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Exploring Labeling for Ecosystem Services and Biodiversity

- a Q study with the German food-processing industry

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Abstract

Agriculture contributes to the deterioration of ecosystem services and the loss of biodiversity. Policy measures to combat these problems are often ineffective. Eco-labeling can help to involve consumers for increasing the share of products addressing ecosystem conservation. However, the literature has paid little attention to the food industry's perspective on labels, albeit the industry's crucial role for label implementation. The objective of this study is to explore the German food industry's views of food product labeling for the effective and efficient provision of ecosystem services. Q methodology was applied which ensured that the interviewees compared statements relative to each other and sorted them based on their subjective valuation which yielded three distinct viewpoints as outcomes. The first viewpoint ("grass-roots labelists") highlighted the importance of transparent norms for the quantification of ecosystem services; the second viewpoint ("local believers") highlighted the potential of 'local' ecosystem services; and the third viewpoint ("skeptics") showed doubts regarding a label-based approach for the provision of ecosystem services. The heterogeneity in viewpoints leads to the conclusion that the detailed assessment of markets, products, consumers, regions, and ecosystem services is crucial. Although context is important, and tailored solutions are necessary, the three identified viewpoints can provide some guidance on focus areas for such further analysis.

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1 Introduction

Nature provides ecosystem services like food, clean water, healthy soils, and carbon storage. Although human well-being depends on the enduring flows of ecosystem services, many ecosystem services are public goods, which are often not priced or traded on markets. At the same time, ecosystem services are not always at the center of economic analysis and policy. On a global scale, we witness decreasing biodiversity and deteriorating ecosystems with far-reaching consequences for humankind (TEEB, 2008), and agriculture is at the core of many of these issues (Zhang et al., 2007).

Various political and private actors have begun to address the low valuation of ecosystem services in European agriculture. The European Union's Common Agricultural Policy has a significant impact on biodiversity and ecosystems in agriculture. However, several studies show that the measures previously taken are often ineffective (Lakner et al., 2019; Pe'er et al., 2019). At the same time, the food industry has begun to cater consumers' demands for organically produced or otherwise environmentally friendly products. Companies increasingly apply ecosystem service and biodiversity indicators within their life cycle assessments to valorize "environmental public goods" to satisfy respective consumer demands (Jensen et al., 1997). As part of these efforts, eco-labeling programs facilitate the process to market environmentally friendly products, since they are "…providing consumers with adequate information on the various dimensions of food production, consumption and distribution in order to allow them to make informed food choices in line with their values and preferences" (Goossens et al., 2016, p. 986). Eco-labels serve as a means to create an environmental consciousness among consumers to enable informed food product choices. Eco-labels can also promote environmentally friendly products (Iraldo et al., 2020). Consumers' perception of labels can, however, differ (Janssen & Hamm, 2014). Furthermore, different label characteristics also imply different label diffusion potentials and adoption processes on the part of the consumers (Iraldo et al., 2020). A label's adoption process is also dependent on the consumer's environmental interest and the intentions a label is pursuing (Thøgersen et al., 2009).

Although the literature available on food labels in consumer research is vast (see for instance Grunert et al., 2014 for an overview), most studies focus on consumers' perceptions and valuations of labels (McCluskey & Loureiro, 2003). Few studies are concerned with the perspective of food processors, retailers, or the organizations that promote and monitor label standards. Taking into account the diverse viewpoints of food industry actors can enhance our understanding of bottlenecks in the implementation of labels. Are subjective views of value chain actors aligned? Or are there large differences in their subjective assessments? Which issues are more controversial than others?

It is the objective of this study to explore the food industry's views of food product labeling for the effective and efficient provision of ecosystem services. First, the perception of labels (from the viewpoint of food processors, retailers, and label organizations) will be investigated. Second, the concept of how ecosystem services can be communicated with labels will be analyzed.

The following research questions guide this project:

- Which aspects of food product labeling are the most important from the perspective of food processors, retailers, and label organizations?
- How can the concept of ecosystem services be communicated best with labels?

2 Literature Review and Theoretical Framework

Chapter two provides the theoretical foundation the study is built on. This study aims to explore food product labeling to explore the role of labels for the effective provision of ecosystem services. Thus, it is important to obtain an understanding of both labeling and ecosystem services.

2.1 (Eco-) Labeling

During the course of the project, labels are defined as a medium to transfer information to the consumer. Goossens et al. (2016, p. 986) state that labels are "…providing consumers with adequate information on the various dimensions of food production, consumption and distribution in order to allow them to make informed food choices in line with their values and preferences." Today, consumers use information provided on packaging to find information about ingredients, expiration date, nutrition, country of origin, serving size, or statements about health benefits to guide their choice. Consumers want this information presented in an easily understandable and transparent way (Wingfield, 2016). Food product labels can be a means to bridge the information gap between producers and consumers (van Amstel et al., 2006). Thus, food product labels are important communication tools. While some product information must be placed on the package by law, other product features are increasingly highlighted with labels, such as organic, natural, or gluten-free to appeal to more specific groups of consumers and to provide consumers with additional information (Wingfield, 2016).

