting such multi-level labeling schemes to highlight the biodiversity benefits of purchasing pasture-raised beef could have a number of important advantages. By avoiding the use of overly general terms, for example, such a scheme could increase the perceived credibility of the label and gain consumers' trust (Torma and Thøgersen, 2021). Multi-level labeling could also support a wider range of sustainably produced meat to address the demands of consumers with different environmental priorities and WTP (Janssen et al., 2016; Zander et al., 2018).

From the existing literature on multi-level labeling, the study closest to our present research aims is an evaluation by Spendrup et al. (2017) of consumer understanding of a Swedish meat guide that used a three-level approach to communicate the biodiversity benefits of meat products alongside three other attributes. Although the target group of this study, i.e., interested consumers well aware of the environmental footprint of food products, were found to have a good understanding of the biodiversity impact of grazing; the meat guide was perceived as too complex for consumers less concerned about the impacts of food production. In addition to the comprehensibility of labels and levels of consumer understanding of the information they contain, other factors shown to influence consumer perceptions and usage of a new biodiversity label include levels of knowledge and awareness, the perceived personal relevance of information on labels, current levels of use and trust in labeling, as well as the specific purchase context (Grunert et al., 2014; Taufique et al., 2019; Verbeke, 2008).

While it goes without saying that consumers will only value biodiversity benefits of grazing if they are aware of these benefits, consumer knowledge and awareness is also vital in relation to labeling because consumers can only make conscious use of a biodiversity label if they understand the labeling and the potential benefits of their product choices for biodiversity (Peschel et al., 2016). Providing detailed information to increase consumers' knowledge and awareness of the importance of biodiversity is a key potential advantage of multi-level labeling (Bangsa and Schlegelmilch, 2019). Such differentiation can help justify higher prices for eco-labelled products (Donato and D'Aniello, 2021). Although additional information can improve consumers' understanding and stimulate their use of labels in purchase decisions, it carries the risk of overloading them with information in a market already saturated with private labels and certification programs, especially in the case of consumers with low levels of involvement with biodiversity and/or the given product (Emberger-Klein and Menrad, 2018; Tonsor and Wolf, 2011; Verbeke, 2008; Weinrich and Spiller, 2016b). Here, "involvement" refers to the perceived personal relevance of environmental issues and sustainability labeling to individual consumers, which in turn is reflected in different levels of interest in and demand for information about products (Cho, 2015; Verbeke, 2008). Higher levels of consumer involvement are connected with greater label use (Grunert et al., 2014), as measured by the amount of attention consumers pay to label information when making purchase decisions (Steiner et al., 2017). Importantly, eco-labels are perceived as highly relevant by a significant minority of German consumers (Janßen and Langen, 2017).

Research has confirmed that easily comprehensible labels increase levels of consumer satisfaction, trust, and liking for products (Samant and Seo, 2016; Weinrich and Spiller, 2016b). A clearly understandable differentiation between levels in multi-level labeling systems can have a positive effect on consumers' WTP for products associated with ecosystem services and high animal welfare standards;

this effect can be even stronger if brief additional information is provided on labeling (Li et al., 2018; Weinrich et al., 2016). Studies have further confirmed the importance of label information being perceived as accurate in order to gain consumer trust in the labelled product (Tonsor and Wolf, 2011).

The extent of consumers' involvement and label use is often be constrained by internal and external factors affecting their attention priorities. Time pressure during shopping significantly complicate decision-making, leading otherwise environmentally conscious consumers to resort to heuristics that compromise their own values (Gjerris et al., 2016; Grunert et al., 2014; Verbeke, 2008). Considering such factors is all the more important in a context of numerous competing sustainability and eco-labels (Asioli et al., 2020; Janßen and Langen, 2017). A large and growing number of sustainability labels on the market can itself have negative effects, including greater consumer skepticism and lower levels of trust due to unfamiliarity with labeling schemes, unspecific claims, unfavorable combinations of different labels on products, or negative associations of a label with a disliked and/or distrusted brand (Sirieix et al., 2013).

While textual information can help consumers comprehend the rationale behind a multi-level label, it is the visual saliency of a label that attracts consumers' attention in the first place and can positively affect their evaluation of the product (Peschel et al., 2019). As eye-tracking studies have confirmed, logos are more prominent to customers than text on packaging, capturing their visual attention more quickly and holding it for longer, thereby helping to stimulate purchases (Katz et al., 2019; Rihn et al., 2019). An easily recognizable label design may be especially important to ensure less environmentally oriented consumers can understand the label (Taufique et al., 2019). In an explorative study of consumers' responses to label images for pasture-raised dairy, for example, Getter et al. (2015) found that a picture of a cow grazing on pasture was preferred by the participants. These findings formed the basis for our development and design of the multi-level labeling concept explored in this study.

5.4 Material and methods

5.4.1 Study approach

As a common instrument for eliciting a variety of views on a specific issue and exploring consumers' perceptions and attitudes (Bryman, 2016; O.Nyumba et al., 2018), focus groups have been used in previous research on sustainable food labels (Sirieix et al., 2013), including for sustainable aquaculture products (Zander et al., 2018). The major advantage of focus groups over individual in-depth interviews is the opportunity they afford for interactions between participants and for observing such interactions (Halkier, 2010; Zander et al., 2018). Listening to the answers of others allows the participants to deeper

reflect on their own views and to question the reasons of other participants for a particular opinion (Bryman, 2016). Although in-person focus groups are more common, online-based methods of data collection have the advantage of involving participants otherwise reluctant to attend face-to-face meetings (Guerrero and Xicola, 2018), especially at a time of social distancing due to the coronavirus pandemic (Lobe et al., 2020). Online methods also enable the simultaneous participation of people from different regions without incurring travel costs. In synchronous online focus groups, the researchers and all the participants join the discussion at the same time, enabling spontaneous interactions and reducing the risks of participants researching the subject on the Internet during the discussion, thereby improving the reliability of the results as compared to asynchronous approaches (Guerrero and Xicola, 2018).

Synchronous online focus groups can be conducted in the form of chats, video conferences, or audio-only discussions. The benefits of an audio-only approach not only include less need for equipment, Internet bandwidth, and typing skills (unlike texting chats), but also greater anonymity which can have a positive effect on the openness of participants in voicing their opinions (Cheng et al., 2009; Lobe, 2017; Stewart and Shamdasani, 2014; Woodyatt et al., 2016). On the other hand, audio-only focus groups have the disadvantage of reducing interactions among participants due to the lack of non-verbal signals and facial expressions, which also complicates moderation (Stewart and Shamdasani, 2017). Overall, audio-only online focus groups have been found a solid alternative to face-to-face focus groups (Cheng et al., 2009). Having weighed these merits and demerits, we adjudged this method most suitable for the purposes of this study.

The focus group discussions followed semi-structured guidelines designed and pre-tested to answer our research questions. The discussions began by investigating the study participants' general understanding and knowledge of pasture grazing, pasture-raised products, and biodiversity, as well as their levels of trust in and use of labels. We then elicited their evaluations of the relevance and comprehensibility of the three-level biodiversity labeling scheme we developed to reflect different agri-environmental measures applied in pasture management to preserve biodiversity (

). The logos of the three different levels of the label were first presented to the participants alongside brief explanatory information prior to being displayed without text. In this way we were able to explore perceptions regarding the relative comprehensibility of different labeling levels. Our findings subsequently informed the recommendations we propose in this paper for biodiversity labeling.

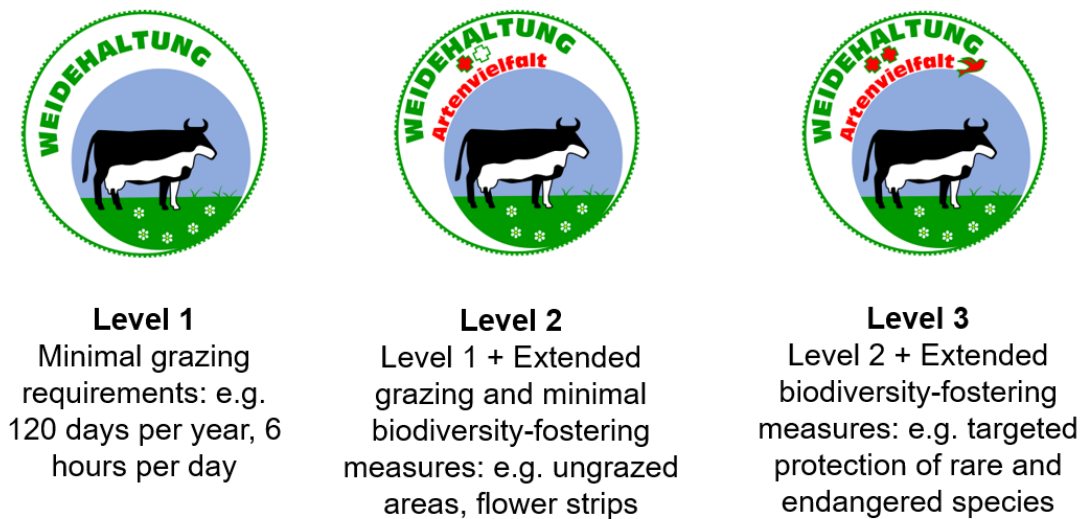


Figure 5.1: Labeling concept and brief explanatory information of the label's levels for the study participants.

Figure 5.1 description: The label prototype was designed in the form of two non-concentric circles, one placed within another. The inner circle contains a symbolic depiction of a black-and-white cow. In the white space between this depiction and the outer circle, we inserted the word 'Weidehaltung', meaning 'pasture grazing', in green font. The second level is designed in the same way but also contains the word 'Artenvielfalt' (biodiversity) in red font, with two plus (+) signs: one in red and the other empty. The third level contains a second red plus sign and a symbolic depiction of a red bird.

Six online focus groups were conducted in October–November 2020, with participants recruited through an online questionnaire by a market research agency contracted to screen participants according to four pre-defined eligibility criteria: (i) that they had full or partial responsibility for household food purchases; (ii) that they made regular purchases of beef; (iii) that they were aged between 18 and 80 years old; and (iv) that they had no affiliation with agriculture, the food industry, or market research. A quota was set of at least one person from the North, East, South and West regions of Germany in each group. Potential participants were informed of the confidentiality of the study, their right to withdraw from the study at any time without consequence, and the monetary compensation they would receive for their time and effort. An equal number of females and males participated in the discussion (see Table 5.1). Despite efforts to organize the groups with a similar balance of ages, only 40 % of the participants were aged 50 and over.

Cisco Webex web conference software was used to conduct and audio-record the discussions. The recordings lasted 75–85 min and commenced once the participants had been greeted and informed about data protection. The recordings were anonymized and transcribed verbatim by a trained assistant.

Table 5.1: Demographic composition of the online focus groups.

Online focus group	Age group	Female		Male		Total number of participants
		18–49	50–80	18–49	50–80	
1		2	1	2	2	7
2		1	1	1	2	5
3		2	2	4	0	8
4		3	2	1	1	7
5		2	1	2	2	7
6		2	1	2	1	6
Total		12	8	12	8	40

5.4.2 Data analysis and interpretation

To extract meaning from the transcripts, we applied thematic qualitative text analysis (Kuckartz, 2014), creating a coding frame of concept- and data-driven codes and categories using MAXQDA 2020 software to classify the retrieved information (see Table 5.2). The concept-driven categories emerged from the discussion guidelines and the first author added data-driven categories to the coding frame during the preliminary reading and editing of the transcribed interviews. The smallest coded segment was defined as a complete thought expressed in at least a single sentence. Certain segments were coded with multiple categories. The first author and a trained assistant coded two transcripts to check the intercoder reliability and subsequently discussed any questionable codes and improved the coding frame. In line with the method recommended by Stewart and Shamdasani (2014), any topics that spontaneously emerged among the first topics discussed and which repeatedly recurred were considered particularly important during the data interpretation.

5.5 Consumer perspectives on grazing, pasture-raised beef, and multi-level biodiversity labeling

5.5.1 Knowledge and associations regarding grazing, pasture-raised beef, and biodiversity

The focus group participants associated pasture grazing with high-quality products, higher standards of animal welfare, and preferable environments in terms of both landscape and biodiversity. Grazing was perceived as being more “natural” for cows, e.g., “*definitely more natural than standing in a*

stall all day" (P5.6:41).² Although some participants associated grazing with healthier animals, others expressed doubts about this outcome: "*even when it's standing in a meadow, it can still be pumped up with chemicals*" (P3.2:111).

Table 5.2: *Categories and codes based on the issues discussed in the focus groups.*

Categories	Codes	Number of coded segments
Pasture grazing	Definition, occurrence, time spent indoors, fresh air, happy cows, naturalness, healthier animals, staying inside in winter, fodder, lack of pasture areas, carbon footprint	83
Pasture-raised products	Taste, quality, origin, availability, traceability	59
Biodiversity	Conservation measures, effect of grazing, (mis)understanding of the term, willingness to pay for biodiversity conservation	37
Animal welfare	Animal-friendly, freedom of movement, stress, indoor cattle housing, intensive cattle farming, slaughter, transport	61
Information relevance	Need or lack of need for more information, importance of education, information search	42
General label use	Attention to labels, information on the packaging, point-of-sale information, QR codes, social media, customer magazines, TV, workshops	87
Labeling perception	Multiple levels, comprehensibility, trust, transparency, familiarity, number of labels on the market, institution issuing the label, control body, certification body, label design	129
Contextual factors	Store format, time pressure, local, meat consumption frequency, conscious consumption, good conscience, local, vegan and vegetarian, appreciation, meat prices, affordability, pasture price premium	114
Other	Organic, greenwashing, urban vs. rural, reduced packaging, other animal species	28

² Here and in the following, the citations from the transcripts translated into English are given in italics with the source coded in the form 'Px.y:z', where Px is the number of the participant, y is the number of the online focus group, and z is the number of the paragraph in the transcript.

Importantly, four participants voiced concerns about the lack of regulations for labeling pasture-raised beef products in Germany:

There are so many labels and anyone can make their label or anything else. There are no legal regulations. ... This means you don't know exactly what is behind this pasture grazing. (P7.3:66)

In the majority of discussion groups, the participants agreed that taste was the most important factor in their decisions about purchasing meat, though some also reported experiencing pangs of conscience about the suffering of animals. In one discussion group the participants agreed that the value of pasture-based production lay not in its taste but in its benefits for animal welfare:

Well, I assume that pasture grazing is something for animal welfare – that I am doing something good for the cow if it can stand around outdoors. ... But that it necessarily tastes better? No, I don't think that at all. I'm rather ready to pay a little more for that, because I really think that it [grazing] is not quite so brutal towards the animals. (P2.6:48)

Most participants had heard of the term biodiversity and understood it as denoting an abundance of plant, insect and animal species, though two participants conflated the concept of biodiversity with the diversity of animal breeds. Even participants who reportedly consumed pasture-raised beef were unaware of the specific beneficial effects of pasture grazing for biodiversity: “*Biodiversity, it was ... well, although I always buy pasture-raised meat it was never clear to me that there's also this aspect*” (P8.3:89). In evaluating these benefits, the responses of some 25 % of the participants highlighted the importance of “personal relevance” and accordingly valued biodiversity more in connection with short supply chains, local production, and conservation measures at local level rather than as a stand-alone feature of grazing:

The cow comes maybe from Bavaria and I live in Berlin. The meat is moved six hundred kilometers around the place, absolutely pointless. And then I have this thought about the environment at the back of my mind [...], we do something for biodiversity ... this must be local, right? The distances must be short, and I must do something too. I don't want to hear that the cow comes from Italy. I make sure that pastures in Italy are doing well and the biodiversity is preserved, but I want this to happen in my region. (P2.2:139)

Our findings regarding consumers' associations with pasture grazing are in line with earlier research (Henchion et al., 2017; Stampa et al., 2020b). In ethical meat purchases, biodiversity was reportedly less important to the participants than either animal welfare or local production, which also confirms previous findings on consumer priorities (Bangsa and Schlegelmilch, 2019; Markova-Nenova and Wätzold, 2018; Zander and Hamm, 2010). While this prioritization may be attributed partly to the

prominence of animal welfare issues in public discourse, the participants' lack of knowledge about the benefits of cattle grazing for biodiversity was also a key factor, further highlighting the need to convey this information to consumers more effectively (Markova-Nenova and Wätzold, 2018; Rööös et al., 2014; Schulze et al., 2021). Although most participants took it for granted that biodiversity is an intrinsic aspect of pasture grazing, they were either unaware of or assigned little value to the specific biodiversity benefits of pasturing, including the benefits of grazing on conservation areas, which again confirms findings from prior research (Sanchez-Sabate and Sabaté, 2019; Schulze et al., 2021). The doubts expressed by some participants as to whether pasture grazing necessarily ensures freedom from hormones and antibiotics further differences between consumers' individual priorities regarding aspects of beef production (Spendrup et al., 2017). Importantly, these doubts indicate that some consumer groups are unlikely to view pasture grazing as interchangeable with organic production even if they associate such grazing with greater "naturalness" and higher animal welfare standards (Pirsich and Weinrich, 2018). In sum, our findings confirm the importance to consumers of environmental benefits perceived as personally relevant to them, as in the case of the high value consumers place on local nature protection measures, which is a factor often mentioned in connection with greater readiness to buy products (Cho, 2015; Gjerris et al., 2016; Taufique et al., 2019).

5.5.2 General label use among the participants and the relevance of a biodiversity label

The participants differed in their levels of general label use and involvement with labels and biodiversity. In four of the focus groups, the participants spontaneously named familiar labels referring to organic products and organic certification (EU organic and German BioSiegel), organic associations (Demeter and Naturland) and the private label of a large discounter chain. A quarter of all participants reported paying attention to labels when making purchase decisions as well as using other available means to obtain more detailed information than that given on packaging. These consumers declared that searching for additional information and gaining knowledge about the background of labels helped them build trust in certain labels. These participants were supportive of the proposal for a new biodiversity labeling scheme, e.g., *"Actually, I pay attention to such things, and this kind of labeling would be really helpful for me"* (P3.6:126). While nearly half the participants acknowledged the importance of labeling for information provision, e.g., *"When it really is a controlled label, where you can be sure that it is as it is, I would find it good. I think it is good to stimulate people to reconsider what they consume"* (P6.4:109), these same consumers also admitted that labels had little relevance for their usual purchase decisions and that they were thus less likely to make use of a new biodiversity label. The

remaining participants raised objections to labeling in general, with many criticizing the large number of labels already in the market. These consumers also specifically opposed the introduction of a new biodiversity label for various reasons, including lack of comprehension or interest in information about biodiversity and lack of time to read such labels:

I hardly know any label and nor do I look into them. It is only by coincidence that I read something like that on a yoghurt or a juice carton during breakfast. And that's why, even more labels? I don't even look at them when shopping. (P3.4:115)

Among those participants who rejected labeling, some reported only using the most prominent and salient information on packaging to inform their purchase decision, including bold claims on packaging such as “pasture-raised” or “organic”, and designations of origin. These participants tended to place their trust instead in local butchers, relying on these familiar shops to meet their requirements for quality, ethical production, and price.

When asked to name which sources of information they considered most useful when buying meat, the participants mentioned packaging, the Internet, flyers, brochures and posters at the point of sale, personal communications with the store's staff, television documentaries, news and advertisements, videos and social media. The participants said they generally appreciated the provision of such information and considered it important to connect consumers with agriculture and biodiversity. Although nearly a quarter of the participants were interested in accessing additional information about products, including by scanning QR codes, others insisted that labeling must “*speak for itself*”. When asked to offer examples of how concise message about the environmental and ethical value of a meat product could be conveyed effectively, some participants proposed the placement of such products among other ethical products on a designated supermarket shelf. Many participants said they considered the mere fact of pasture grazing as sufficient in itself as essential information on the packaging of pasture-raised products. However, some participants insisted that labels must also indicate the geographical origin of the product and include the name of a trusted institution or certification body issuing the label to help inform their purchase decisions.

The fact that the participants who denied making use of labeling also reported buying organic products may indicate that label use is not always conscious. This accords with the fact that while the majority of these participants claimed not to differentiate between labels, they nevertheless appreciated the presence of a label (Janßen and Langen, 2017). Another possible explanation as to why some of these consumers reported not using labels and not feeling a strong responsibility regarding biodiversity

conservation is that they may feel that buying local or organic products itself constitutes a sufficient contribution to the environment (Jansson et al., 2010).

As previous studies have shown, acknowledging and factoring in the heterogeneity of consumers' perceptions and use of labels is crucial for the development of customized and targeted approaches to information provision to support labeling (Greibitus et al., 2015; Janßen and Langen, 2017; Pirsich and Weinrich, 2018). Information provision may be necessary, for instance, to explain specific conservation measures and to communicate the unique selling point of a new biodiversity label, since these aspects may well not be self-explanatory or effectively conveyed solely by adding the term 'biodiversity' to packaging (Flinzberger et al., 2020). While some consumers will find such additional information necessary, others will overlook these details and pay much more attention to external attributes and heuristics such as the use of logos on packaging or the placement of such products on a particular shelf, since processing information requires a cognitive effort (Horne, 2009).