Eco-labels inform consumers on the degree of environmental friendliness of a product (van Amstel et al., 2006). Labels can serve as a means to create an environmental consciousness among consumers, to enable informed food choices, while also promoting environmentally friendly products (Iraldo et al., 2020). It has to be asserted though, that consumers must process complex information. To be effective, labels must speak to the consumers' preferences for environmental and other services (van Amstel et al., 2006). Another objective is the encouragement of companies to make their products better from an environmental perspective using different production practices and innovation (Iraldo et al., 2020). Labels provide the opportunity for the quality of these products to receive official recognition by a third party. The overall objective of an eco-label is to have better product sustainability, and at the same time to change consumption patterns. Labels often aim to balance consumer satisfaction and the companies' interests to achieve a reduction of the product's environmental impact (ibid). Thus, it is crucial that an eco-label's trustworthiness, scientific exactness, and selection criteria/standards are reassured to consumers and businesses at any time. In order to do so, eco-labels assess a product's environmental impact using life cycle assessments, which recently have developed into the standard methodology. However, the effectiveness of eco-labels faces some challenges. The widespread application of ecolabels throughout small and medium-sized enterprises to effectuate changes within production schemes is difficult to achieve since adoption costs of an eco-label are a significant obstacle. Competitive and economic advantages associated with the adoption of eco-labels are often restricted or unsatisfactory due to consumers' lack of awareness (ibid).

There is a trade-off between market penetration and how stringent the requirements of an eco-label are. Some eco-labels have such high ambitions and can, therefore, only certify a small number of products with high environmental performance. This might also result in a smaller number of producers attempting labeling (ibid). Janssen & Hamm (2014) showed that labels are perceived differently even if they apply the same standards. They also showed that higher standards do not necessarily translate into a higher willingness-to-pay on the part of the consumers. This has to be considered by producers, and could have a negative effect on their

willingness to pursue labeling. Therefore, if high market penetration is the goal, it is inevitable to lower labeling requirements or to implement only requirements that do not cause increases in costs. Furthermore, to enhance the diffusion of eco-labels it is important to improve their marketing potential and to facilitate the adoption process. Different label requirements at a global level and the integration of social aspects to live up to sustainable development related goals are further issues that have to be addressed (Iraldo et al., 2020). According to Thøgersen et al. (2009), recognition, understanding and, finally, adoption of new eco-labels rely on the consumer's level of interest in the environment, as well as on how strong the particular behavioral intentions associated with an eco-label are. An eco-label can, therefore, be regarded as a tool transforming credence attributes (i.e. the characteristics of a product that cannot be directly observed by the consumer) into search attributes. Consequentially, an eco-label's success is dependent on the demand of environmentally friendly products (Thøgersen et al., 2009).

Although labels can help to overcome information asymmetries between consumers and producers, they also can create a meta-problem of information asymmetries between consumers and labels (Banerjee & Solomon, 2003). Thus, it is crucial for any label to generate trust which can be achieved via good communication and high transparency services (van Amstel et al., 2006). This includes facilitating that consumers can distinguish labeled and unlabeled products (Chen et al., 2018).

2.2 Ecosystem Services (and Biodiversity)

According to Constanza et al. (1997), ecosystem services represent the goods and services derived from the functions of ecosystems, and which are utilized by humanity. The concepts of ecosystem services are useful for the recognition of the various benefits nature is providing. Defined in economic terms, "the flows of ecosystem services can be seen as the dividend that society receives from natural capital" (TEEB, 2010, p. 7). The preservation of natural capital stocks enables ecosystem services to be provided in the future and, therefore, to contribute to human well-being. To maintain the flow of these services makes, it necessary to understand the functioning of ecosystems and in which ways they provide their services. Thus, it is also crucial to be aware of all different kinds of threats that might disturb ecosystem services. For this reason, findings of the natural sciences are important to grasp the relationships between the provision of ecosystem services and biodiversity. This includes the resilience of ecosystems, which means the ability to endure the provision of ecosystem services experiencing altering circumstances, mainly caused by climate change (ibid).

As stated in The Economics of Ecosystems and Biodiversity (TEEB, 2010), ecosystem services can be divided into four different categories, those being (1) provisioning services, (2) regulating services, (3) habitat or supporting services and (4) cultural services.