Given these findings, and bearing in mind that only information which is read and correctly understood by consumers can instigate a desired pro-environmental behavior, it is clear that any information provided must not only be brief and factual and conveyed in a manner accessible to consumers lacking specific knowledge, but also sufficiently detailed to engage more environmentally conscious consumers (Donato and D'Aniello, 2021; Golan et al., 2001; Herbes et al., 2020). Even if such an approach is adapted, however, comprehensibility challenges and the unwillingness of consumers to engage with complex topics in stores or at home can compromise the effectiveness of such communication, leading consumers to resort to habitual purchasing (Verbeke, 2008).

5.5.3 The comprehensibility of multi-level biodiversity labeling

Regarding the comprehensibility of multi-level labeling for biodiversity, two key aspects emerged from the online focus group discussion: (i) the need to indicate different levels of biodiversity conservation measures, and (ii) the importance of label design. The participants agreed that a multi-level labeling system could be comprehensible for a layperson if sufficient explanatory information was made available about the different measures indicated by the different label levels. However, defining precisely what would constitute a necessary amount of information proved difficult. Nearly a quarter of participants objected to the proposed multi-level labeling system as being superfluous and difficult to understand and memorize, especially those unwilling to seek out background information or interact with the information provided, e.g. *"Well, biodiversity, that would be too complicated for me to deeply look into it"* (P6.3:104). This objection was associated with unwillingness to pay more for higher levels

of biodiversity conservation: “*I don’t think that consumers are ready to pay even more, whether there’s one, two or three plus-signs on the logo*” (P4.2:97).

In response to the question “What could make this labeling more comprehensible?”, some participants suggested reducing the number of levels, while participants in four of the six groups suggested a traffic-light system would be “*simply clear to everyone*” (P7.1:294). From a different perspective, some participants regarded the explicit mention of biodiversity as redundant since they already perceived pasture grazing as an indicator of sustainable production and understood this to imply benefits for biodiversity, meaning for them it was sufficient to know a product came from pasture-grazing in order to make a purchase decision:

I generally expect from pasture grazing that simply everything is included, so to speak. All that comes with these levels ... I get all this when I buy [products from] pasture grazing. (P6.1:217)

Our findings suggest that when consumers are uncertain about a product or a label, they will typically opt for a label they understand and reject products with less obvious ethical and/or environmental features (Verbeke, 2008). Although the participants intuitively grasped the logic of a multi-level labeling system, they struggled to differentiate between the levels and required additional explanatory information, which accords with findings from earlier studies (Herbes et al., 2020; Janßen and Langen, 2017; Weinrich et al., 2016). The participants’ proposal of a traffic-light system of labeling for biodiversity as a generally understandable code for conveying information about biodiversity benefits likewise reflects similar suggestions made in studies on carbon footprint and other sustainability indicators (Emberger-Klein and Menrad, 2018; Feucht and Zander, 2018; Meyerding et al., 2019; Spendrup et al., 2017). The application of traffic-light coding to biodiversity would require further research to define a comprehensible and valid reference point for biodiversity impact of grazing (see also Rööös et al., 2014). While this question is beyond the scope of the present study, it may be relevant for comprehensive sustainability labels emerging on the European market that seek to account for biodiversity, including the new Planet-Score label (Southey, 2021).

5.5.4 General trust in labeling and trust in a new biodiversity label

When discussing trust in labeling and the factors that influence their levels of trust, the participants emphasized the importance of the certification and control bodies behind the introduction of new labels:

I believe it is one of the prerequisites for positively assessing a label that you can trust the institution issuing the label. A label alone says nothing at all. But the institution which issues the label

must be independent from the producers. It must be rather from the side of consumer protection. (P4.2:164)

The credibility of certification and control bodies was among the first topics raised by the participants and one that recurred throughout the discussions. The participants emphasized the need for independent and impartial third-party control organizations, preferably in the form of long-established bodies acting at community level. The actors or bodies they considered most trustworthy to control the implementation of a new label were farmers' associations, the German Federal Ministry of Agriculture, NGOs, and veterinarians. However, several participants considered small butcher's shops to be more trustworthy than any certification bodies, basing this preference on their personal acquaintance with the seller, the butcher's long history of consistent performance, and the fact that the butcher's reputation was at stake. In the case of products purchased in supermarkets, the participants reported being usually unable to recognize the certifying organization by the label alone, hence trust was mostly related to label familiarity in these contexts. Another aspect of trust that emerged from the discussions relates to product origin and traceability systems, with participants viewing short supply chains as more transparent and more likely to guarantee the qualities they desired in accordance with their ethical values.

Although "familiarity" was often cited as being a prerequisite for trust in a label, not all familiar labels were equally trusted by the participants. Indeed, certain private labels and supermarket labels were regarded as distinctly untrustworthy, especially in the case of organic brands sold by discount stores. In all but one of the focus groups the participants emphasized the "unmanageable" number of labels as a barrier to trust. This objection included the risk of information overload and the cognitive efforts needed to make a choice between multiple labels: *"There are so many labels, I trust none of them. ... How should a consumer know the differences among all these labels?"* (P4.3:69).

The novelty of a particular label was not directly associated with lower or higher levels of trust, however, since other factors appeared to be more important, including the institution issuing the label and the monitoring authority. The introduction of new labels was nonetheless negatively associated with suspicions of greenwashing and the need to invest more time in searching information. On the positive side, five participants noted that a trustworthy new label could become a helpful decision-making tool and a means of informing the broader population about biodiversity and ethical beef consumption.

In sum, these findings confirm previous research results that the current multiplicity of labels for ethical products reduces trust and exacerbates the complexity involved in making meat-purchasing choices (Gjerris et al., 2016; Torma and Thøgersen, 2021). Participants often cited the abundance of

labels as a cause of frustration and even unwillingness to engage with information, with many saying they lacked the time and other resources to prioritize ethical options consistently, leading them to prefer labeling schemes that facilitate simple decision-making (Verbeke, 2008). Opting for familiar labels can thus be understood in part as a strategy to deal with information overload. From this we can conclude, in line with the findings of previous research (Sirieix et al., 2013), that a new and unfamiliar biodiversity label is likely to be met with skepticism. However, our findings also confirm that the indication of a known and trusted institution behind a label can increase its perceived credibility, especially in the case of state-controlled mandatory certification, thereby increasing consumer trust in the label (Horne, 2009; Janssen and Hamm, 2014; Janßen and Langen, 2017; Torma and Thøgersen, 2021).

5.5.5 Contextual factors relevant for multi-level biodiversity labeling

5.5.5.1 Time pressure

Among those participants who did not consider labels relevant in their purchase decisions, many saw shopping for food as a functional activity that should take no longer than necessary, even when shopping for more expensive items such as meat. For those who made an extra effort to visit a butcher's shop or a farmer's market, however, time pressure seemed to be less relevant. Time pressure when shopping was also linked to label comprehensibility and knowledge, since many participants reported lacking the time to learn more about the different levels of labeling. The number of food labels available was regarded as time-consuming due to the need to check the background of these labels and the traceability of the product:

I don't want to run around and check everything with my smartphone, first scanning and then following up on everything. That way I would never be done with my purchases. (P1.2:73)

The participants' frequent references to having insufficient time to research the background of food products confirms earlier findings that time pressure affects consumers' choices in favor of familiar, trusted, and easily available products (Horne, 2009; Verbeke, 2008). The importance of this factor further indicates the difficulty experienced by consumers in striving to act consistently in accordance with their own ethical values when shopping for food (Gjerris et al., 2016). The fact that so many participants alluded to a lack of time to learn about the different levels of a multi-level biodiversity label scheme suggests these different levels would probably be ignored by many consumers and that any potential positive effect of such a scheme could be attributed to the mere presence of an eco-label regardless of its specific content (Janßen and Langen, 2017).

5.5.5.2 Store format

The perceived relevance of labels to the participants further varied according to the particular format of stores and the packaging or absence of packaging of products. While biodiversity labeling could be helpful in large retail settings, it may be of less relevance in local butchers' shops where higher value is placed on trustworthy personal communications that satisfy consumers' need for information:

I think such a label only makes sense when such products are available in large discount stores. I don't need such a label in my butcher's shop around the corner because I already assume the meat is pasture-grazed. (P4.1:190)

On the one hand, the participants' preference for personal communications with butchers as a trustworthy and sufficient source of information suggests opportunities for direct selling. On the other hand, this preference also renders the effective communication of biodiversity-related attributes through labels in retail stores even more complex. For example, our finding that many participants perceive certain private labels of retailers and discounters as untrustworthy suggests there may be a risk of consumer choices being negatively affected if they associate a biodiversity label with a retailer perceived as being less caring about the environment (Sirieix et al., 2013).

5.5.5.3 Price

A common opinion voiced by the study participants was that labeling beef as pasture-raised signifies better quality and thus helps them understand and accept higher prices for such products. However, the factor cited as most important to justify higher prices for pasture-raised beef was that of "improved animal welfare":

I have already said that pasture grazing definitely is an animal-friendlier husbandry system than keeping cattle in stalls. ... It should be clear to us as consumers that we have to pay an appropriate price for this (P1.5:46).

In the opinion of several participants, differentiated pricing for livestock products according to levels of biodiversity conservation could be appealing to consumers who are both concerned about the environment and also budget-conscious.

Our findings thus show that high product quality and animal welfare are widely perceived as justifying a higher price for pasture-raised beef, since both of these attributes are associated with pasture grazing. Biodiversity conservation, meanwhile, is perceived rather as a collateral effect of pasture grazing that only brings low additional value to the product (Schulze et al., 2021). Nevertheless, consumers

with high levels of both environmental and price consciousness may appreciate a multi-level label indicating different levels of biodiversity conservation measures since such a scheme would enable them to make ethical beef purchases and a positive environmental contribution in different price segments (Spendrup et al., 2017; Torma and Thøgersen, 2021).

5.5.5.4 Local origin

Confirming the relevance of local biodiversity to consumers, over a quarter of the study participants emphasized the importance of local origins in their purchase decisions, stating they would appreciate information on biodiversity conservation at local level: *“When I buy an apple, locally grown but not necessarily certified organic, it has more value to me than an organic apple from Spain”* (P3.2:107). Accordingly, six participants regarded local production as the most important factor in making purchase decisions:

It’s simply too much effort for me to read all this and to find out what it actually means. That’s why I buy local and make sure that I feel good about it. (P8.3:68)

The availability of meat from local origins is closely related to consumers’ place of residence, however, hence those participants who lived in large cities felt disconnected from beef production and complained about the lack of local butchers in whom they could trust.