Ecosystem services providing material or energy output such as food and water are called provisioning services. Services responsible for the regulation of, for example, air and soil quality are called regulating services. The sequestration and storage of carbon is also an example of a regulating service. Habitat or supporting services provide things that are necessary for the survival of individual animals or plants such as water and food. Different ecosystems create different habitats for different species, and can be crucial for their lifecycles. Migrating species rely on diverse and intact ecosystems during their migrations. Finally, ecosystem services also cover cultural services such as recreation and tourism. Different types of tourism rely on ecosystems and biodiversity which, again, enables important income generations for many countries. There is also educational potential of cultural and eco-tourism to inform people about the value and relevance of ecosystems and biodiversity (TEEB, 2010).

The Convention on Biological Diversity (CBD) defines biodiversity as "the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems

and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (CBD, 1992). This also covers the variety of species and the genetic variation of flora and fauna. The quality and quantity of biodiversity is crucial when studying the interrelationships of nature and economic activity, and by extension, human well-being.

Although people are more aware of ecosystems and biodiversity and their contribution to human well-being, the deterioration of ecosystems and biodiversity continues to pose a threat. This implies that society must radically limit its impact on ecosystems and acknowledge the importance of ecosystem services. One of the main problems, which occurs is that many ecosystem services are public goods which makes it difficult to regulate the degree to which they may be exploited, even when they are close to collapse. Even though society benefits from ecosystem services, there is no individual incentive to maintain ecosystems to guarantee future service provision. One example of such social dilemma situations where the individual interests are at odds with the collective interests is open access fisheries which provide valuable outputs. At the same time individuals often have an incentive to free-ride and to over-exploit fishing stocks, resulting in shrinking fish populations and, therefore, in lower future outputs below the social optimum or maximum sustainable yield (de Groot et al., 2010).

One must keep in mind that ecosystem services can be perceived differently by different stakeholders. Hermelingmeier & Nicholas (2017) found five perspectives on ecosystem services using Q methodology. The first perspective ("Non-economic utilitarian") regards ecosystem services as a useful tool, the second perspective ("Critical idealist") is skeptical towards ecosystem services, the third perspective ("Anti-utilitarian") understands ecosystem services as an encompassing approach, the fourth perspective ("Methodologist") follows a methodological approach on ecosystem services, and the fifth perspective ("Moderate economists") regards ecosystem services as a useful tool for an economic approach of environmental decision-making. Each perspective is applying different assessments and approaches which reflects the growing attention to, and community surrounding the concept experiences (ibid).

2.3 Potential of labels to promote ecosystem services

According to van Loo et al. (2015), sustainability traits of food products are credence attributes. This implies that these attributes are neither visible to the consumer before buying a product nor afterwards. This also applies to ecosystem services since their impacts on human well-being or in economic terms "externalities" are also not observable. Hence, trust and monitoring become important. Bougherara and Combris (2009) showed that consumers are willing to pay a price premium for altruistic reasons and, therefore, may derive utility from externalities a product creates. The perception of these externalities, however, can take different forms. Chen et al. (2018) showed in their "fresh produce" study that a reduction in the use of pesticides is appreciated the most by consumers followed by less negative impacts on water quality which finally translates into a different willingness-to-pay for a different ecosystem service provided. If for example, a brewery decides to plant a tree for each crate of beer sold, the consumer benefits twice: firstly because of the consumption of beer and secondly because of the tree planting activity.

Another advantage of eco-labeling is that it encourages farmers to take the provision of ecosystem services into consideration within their practices (van Amstel et al., 2006). For instance, if a farmer decides to plant legumes, he or she will increase the soil fertility and reduce mineral nitrogen fertilizer input, which ultimately may improve the surrounding water quality. Likewise, if a fruit farmer decides to cooperate with local beekeepers, the bees will help pollinating the trees and also produce honey. Producers, however, often incur higher production costs to perform these sustainable management practices. Consumers on the other hand, cannot

directly verify whether a certain sustainable practice has been implemented, as most of the effects are not directly visible. Thus, there exists a high degree of information asymmetry between consumers and producers regarding what action the producers truthfully carried out (van Amstel et al., 2006).
A label could tackle this problem of information asymmetry by informing consumers about the producers' production practices and the environmental benefits resulting from the producers' activities. This requires, that the activities and benefits are certified to some degree by an independent institution (Knoefel et al., 2018). One example of such a certification is the Naturplus Standard, which is currently implemented in Germany (Naturplus-Standard, 2020). The Naturplus-Standard contains criteria for designing efficient nature conservation projects that aim to provide biodiversity and ecosystem services. The services of the sustainable activities can then further be quantified and expressed as a graph resembling a flower, which is currently planned for a German online marketplace for nature conservation projects (AgoraNatura, 2020).