In sum, given the value consumers place on local production (Feldmann and Hamm, 2015; Katz et al., 2019), together with the increased perceived utility value of certain label combinations for consumers (Janßen and Langen, 2017; Sirieix et al., 2013), designating the local origins of meat on labels alongside its biodiversity benefits could be an effective way to appeal to these consumers and the appreciation they appear to have for local conservation measures.

5.6 Conclusions

This paper has presented the findings of an online focus group study exploring consumer perceptions of a multi-level labeling system for biodiversity-friendly pasture-raised beef. With regard to our first research question, we found that although consumers in Germany associate pasture grazing with high-quality beef and with valuable animal welfare and environmental attributes, there is little awareness of the benefits of pasture-grazing for biodiversity. This is one reason why biodiversity is not currently a priority for most consumers in their beef-purchasing decisions. Gaining consumer acceptance of a new biodiversity label in Germany at present would thus be challenging, therefore, especially given

the predominance of habitual decision-making in food purchases and low levels of consumer knowledge about or involvement with food systems, as well as the time pressures.

Regarding our second research question about consumer perceptions of a multi-level labeling system, we found that the proposed multi-level approach to biodiversity labeling tended to confuse the participants rather than serving as a useful aid to decision-making. From this we conclude that the introduction of a multi-level biodiversity labeling scheme would probably have little or no success in engaging consumers currently uninterested in ethical or eco-labeling. However, such a scheme may well be appreciated by consumers already conscious of the effects of food consumption on biodiversity.

Regarding our third research question about recommendations for biodiversity labeling, we conclude that a binary pasture-grazing label would probably be sufficient to satisfy consumers already concerned about the environmental impacts of meat consumption and the effect of grazing on biodiversity. Our study confirms previous research findings that consumers are overwhelmed by the sheer number and diversity of sustainability labels on the market, which they claim renders it difficult for them to select information that is personally relevant to them. For a significant proportion of consumers, ethical topics such as biodiversity conservation rank rather low on their personal list of priorities, resulting in a lack of interest in additional information about these issues. A legally binding definition of pasture-based production could help address current levels of confusion and lack of trust in labels. In addition, we suggest that efforts to facilitate more direct communications between consumers and farmers might be an effective alternative to the introduction of a new label. This alternative may yield additional opportunities not only to stimulate changes in consumption behavior but also to engage citizens more actively in the environmental consequences of their behavior. In sum, our findings indicate that current levels of confusion and lack of trust in labels need to be addressed through stricter policies at state level, including a legally binding definition of pasture-based production and a well-designed and communicated labeling system.

The limitations of this study relate primarily to its explorative design and its consequent incapacity to quantify predominant opinions. The use of audio-only online focus groups probably resulted in less fluent interactions than a conversation held in full presence, thus raising the question of whether the benefits of maximizing anonymity through audio-only techniques outweigh the costs of hindering natural interactions so important in focus groups.

To identify likely target groups for beef from grazing-based production, future quantitative research should analyze the combined effects of biodiversity and other ethical labels and consumer pref-

erences for different levels of biodiversity conservation in pasture grazing. Given our study's confirmation of the importance of purchasing contexts, future research should include consumers in different kinds of food shopping locations.

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5.8 CRediT authorship contribution statement

Ekaterina Stampa: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization. Katrin Zander: Conceptualization, Methodology, Writing – review & editing, Supervision, Project administration. All authors have read and agreed to the published version of the manuscript. The article is the authors' original work, hasn't received prior publication and isn't under consideration for publication elsewhere.

5.9 Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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6 Discussion

In the current chapter, the findings of the three studies presented above are discussed within the context of sustainability communication as a link between sustainable animal production and consumer behavior. The findings on consumer perceptions, preferences, and behavior regarding pasture-raised products and their views on biodiversity-friendly pasture-based husbandry are placed in a broader context of sustainable consumption behavior and are discussed against recent scientific findings. The perspectives of biodiversity labeling are related to the recent research on the role of sustainability labeling in consumer communication. Finally, the merits and the limitations of this dissertation are reviewed.

6.1 Overall discussion

The main goal of this dissertation was to provide insights regarding consumer perceptions, acceptance, preferences, and communication of biodiversity-friendly pasture-based cattle husbandry and its products. To achieve this goal, this dissertation first provided a review of the state-of-the-art research on consumers' perceptions, preferences, and behavior regarding pasture-raised products. The review of the literature was conducted within the Alphabet Theory framework, focusing on the role its elements such as attitudes, knowledge and information seeking, context, demographics, and habits play in shaping consumers' purchase intention and behavior. Next, consumers' associations with and knowledge of grazing-based cattle production and its environmental outcomes were explored in the context of consumers' perceptions and acceptance of a cattle management system based on virtual fencing. A qualitative study was conducted with German consumers using the method of think aloud protocols. Finally, in an online focus group study, the perspectives of communicating to consumers the biodiversity-friendly aspect of cattle grazing through a multi-level biodiversity labeling scheme for pasture-raised products were investigated.

From consumers' perspective, pasture grazing is a desirable cattle husbandry practice. As the literature review shows, consumers value the "pasture-raised" attribute of livestock products. Their preferences for pasture-raised products are influenced by the positive attitudes related to environmental values and health consciousness, animal welfare concern, perceived high product quality, naturalness, and sensory expectations of the product. This is also reflected in the findings of the online focus group study demonstrating that consumers in Germany associate pasture grazing with high-quality beef and with valuable animal welfare and environmental attributes.

Although grazing-based production is important to consumers, this positive attitude does not always translate into sustainable purchase behavior, as the focus groups indicate. The studies examined

in the review repeatedly referred to an attitude-behavior gap, meaning that in a real purchase situation, consumers often act in discordance with their ethical values, compromising sustainable choices under circumstantial influence (Kühl et al., 2017; Weinrich et al., 2014). In other words, other product attributes, such as price, availability, taste as well as the context of a purchase, e.g., shopping location and consumption context greatly affect consumers' purchase decisions. As the review's findings demonstrate, for a substantial share of consumers price often remains a barrier to the purchase of ethical food products, whether organic, fair-trade or with higher animal welfare standards (De Graaf et al., 2016a; Li et al., 2016; Markova-Nenova and Wätzold, 2018; McCluskey et al., 2005; Thilmany et al., 2006). The participants of the qualitative studies, however, often mentioned their willingness to reduce their consumption to be still able to purchase high-quality products instead of substituting them with a cheaper alternative from less sustainable production systems, in line with earlier findings (Risius and Hamm, 2018). Whereas the habit of frequent meat or dairy consumption as well as established cooking routines are hard to break (Vermeir et al., 2020), the willingness of a part of consumers to adjust their consumption habits and to purchase pasture-raised products despite high prices, expressed in both qualitative studies, underlines that there is a consumer segment which highly values sustainable cattle husbandry.

Although consumers value pasture-raised products, they often lack knowledge about grazing and its meaning for the environment. According to the review results, greater awareness of the different practices in beef and dairy husbandry and deeper knowledge of their interrelations with animal welfare, human health, and the environment can reinforce positive consumer attitudes towards pasture-raised products. As the focus group study reports, consumers appreciate conservation efforts on a local scale and, thus, value biodiversity more in connection with local origin of the product, which suggests promising opportunities for marketing local pasture-raised beef. The findings of both qualitative studies demonstrate that consumers are little aware of the benefits of pasture grazing for biodiversity and often misunderstand biodiversity itself. This accords with the results of a recent survey among German consumers showing that less than every fifth respondent knows the meaning of "biodiversity" but most of them assume the outcomes of agricultural production for biodiversity as far-reaching and negative (Böhm and Frey, 2022). Whereas such estimations may be true in the overall perspective (FAO, 2021; UN, 2022), certain agricultural practices, like pasture grazing or organic farming have positive impacts on biodiversity (Angerer et al., 2021; Dawson et al., 2011; Reisch et al., 2013). The lack of understanding of the interactions between grazing and biodiversity renders biodiversity a rather low priority in purchase decisions of many consumers, as the focus group study demonstrates, in line with earlier reports on environmental conservation being of inferior importance in purchase decisions (Markova-

Nenova and Wätzold, 2018; Vega-Zamora et al., 2019). Since German consumers feel the need for more information about the impact of the products on biodiversity (Böhm and Frey, 2022), consumer communication may deepen consumers' understanding of biodiversity and increase its importance in purchase decisions.

Specific cattle management technologies may be quite difficult for consumers to understand and appear less relevant in consumer communication than sustainability aspects of cattle husbandry practices. The results of the think aloud protocols study demonstrate that the use of virtual fencing in biodiversity-friendly pasture grazing encounters polarized reactions from consumers. Whereas some technically savvy consumers are interested in or even enthusiastic about the technology, negative feedback, concerned questions and lack of particular interest are more common. The understanding of the principles of virtual fencing requires significant efforts from the consumers. The complexity of the technology and its implications for animal welfare, the environment, and humans, are a stumbling stone in consumers' acceptance of virtual fencing, confirming earlier concerns regarding the perception of virtual fencing (Eastwood et al., 2019). More recent research demonstrates positive consumers' reaction to digital farming technologies when the information on their potential influence on animal welfare and environmental protection are provided (Pfeiffer et al., 2021). In our study, whereas consumers appreciated the promotion of pasture grazing that can be achieved using virtual fencing, their concerns about animal welfare outweighed the benefits communicated in the information brochures. Thus, the connection between virtual fencing and animal welfare that consumers established based on the information provided in the brochures could not meet reported by Krampe et al. (2021) consumers' high expectations of precision livestock farming regarding animal welfare improvement and positive environmental outcomes. When purchasing animal food, however, consumers usually are not confronted with the technologies used in animal husbandry. Considering this fact and the ambivalent perceptions of digital farming (Eastwood et al., 2019), communicating virtual fencing to consumers in pursuit of stimulating sustainable purchases might not have the desired effect, as the findings of the think aloud protocols study confirm. Promoting sustainable consumption and biodiversity conservation through cattle grazing should not rely on communicating the technological details of cattle herding but rather aspects that are more relatable, such as the effects on animal welfare and biodiversity.

Communication of the advantages of sustainable cattle husbandry that are relevant to consumers seems a promising strategy in fostering sustainable consumption, according to the results of the qualitative studies presented in this dissertation. Whereas the environmental impact and biodiversity conservation are relevant factors for some consumers (Gassler et al., 2018; Köhl et al., 2017; Markova-Nenova & Wätzold, 2018; Weinrich et al., 2014), sustainable food products are often bought

not for the sake of environmental protection but rather for egoistic reasons, e.g. personal health, taste, prestige, pride (Donato and D'Aniello, 2021; Vega-Zamora et al., 2019). Since different goals pursued by consumers can motivate similar consumption patterns (Vermeir et al., 2020), communication efforts could accentuate personal benefits of pasture grazing that are relevant to consumers and particularly valued by them. The literature review highlights these personal benefits, for instance, perceived healthiness, higher quality, superior taste, and social image associated with buying more expensive products (Evans et al., 2011; Vega-Zamora et al., 2019; Vermeir et al., 2020; Xue et al., 2010). These factors deserve particular attention in promoting pasture-raised products since consumer communication based on the arguments most relevant to consumers may increase their trust in the products (Vega-Zamora et al., 2019). Perception of naturalness or ethical concerns about animal welfare, found to be important in defining preferences for pasture-raised products (Evans et al., 2011; Vigers, 2018; Xue et al., 2010), may also foster pro-environmental behavior without making appeals to consumers' environmental values. Animal welfare, that is higher in grazing-based systems (Crump et al., 2019; Verdon et al., 2021), was frequently mentioned by the participants of both qualitative studies. It is also an attribute for which consumers reportedly have the highest willingness to pay (De Graaf et al., 2016a; Markova-Nenova and Wätzold, 2018). This makes addressing animal welfare benefits particularly promising in promoting pasture-raised products from sustainable cattle husbandry. For consumer groups not demonstrating strong environmental or animal welfare values, other approaches, apart from persuasive communication, may be more promising (Vermeir et al., 2020). For instance, consumers can be motivated to engage in sustainable consumption not only through cognitive perception, knowledge creation, and rationalization but also by appealing to emotions and the sense of aesthetics through communication strategies involving storytelling and gamification (Barnett et al., 2005; Crang, 1996; Demarmels et al., 2016; Eden et al., 2008).

The literature review suggests producers and retailers to provide information that stresses the advantages of environmentally friendly pasture-based production over conventional livestock farming methods. This strategy may be efficient in reinforcing the positive attitudes of consumers (Elbakidze and Nayga, 2012; Zepeda and Deal, 2009). Sustainable food purchasing and consumption require complex critical assessments of the products' attributes by the consumers prior to purchase (Gjerris et al., 2016). Providing consumers with information in order to stimulate sustainable food consumption may not be the most important point in consumer communication because any information received by consumers can be understood and evaluated differently in comparison to initially intended meaning (Eden et al., 2008). Furthermore, hoping that consumers change their purchase behavior to be more pro-environmental solely based on information provided shifts responsibility for sustainability of the

food systems from highly influential food chain actors like governments, producers, and retailers to individual consumers (Eden et al., 2008; Reisch et al., 2013).

In addition to addressing the relevant values, communication pursuing the goal of promoting sustainable choices must be placed in the right context (Verbeke, 2008), as the review's results emphasize. Seeing that shopping location and product availability play a great role in consumers' purchase behavior (Conner and Oppenheim, 2008a, 2008b; Lim et al. 2018), interventions that do not address consumers' values and attitudes, but tailored to induce pro-environmental choices and easily implemented in stores, may bring the desired effect (Vermeir et al. 2020). For instance, increasing the saliency of pasture-raised products through optimized placement in stores may generally increase perceived by consumers availability of sustainable options as well as positively affect consumer choices (Peschel et al., 2019). Well-distinguished packaging of pasture-raised products and transparent and trustworthy labeling could also play a role of nudges and influence consumers' behavior (Vigors, 2018; Vermeir et al. 2020). However, the extent to which these factors can affect consumers' behavior had been barely touched in the literature investigated in the review.

A simple grazing label will likely be sufficient to communicate the most relevant aspects of sustainable, biodiversity-friendly cattle husbandry and provide necessary information about the production conditions, as the online focus group study shows. Consumers' apparent preference for it suggests a perspective for the existing private grazing certification schemes. However, further development of such certification may be hindered by the lack of legally binding definition of grazing-based production. As long as there is no clear definition, consumers' confusion and low trust in private grazing certification schemes are likely to persist, which may hinder their satisfaction with a label (Weinrich and Spiller, 2016b).

Whereas the findings of qualitative studies cannot be generalized to the total population due to a small sample size, they deliver important insights regarding the future of a specialized biodiversity label. Effective promotion of sustainable consumption through labeling requires consumers' understanding of the label. In the context of consumers' information overload and the multiplicity of eco- and sustainability labels on the market (Asioli et al., 2020), the findings indicate that an introduction of a new multi-level biodiversity labeling scheme is most likely redundant. The labeling scheme tested in this study was found to confuse the participants rather than serving as a useful aid to decision-making. Multi-level biodiversity labeling was perceived as comprehensible when additional explanatory information was available. This can be regarded positively since consumers' knowledge of the standards

behind a label is a prerequisite for eco-label use by consumers (Daugbjerg et al., 2014). However, consumers perceived proactive information seeking as time-consuming and annoying. Thus, a multi-level approach to biodiversity labeling is supposedly excessive as long as consumer knowledge about biodiversity and its importance in environmental sustainability of agricultural production remains low (Heise and Theuvsen, 2017; Peschel et al., 2016; Weible et al., 2016). Considering current medial efforts to attract consumer attention to the issues of animal welfare accompanying the introduction of a state animal husbandry label (Hirsch et al., 2019; BMEL, 2022), the present moment seems quite inopportune for a new biodiversity label.

The findings underline the importance of trust in labeling for effective use in purchase decisions, in line with earlier research (Daugbjerg et al., 2014; Grebitus et al., 2015; Sultan et al., 2020). To minimize false expectations that may damage consumers' trust, a label introduction must go along with extensive, long-term information campaigns to explain the standards behind the label and deal with consumers' skepticism (Daugbjerg et al., 2014). As the focus group study shows, the organization or institution introducing a labelling scheme must be trustworthy. Considering low consumers' trust in private actors, certification provided by third parties, especially with state accreditation, has more chances to be perceived with trust (Daugbjerg et al., 2014; De Jonge et al., 2008; Janssen and Hamm, 2014).

In theory, consumer communication of the sustainability attributes of pasture-base cattle husbandry may also occur through comprehensive labels based on the assessment of different sustainability attributes (Futtrup et al., 2021; Torma and Thøgersen, 2021). Comparing multiple specific labels for different sustainability attributes complicates consumers' decision-making, making consumers resort to heuristic clues or hindering sustainable choice altogether (Janßen and Langen, 2017; Vega-Zamora et al., 2019; Vermeir and Verbeke, 2006). A comprehensive meta sustainability label that includes biodiversity conservation in its certification criteria would outsource the assessment of a total sustainability impact of a product to the experts, providing consumers with an easy to classify product ranking (Torma and Thøgersen, 2021). Such labelling can be realized in form of a traffic light index, to which the focus group participants often referred. However, even for the experts the task of relative assessment of different impacts a product has on biodiversity, animal welfare and other environmental or social aspects is a challenging one (Bratt et al., 2011; Chaudhary et al., 2018). A multi-stakeholder perspective on sustainability labelling on food suggests that the adoption of such an approach is also challenged by the different attitudes of the relevant stakeholders hindering a consensus on a meta-label (Gröfke et al., 2021; Torma and Thøgersen, 2021).

Promoting products from pasture-based cattle husbandry fostering biodiversity must not necessarily rely exclusively on labeling but can create consumer awareness through different media, online and offline, as well as campaigns at the point of sale (Azzurra et al., 2019; Sultan et al., 2020). Although in most cases consumers must count on labeling to learn about credence attributes of food production, in short supply chains, direct communication between consumers and producers facilitates information exchange and enhances trust (Giampetri et al., 2018). Whereas the focus group study's findings on consumers' appreciation of biodiversity conservation on the local scale are yet to be confirmed by quantitative studies, promotion of biodiversity-friendly pasture-raised products on a local scale, through short supply chains appears an auspicious course of action. Such communication depends less on labelling but rather on creating transparent information flows along a clear, short supply chain where trust can be built through personal contacts (Giampetri et al., 2018).

6.2 Limitations of the dissertation and future research areas

Alongside its contribution to the research on a relevant topic, several limitations of this dissertation have to be recognized. First, a qualitative approach was used in both empirical studies reported above. The choice in favor of explorative methods was based on the lack of prior research on consumers' perception of virtual fencing and multi-level biodiversity labeling. The results of the two qualitative studies cover the spectrum of consumers' reactions to the examined topics but make no suggestions about their distribution in the population. Future research may build upon the explorative finding of this dissertation and include a quantitative investigation of consumer preferences regarding the most prominent attributes of grazing-based production. Future studies may also conduct consumer segmentation and identify target populations for communication based on their willingness to pay for pasture-raised products. Moreover, future research may concern the trade-offs in purchase decisions for pasture-raised products, such as consumption reduction for financial or environmental reasons.

The stimuli used in both qualitative studies were created specifically for the purposes of this research due to the lack of established in the praxis materials. The information stimuli in the first study were limited to printed information brochures, whereas in reality different designs and framings may alter the structure of consumers' reactions. These points could be addressed in future research conducted in a real-life setting, such as a store test, to investigate the influence of informational stimuli on consumers' purchase behavior and thereby contribute to the development of effective promotional campaigns.

The unfamiliarity to consumers of the multi-level labeling system proposed for the discussion in the online focus groups might have had a negative effect on its perception by the participants. There are no multi-level biodiversity labeling schemes present on the market and using any of the existing labels that are binary would not have corresponded to the research question. The findings regarding a new biodiversity labeling refer to a situation where consumers have not yet been exposed to any informational campaigns about the role of pasture grazing for biodiversity.

7 Conclusions and recommendations

The present dissertation provides insights into consumer communication of biodiversity-friendly cattle pasturing. The conducted literature review is the first to systematically analyze and summarize the existing scientific findings on consumers' perceptions of and preferences for pasture-raised products, revealing the research gaps and contributing to the development of further investigations into the subject. The review adds to the body of literature on sustainable food consumption behavior by providing a better understanding of the interactions and mutual influences of different constructs influencing consumers' purchase intention and behavior. The empirical results presented in this dissertation contribute to the understanding of consumers' preferences for pasture-raised products and provide the insights on the perspectives of different communication approaches regarding pasture-raised products from biodiversity-friendly grazing-based cattle husbandry systems. This final chapter addresses the implications of this dissertation and draws conclusions for different actors along the beef and dairy supply chains, such as producers and retailers of pasture-raised products as well as policymakers and private owners of certification and labeling schemes for pasture-raised products.

The findings of the dissertation indicate that consumers appreciate pasture-raised products for their perceived high quality, higher animal welfare standards and lower environmental impact. Consumers perceive grazing-based cattle production positively and, as far as explorative data allows to conclude, state a willingness to buy animal products derived from pasture-based systems and to pay more for them.

This dissertation provides the first explorative evidence on German consumers' perceptions of cattle production employing virtual fencing. Technological advances in cattle grazing management, in form of optimized grassland use through virtual fencing, tend to interest consumers less than the tangible outcomes of innovative approaches, e.g., the aforementioned product quality, pasture-based production, and better conditions for the animals. The complexity of the virtual fencing technology and its low relevance to consumers suggest that marketing of pasture-raised products from farms applying this technology should rather rely on the communication of the production attributes that consumers value more, such as grazing and animal welfare improvement. These findings are relevant for the research on consumer perception of agricultural innovation, for producers considering the implementation of this technology and for future marketers of the products derived from such grazing systems.

The findings regarding the potential of communicating biodiversity conservation in cattle pasturing through multi-level labeling scheme suggest that this approach may not yield favorable results in terms of providing practically useful information to consumers and stimulating the sales of labelled

products. So, a multi-level labeling system was perceived with confusion that can be attributed to consumers' low knowledge about biodiversity and the resulting inability to extract any meaningful information from the different levels of biodiversity conservation. According to the focus group data, pasture grazing alone stands for all the positive outcomes that consumers associate with this form of animal husbandry. This makes a binary grazing label sufficient to convey the desired signal to consumers seeking sustainable livestock products.

Creating opportunities for consumers to act according to their values and choose sustainable products, thereby minimizing the attitude-behavior gap, is a necessary step towards ethical food consumption. This requires collective action from retailers and producers supported by the governmental regulations. So, a cooperation of grazing practitioners and researchers with policy-makers to elaborate a legally binding definition of pasture-based production is an important step towards strengthening consumers' positive perception of pasture-based production. Defining the standards for "pasture-based" claims on livestock products would help building and reinforcing consumers' trust into this production practice. Including the requirements for biodiversity conservation in certification standards for pasture-based production could help to address consumers focusing on animal welfare.

The results of consumer research on biodiversity clearly indicate that changing consumer behavior in favor of biodiversity is very challenging. Having in mind the overall needs to avoid a further reduction of biodiversity loss, policymakers have to act without shifting the responsibility for sustainable consumption solely on consumers because information provision is not a universal pill to cure unsustainable habits and production practices. It is a political task to develop effective strategies making sustainable pasture-based products affordable for consumers and profitable for the producers, thereby facilitating the transition to sustainable consumption. A good understanding of the interrelationships within the whole food system, from primary producers to end consumers, is necessary to develop comprehensive, long-term policies that would effectively foster sustainable consumption and production by addressing the entirety of related issues: crop cultivation and animal husbandry, supply and availability, social welfare, financial aspects, information provision, and targeted communication (Reisch et al., 2013).

For producers of sustainable cattle products, it could be helpful, on the one hand, to seek participation in subsidized biodiversity conservation programs, and on the other hand, to pursue the establishment of possibly short supply chains. It seems promising to offer consumers an opportunity to visit the farm, in person or online, to create chances to convince skeptically-minded consumers who have little trust into certification or labeling and information communicated by stakeholders other than farmers.

Considering varying consumer preferences and the vast number of factors affecting consumer purchase behavior, no “one size fits all” marketing strategy can be developed to promote pasture-raised products. Different communication approaches adjusted to the specific context are required in different regions, depending on the spread of pasture grazing in the area and the existence of or the potential to create short, local supply chains. Transparent information about the origin should accompany any communication on biodiversity conservation to allow consumers to estimate their personal benefits. Another leverage to promote sustainable consumption that is available to retailers is product placement, aimed at increasing visibility and availability of pasture-raised products and thereby affecting consumer choices.

Further research is recommended to provide a quantitative estimation of the influence of pasture-raised product communication; to define consumer segments and target groups for future communication efforts; and to identify effective ways of consumer communication in different supply chains.

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Legal documents

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Appendix

A.1 Information brochures used in the TAP study

Brochure 1: Gut für Tier und Mensch (1/2)

Genuss erleben ...

Natürliches Futter durch immer frisches, saftiges Gras und aromatische Kräuter ist die Grundlage für die besonderen Geschmackseigenschaften der Weideprodukte. So können Sie das zart würzige Aroma der Weidekräuter bei der Zubereitung von Ihrem Steak am besten entfalten lassen.

Tipps fürs Grillen (ein Steak ca. 2 cm dick, Medium Rare):

- Gut ausgereiftes (mind. 4 Wochen) Weidefleisch bei Ihrem Metzger finden
- Das Fleisch vor dem Braten auf Raumtemperatur erwärmen lassen (ca. eine halbe Stunde)
- Das Steak trocken tupfen und von beiden Seiten kurz bei starker Hitze ohne Flammen anbraten (max. 1,5 Minuten)
- Ruhen lassen (max. 2 Minuten)
- Auf einem vorgewärmten Teller im vorgeheizten Ofen bei ca. 90°C fertig garen oder auf der kühleren Seite des Grills (ca. 10 Minuten)
- Teller vorwärmen
- Steaks herausnehmen, aufschneiden, salzen und würzen
- Genießen

„GreenGrass“
Ein Projekt zur Erhaltung der Biodiversität

Projektkoordination: Universität Göttingen

Verbundpartner:
Universität Kassel, Universität Gießen, Universität Köln, Humboldt-Universität zu Berlin, Brandenburgische Technische Universität Cottbus-Senftenberg, Universität Hohenheim, Texas Trading and Horizon Group GmbH, Grünlandzentrum Niedersachsen/Bremen e.V.

Durchgeführt in Kooperation mit Unternehmen aus Landwirtschaft, Ernährungsindustrie und Lebensmittelhandel sowie mit Verwaltungen und Verbänden des Natur- und Landschaftsschutzes.

Zahlen und Fakten über die teilnehmenden Unternehmen, den aktuellen Beitrag zur Erhaltung und Steigerung der Artenvielfalt, die Weidezeiten der Rinder und weitere Informationen:

www.uni-kassel.de/go/greengrass



Ökologische Agrarwissenschaften UNI KASSEL
FB Agrar- und Lebensmittelmarketing
Steinstraße 19 | 37213 Witzzenhausen
www.uni-kassel.de/agrar

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**Bundesministerium
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WEIDERINDER HALTUNG

Gut für Tier und
Mensch



Broschüre 1: Gut für Tier und Mensch (2/2)



Biologische Vielfalt erhalten ...


Die Folgen der sinkenden biologischen Vielfalt haben Sie wahrscheinlich schon bemerkt: Selteneres Insektenbrot, weniger Vogelstimmen und Farbreichtum in der Natur. Um die Pflanzen- und Insektenvielfalt auf dem Grünland zu erhalten, braucht es eine pflegende Nutzung durch weidende Tiere statt häufigen Maschinenschnitt.

In unserem Projekt entwickeln wir neue Wege, um die Weidehaltung von Rindern zu ermöglichen. Dadurch wollen wir mehr Lebensqualität für Tier und Mensch schaffen. Biologische Vielfalt auf Weiden erbringt unverzichtbare Leistungen für die Ökosysteme, den Klimaschutz und die Umwelt.

Tiergerechte Haltung fördern ...

Vor zehn Jahren durften noch zwei von fünf Milchkühen in Deutschland auf die Weide. Dieser geringe Anteil geht weiterhin zurück. Laut Expertenmeinungen wird im Jahr 2025 nur jede zwanzigste Milchkuh einen Zugang zur Weide haben.

Wir wollen Rinder zurück auf die Weide bringen und dadurch tiergerechte Haltungsbedingungen ermöglichen. Dazu gehört mehr Bewegungsfreiheit, artgerechtes Futter, reichlich Tageslicht, frische Luft und Austausch mit den Artgenossen.

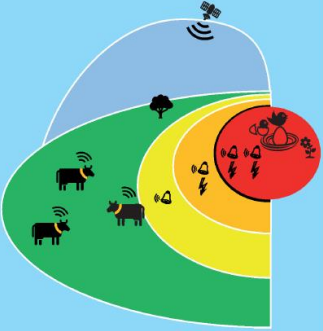


Technologie weiterentwickeln ...

Mit einem virtuellen Zaunsystem bauen wir Sicherheitsinsel für seltene Pflanzen und Vogelneester auf der Weide. So können wir den Rindern Bewegungsfreiheit geben und sie dabei in sicheren Grenzen halten.

Die Zäune werden von Herdenmanagern bequem auf einer Satellitenkarte markiert. Innerhalb einer Weide können virtuelle Zäune flexibel gestaltet und schnell umgestellt werden.

Die Rinder bekommen ein GPS-Halsband und dürfen frei grasen. Ob die Rinder sich auf einer bestimmten Fläche aufhalten, wird auf Basis von GPS-Daten überwacht – automatisch, meteregenau und in Echtzeit. Kommen die Rinder zu nah an Grenzen, werden sie mit Hilfe zunächst von akustischen, dann von schwachen elektrischen Signalen aus dem Halsband gewarnt. Zur beidseitigen Sicherheit von Rind und Mensch bleiben die feststehenden Elektrozaune am Weiderand erhalten.



Broschüre 2: Tierwohl fördern (1/2)

Machen auch Sie mit ...

Ihr Beitrag zum Wohle der Weidetiere ist auch für die Umwelt besonders wertvoll. Bei jedem Einkauf entscheiden Sie mit, wie es den Rindern und Menschen in der Zukunft geht.

... und freuen Sie sich auf diese Vorteile!

Wenn Sie mit Ihren Freunden am Wochenende Weidesteaks grillen oder ein Glas Milch von Kühen aus Weidehaltung trinken, können Sie mit einem guten Gefühl den besonderen Geschmack genießen, weil:

- Die Rinder tiergerecht leben und behandelt werden
- Die weidenden Rinder gesünder sind
- Die Rinder entspannter leben, was die Fleischqualität verbessert

So können Sie sicher sein, die richtige Wahl getroffen zu haben.

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WEIDERINDERHALTUNG

Tierwohl fördern



Broschüre 2: Tierwohl fördern (2/2)

Ein Projekt zur Förderung des Tierwohls

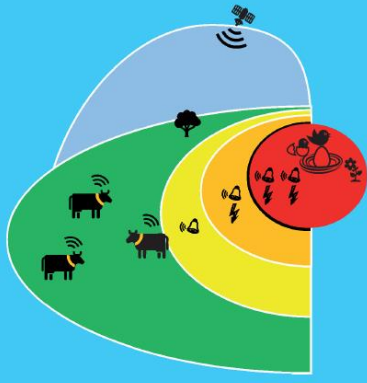
Am wohlsten fühlen sich Rinder auf der Weide, artgerecht in einer Herde im Freien. Diese Art der Haltung wollen wir, ein Verbund von Praktikern und Wissenschaftlern, in unserem Projekt fördern.

Ein wichtiger Teil der artgerechten Haltung ist passendes Futter. Für Rinder ist Gras genau das Richtige. Ähnlich wie bei Haustieren wird den Rindern die benötigte Menge an Futter täglich zu Verfügung gestellt. Dafür wird die Weide so eingeteilt, dass die Rinder nach dem Abgrasen einer Fläche zur nächsten gelassen werden. So wird eine hohe Futterqualität gewährleistet.

Jedoch ist eine Aufteilung der Weide und das Umtreiben der Rinder mit viel Arbeitsaufwand für die Landwirte verbunden. Deshalb sieht man immer weniger Rinder auf der Weide. Mit den virtuellen Zäunen erleichtern wir Landwirten die Arbeit und sorgen dafür, dass wieder Rinder auf die Weide dürfen.

So setzen wir es um:

- Die Zäune werden nicht mehr mit Elektrodraht gesichert und per Hand umgesetzt, sondern virtuell per Satellitenkarte gezeichnet.
- Die Rinder tragen Halsbänder, die ihren Standort ermitteln.





Die Kombination aus den GPS-Bändern und den virtuellen Zäunen wirkt wie ein wachsamer Kuhhirte. Nähert sich eine Kuh einem virtuellen Zaun, bekommt sie durch das Halsband erst ein akustisches Warnsignal. Bei Nichtbeachtung folgt ein elektrisches Signal, viel schwächer als bei einem Elektrozaun.

Die Rinder lernen schnell und halten sich in den gesetzten Grenzen auf.

Das System hat folgende Vorteile für die Rinder:

- Die Sensoren im Halsband ermitteln den Gesundheitszustand der Rinder: das Wohlbefinden jedes Tieres kann genau gemessen werden.
- Die Rinder dürfen zum Teil auf die Weiden, die aus Gründen des Naturschutzes bisher für sie komplett gesperrt waren.





Broschüre 3: Biologische Vielfalt fördern (1/2)

Was sind meine Vorteile?

Weidehaltung betrifft uns alle. Es gibt viele persönliche Gründe, Landwirte zu unterstützen, die sich für Weidehaltung einsetzen:

- Die Weiden blühen artenreich auf
- Seltene Vogelarten gedeihen in geschützten Räumen
- Eine vielfältige Kulturlandschaft wird erhalten
- Weidende Rinder sind wieder ein Teil des Alltags
- Milch- und Fleischerzeugnisse zeichnen sich durch eine hohe Qualität aus

Durch die Unterstützung von Weidehaltung und somit von biologischer Vielfalt setzen Sie sich für eine lebenswerte Zukunft für Mensch und Tier ein.



Kiebitz

„GreenGrass“
Ein Projekt zur Erhaltung der Biodiversität

Projektkoordination: Universität Göttingen

Verbundpartner:
Universität Kassel, Universität Gießen, Universität Köln, Humboldt-Universität zu Berlin, Brandenburgische Technische Universität Cottbus-Senftenberg, Universität Hohenheim, Texas Trading und Horizont Group GmbH, Grünlandzentrum Niedersachsen/Bremen e.V.

Durchgeführt in Kooperation mit Unternehmen aus Landwirtschaft, Ernährungsindustrie und Lebensmittelhandel sowie mit Verwaltungen und Verbänden des Natur- und Landschaftsschutzes.

Zahlen und Fakten über die teilnehmenden Unternehmen, den aktuellen Beitrag zur Erhaltung und Steigerung der Artenvielfalt, die Weidezeiten der Rinder und weitere Informationen:

www.uni-kassel.de/go/greengrass



Ökologische Agrarwissenschaften UNI KASSEL
FB Agrar- und Lebensmittelmarketing
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Bundesministerium
für Bildung
und Forschung



Agrarsysteme
der Zukunft

WEIDERINDER HALTUNG

Biologische Vielfalt fördern



Broschüre 3: Biologische Vielfalt fördern (2/2)

Ein Projekt zur Erhaltung der biologischen Vielfalt

Eine Weide ist mehr als ein grüner Rasen. Weiden bieten Nahrung, Schutz und Lebensraum für zahlreiche Lebewesen. Die Gesundheit eines Weideökosystems ist für unsere eigene Gesundheit, aber auch für unseren Genuss und unsere Erholung wichtig.

In unserem Projekt erarbeiten wir neue Technologien zur Förderung der biologischen Vielfalt durch Weidehaltung von Rindern.

- Durch das regelmäßige Abgrasen von Weiden können mehr Pflanzenarten wachsen und blühen
- Eine große Vielfalt an Pflanzen bietet einer Fülle von Insekten Lebensraum
- Eine Vielzahl an Insekten bedeutet ausreichend Nahrung für Vögel und kleine Tiere
- Biologische Vielfalt auf der Weide sorgt für Boden- und Gewässerschutz
- Gesunde Böden speichern CO₂ besser und tragen so zu einem besseren Klima bei



Hummel auf Weißklee

Wie wird es gemacht?




- Bisher: Elektrozaune. Eine ganze Weide wird wegen blühender Orchideen oder auf dem Boden brütender Vögel für Weiderinder gesperrt.
- Jetzt: Virtuelle Zäune. Nur der Bereich wird gesperrt, in dem sich Orchideen oder Vogelnester befinden. Die Rinder grasen im restlichen Bereich der Weide.
- Die Rinder bekommen GPS-Halsbänder, die sie vor dem Betreten des gesperrten Bereiches erst akustisch und dann mit schwachen elektrischen Signalen warnen.
- So wird mit dem virtuellen Zäunen für den Naturschutz gesorgt und die Weidehaltung lohnt sich wieder.

Wie kann ich mitmachen?

Alle können zum Erhalt der biologischen Vielfalt beitragen und jeder einzelne Beitrag ist wertvoll. Mit den Kaufentscheidungen, die Sie heute treffen, bestimmen Sie die Zukunft. Sie beteiligen sich an dem Erhalt der Artenvielfalt, indem Sie sich für Milch- und Fleischprodukte aus Weidehaltung entscheiden.





Geflecktes
Knabenkraut

Broschüre 4: Natürliche Landschaften erhalten (1/2)



... für eine lebenswerte Zukunft für Mensch und Tier

- Lohnenswerte Arbeit erhält ländliche Gebiete am Leben
- Anziehende Landschaften laden zu Freizeitaktivitäten in der Natur ein
- Beweidung von Grünland liegt eine tiergerechte Rinderhaltung zugrunde



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Bundesministerium für Bildung und Forschung



Agrarsysteme der Zukunft

WEIDERINDERHALTUNG

Natürliche Landschaften erhalten



Broschüre 4: Natürliche Landschaften erhalten (2/2)

Ein Projekt zur Erhaltung der natürlichen Landschaften und des Artenreichtums

Wir entwickeln Lösungen für eine zukunftsfähige Weidehaltung zum Erhalt des Artenreichtums. Unser Ansatz basiert auf der Kombination von artgerechter Weidehaltung von Rindern, Naturschutz sowie dem Erhalt von natürlichen Landschaften. Technisch wird dies durch das virtuelle Zäunen ermöglicht.

Die Rinder bekommen ein GPS-Halsband, das ihren Standort auf einer Satellitenkarte zeigt. Sollen die Rinder einen Bereich nicht betreten, bekommen sie durch das Halsband ein Warnsignal, erst akustisch, dann mit schwachen elektrischen Impulsen. Rinder lernen schnell und treten schon bei einem Ton-signal zurück. So werden seltene Pflanzenarten und Bodenbrüter vor den Rinderhufen geschützt. Die Rinder bekommen dennoch Zugang zu einer Weide.



Virtuelles Zäunen ... für natürliche Landschaften

- Grasende Weidetiere sorgen für eine attraktive Kulturlandschaft
- Grünflächen werden sinnvoll und schonend genutzt
- Für schwere Landschaftspflegetechnik unzugängliche Flächen werden natürlich gepflegt



... für greifbaren Naturschutz

- Artenreichtum auf den beweideten Flächen hilft dem Klimaschutz
- Natürliche Düngung durch weidende Rinder erlaubt den Verzicht auf synthetische Düngungsmittel





... um Landwirte zu unterstützen

- Virtuelles Zäunen spart Kosten für aufwendiges Umzäunen von kleinen Weideflächen zum Schutz von seltenen Pflanzen
- Virtuelles Zäunen vereinfacht das Umtreiben der Rinder zu Weideflächen mit frischem Gras

... um die Landschaft mit allen Sinnen zu genießen

- Einmalige Harmonie der heimischen Kräuter schafft einen kraftvollen, runden Geschmack und mildes Aroma der Fleisch- und Milchprodukte aus Weidehaltung



A.2 Screening questionnaire used in the TAP study

Screening

Ort, Datum _____

Rekrutierer _____

Voraussetzungen für die Teilnahme an der Studie:

- Gute Deutschkenntnisse
- Mindestens 18 Jahre alt (bis ca. 68)

Quoten	Alter	Frauen	Männer
	18-49	2	1
	Ab 50	2	1

Guten Tag, ich komme von der Universität Kassel und möchte Ihnen ein paar Fragen stellen.

a. Sind Sie in Ihrem Haushalt für den Lebensmitteleinkauf zuständig?

(Die Person sollte mind. die Hälfte der Lebensmitteleinkäufe tätigen)

Bitte Strichliste führen

Ja	Nein → der Person danken und das Interview beenden

b. Arbeiten Sie in der Landwirtschaft oder Lebensmittelindustrie?

(Die Person sollte NICHT in der Landwirtschaft/ Lebensmittelindustrie beschäftigt sein)

Bitte Strichliste führen

Nein	Ja → der Person danken und das Interview beenden

c. Kaufen Sie zumindest 1 Mal pro Woche Milchprodukte?

(Die Person sollte die Produkte zumindest 1 Mal pro Woche kaufen)

Bitte Strichliste führen

Ja	Nein → der Person danken und das Interview beenden

d. Kaufen Sie zumindest 1 Mal pro Monat Rindfleisch?

(Die Person sollte Rindfleisch zumindest 1 Mal pro Monat kaufen)

Bitte Strichliste führen

Ja	Nein → der Person danken und das Interview beenden

Sind Sie bereit, an einer Studie teilzunehmen? Wir werden ein Gespräch mit Ihnen führen und Ihnen einige Broschüren zeigen. Sie müssen kein besonderes Vorwissen für die Teilnahme haben, es geht uns einfach um Ihre individuellen Eindrücke. Das Interview wird mit einem Diktiergerät aufgenommen, und eine Kamera wird auf die Broschüren in Ihren Händen gerichtet sein. Ihr Gesicht wird nicht gefilmt. Die Ergebnisse dienen ausschließlich Forschungszwecken. Ihre Daten werden vertraulich behandelt und anonym ausgewertet. Das Interview wird etwa 30 Minuten dauern. Im Gegenzug für Ihre Teilnahme erhalten Sie eine Aufwandsentschädigung von 30 € in bar. Darf ich Sie dazu bitten, mit mir zu unserem Interviewraum im Gästehaus der Universität Osnabrück (Lürmannstraße 33) / im City Hotel Cottbus (Rudolf- Breitscheid-Straße 10) / im Zeughaus (Zeugplatz 4) zu kommen?

Bitte Strichliste führen

Ja	Nein → Sagen Sie mir noch, warum Sie nicht teilnehmen wollen?	
	Zeitmangel	
	Kein Interesse	
	Sprachschwierigkeiten	
	Generell keine Teilnahme an Befragungen (Verweigerung)	
	Krankheit	
	Vertraue Befragungen nicht / Angst vor Datenschutzverletzungen	
	Anderer Grund:	

Small-Talk Themen während des Weges: Schonmal an Studie teilgenommen, Sehenswürdigkeiten...

A.3 Closing questionnaire used in the TAP study

1. **Ihr Geschlecht?** Weiblich Männlich Divers
2. **Ihr Geburtsjahr?**
3. **Ihr höchster erlangter Bildungsabschluss:**
- Noch in Ausbildung
 - Keine abgeschlossene Schul- oder Berufsausbildung
 - Hauptschulabschluss / Mittlere Reife
 - Abitur / Fachabitur / abgeschlossene Berufsausbildung
 - Hochschulabschluss
4. **Haben Sie schon einmal Produkte aus Weidehaltung gekauft?**
- Nein, noch nie.
 - Ja.
 - Kann ich nicht sagen, ich habe nie darauf geachtet.
5. **Haben Sie schon einmal Produkte aus Weidehaltung in der Gastronomie gegessen?**
- Nein, noch nie.
 - Ja.
 - Kann ich nicht sagen, ich habe nie darauf geachtet.
6. **Wie regelmäßig essen Sie Fleisch- und Wurstwaren?**
- Täglich
 - An mindestens 5 Tagen in der Woche
 - An 3 - 4 Tagen in der Woche
 - 1 - 2 Tagen in der Woche
 - 1-2 Mal im Monat
7. **Wie regelmäßig verzehren Sie Milch oder Milchprodukte?**
- Täglich
 - An mindestens 5 Tagen in der Woche
 - An 3 - 4 Tagen in der Woche
 - 1 - 2 Tagen in der Woche
 - 1-2 Mal im Monat

8. Sind Sie bereit, für Produkte aus Weidehaltung einen höheren Preis zu bezahlen?

- Nein
 Ja
 Kann ich so nicht sagen

9. Wenn „Ja“ als Antwort bei Frage 8, bitte geben Sie an, wieviel Sie für die folgenden Produkte aus Weidehaltung mehr zahlen würden im Vergleich zu Produkten aus Stallhaltung:

	Stallhaltung	Weidehaltung
1 Liter Milch	0,69 €	€
1 kg Rinder-Hüftsteak	19,90 €	€

10. Wie wichtig sind die folgenden Botschaften für Sie beim Kauf von Fleisch- und Milchprodukten? Bitte bewerten Sie jede einzelne Botschaft.

	Sehr un- wichtig		Weder noch		Sehr wichtig
Erhaltung von natürlichen Landschaften	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unterstützung für Landwirte	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Förderung des Tierwohls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lebenswerte Zukunft	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hohe Produktqualität	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Erhaltung der biologischen Vielfalt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nachhaltige Technologie	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Erhaltung seltener Tier- und Pflanzenarten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A.4 Online focus groups guide

Phase und Ziel	Verlauf der Diskussion	Dauer (Ges.), Min.
<p>Begrüßung Datenschutz-hinweise</p>	<p>Herzlich Willkommen in unserer kleinen Diskussionsrunde. Vorab möchte ich Sie darauf hinweisen, dass diese Diskussion aufgezeichnet wird. Die Nutzung Ihrer Videokameras stelle ich ab, Sie sind nur mit Ihrer Stimme dabei. Die Aufnahme brauchen wir, um die Diskussion vollständig auswerten zu können, weil wir nicht so schnell mitschreiben können. Wir behandeln Ihre Daten vertraulich und anonym. Nach der Diskussion tippen wir die Aufnahmen ab und arbeiten nur mit der Textdatei weiter. Die Aufnahmen selbst werden wir nicht veröffentlichen. Hat jemand was dagegen? Falls Sie mit diesem Verlauf nicht einverstanden sind, so können Sie die Diskussion sofort und ohne Nachteile verlassen.</p> <p>Nochmals herzlichen Dank dafür, dass Sie an dieser Diskussion teilnehmen. Ich heiße XXX und arbeite an der Uni Kassel. Ich werde die heutige Diskussion moderieren und meine Kollegin YYY wird mich dabei unterstützen.</p>	2 (2)
<p>Einführung Thema vorstellen Ablauf erklären Zweck erklären Technische Hinweise</p>	<p>Wir werden über Rindfleisch und Rindfleischproduktion in Deutschland reden und ungefähr 90 Minuten über unterschiedliche Fragen zu diesem Thema diskutieren. YYY und ich werden ein paar Fragen in die Runde stellen. Die Diskussion soll aber unter Ihnen stattfinden und nicht als Frage-Antwort ablaufen.</p> <p>Warum führen wir überhaupt Gruppendiskussionen durch? Es gibt wenig wissenschaftliche Erkenntnisse zu diesem Thema, daher interessiert uns Ihre Meinung.</p> <p>Jede Meinung ist wichtig, es gibt hier keine richtigen oder falschen Antworten. Am Ende wollen wir nicht, dass Sie sich alle einig sind, sondern dass Sie Ihre eigene Meinung frei äußern können.</p> <p>Jetzt zur Diskussion an sich. Es gibt einige Regeln, denen wir alle bitte folgen, dann läuft unsere Kommunikation angenehm und effizient ab. Die Große Regel ist, wir sprechen nacheinander und melden uns zu Wort indem wir das Hand-Symbol benutzen, um die Hand virtuell zu heben und danach zu senken. Wie das geht, können Sie auf Ihrem Bildschirm sehen.</p> <p>Wenn Sie gerade nicht sprechen, schalten Sie bitte ihr Mikro stumm, so dass wir weniger Lärm haben und uns besser verstehen können. Dafür ist es auch wichtig, laut und deutlich zu sprechen. Es wäre einfach schade, wenn Informationen verloren gehen, weil wir sie einfach nicht verstehen. Wir möchten eine offene und respektvolle Diskussion, in der alle Meinungen wichtig und sehr willkommen sind. Haben Sie noch Fragen?</p>	3 (5)

Vorstellungsrunde Gegenseitiges Kennenlernen Auflockerung Einleitungsfrage	Wenn es keine Fragen mehr gibt, beginnen wir jetzt mit einer kleinen Vorstellungsrunde. Das Ganze soll anonym ausgewertet werden, deshalb bitte keinen vollen Namen nennen, sondern Ihre ID oder einen Spitznamen, mit dem Sie sich wohl fühlen. Bitte nennen Sie Ihre ID oder Ihren gewünschten Spitznamen und erzählen Sie uns kurz, was Ihr Lieblingsgericht ist?	5 (10)
Weidehaltung und Weideprodukte Ausgangswissen: Spontane Assoziationen	Ein Thema, über welches wir heute sprechen, ist Weidehaltung von Rindern in Deutschland. ➤ Was fällt Ihnen spontan ein, wenn Sie an Weidehaltung von Rindern denken?	15 (25)
Übergang zu Produkten. Erwartungen an Weideprodukte, Kaufkriterien	Weidefleisch kommt von Rindern, die auf einer Weide grasen. ➤ Ist Weiderindfleisch besser als das Fleisch aus einer Stallhaltung? ➤ Kann das Weidefleisch beim Einkauf erkannt werden?	
Infoinput	Info	
Einfluss der Information	➤ Jetzt wenn Sie diese Info bekommen haben, hat sich Ihre Meinung zu Weidehaltung verändert?	5(30)
		10(40)
Kennzeichnung Kenntnisse über Kennzeichnung, Vertrauenswürdigkeit Verständlichkeit des Labels, Erwartungen, Informationsquellen	In der letzten Zeit gibt es immer mehr Produkte, die Qualitäts- oder Umweltsiegel haben. Jetzt schauen wir uns eine neue Kennzeichnung an, die für Produkte aus Weidehaltung vorgesehen ist. ➤ Was würden Sie von einer solchen mehrstufigen Kennzeichnung halten? ➤ Sind Ihnen die Abstufungen klar? ➤ Würden Sie sich eine solche Kennzeichnung wünschen?	25(65)
Information Ergänzungen	Unsere Diskussion nähert sich ihrem Ende. ➤ Möchten Sie mehr Informationen über die Weideprodukte in der Zukunft erhalten? ➤ Wie sollen diese Informationen bereitgestellt werden?	15(80)
Wahrnehmung des VZ (Für die FGs 3 bis 6)	<i>Die Umweltmaßnahmen zur Erhaltung der Artenvielfalt können mit innovativen Tierhaltungspraktiken unterstützt werden. Eine solche Praktik ist virtuelles Zäunen. Wir werden uns jetzt einige Informationen über diese neue Technologie anschauen.</i> ➤ Was halten Sie von solcher Technik, wenn sie zum Erhalt der Artenvielfalt eingesetzt wird?	10(90)
	Das war ja eine spannende, aufschlussreiche Diskussion. Herzlichen Dank für Ihre Teilnahme!	