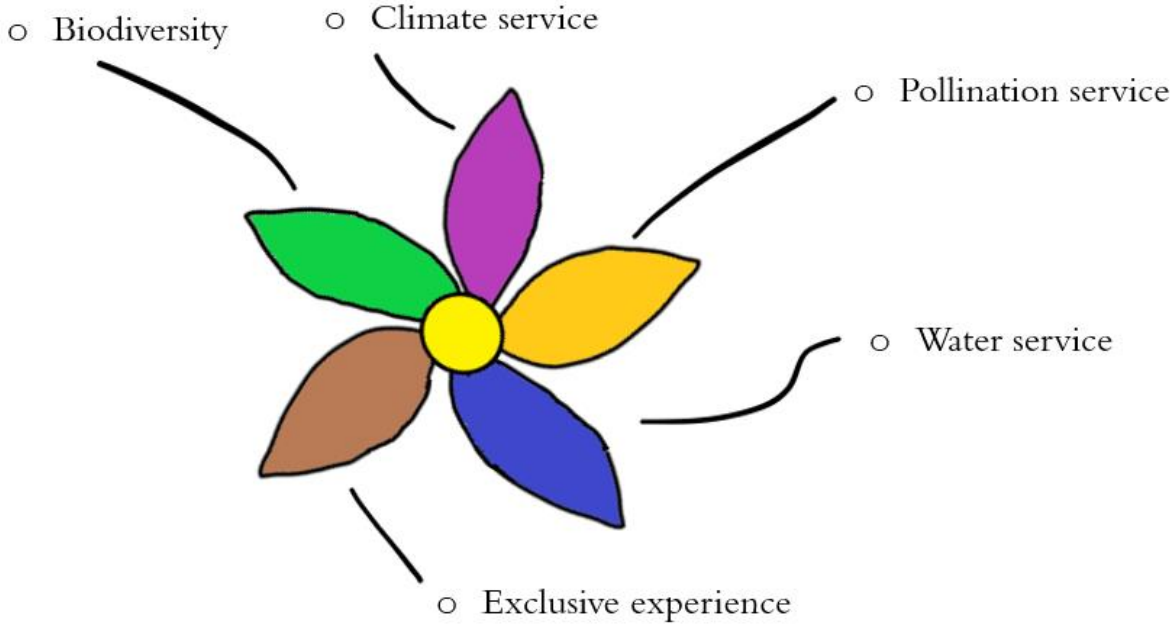


Figure 1. Flower representing ecosystem services. Own illustration adopted from AgoraNatura (2020)

The combination of standard and representation in the form of a flower achieves two important goals: Firstly, by having the standard in place (and by enforcing it credibly), it is possible to bridge the information asymmetry between consumers and producers. Secondly, by quantifying and representing the services through the flower, it is possible to raise awareness about the services of nature conservation practices. As Janssen & Hamm (2014) highlight, it is essential for a successful label to have high consumer trust. Having gained the trust from consumers, producers are able to charge a premium for sustainable practices, so that both parties benefit – consumers through the positive externalities of sustainable production practices and producers through higher profits.

3 Methodology

This chapter presents the study's research methodology. It focuses on Q methodology and what it implies for the research philosophy and design. The purpose of a literature review, quality criteria and ethical aspects are also mentioned.

3.1 Research philosophy and design

The research philosophy is determined by the researcher's ontological and epistemological perspective. It is important to consider ontological and epistemological perspectives for the choice of methodology (Guba & Lincoln, 1994), as they are directly related to each other. Ontology, on the one hand, describes the nature of reality: what counts as real and what can be known about it. Epistemology, on the other hand, describes the perspective on knowledge, what we can know and what we do not know. Also, epistemology determines whether knowledge can be viewed as objective or subjective (ibid).

The underlying ontological perspective of this study is based on a social constructionist view which supports abductive explanation, giving reason to emerging robust and substantial factors in the Q study described below (Watts & Stenner, 2012). It is important to mention the difference between constructivism and constructionism, because both views can be applied for a Q study. Stephenson and traditional Q researchers commonly took a constructivist perspective and used the method with only one interviewee and thus focused on personal viewpoints and self-reference. Constructivism focuses on personal aspects of meaning construction, in particular the different forms individuals use to interpret their physical and social environment and personal standpoints and knowledge structures which emerge from this. Constructionism, however, focuses on the social aspects of the same practices applying a multiple participant design. The focal point is, therefore, transferred from personal aspects to their social complements, i.e. the shared viewpoints the study explores. This is why it is also referred to as social constructionism (ibid).

In the tradition of American pragmatism, John Dewey (1931, accessed in Sharpe et al., 2008) referred to these outcomes as social facts, and, according to Watts and Stenner (2012), these social facts are the objective of constructionist research. This type of research provides an understanding of predominant standpoints, while also attempting to map them within a specific context. The method particularly fits the purpose here, since it makes it possible to amplify these standpoints in a systematic and qualitatively rich way.

There are some limitations of combining the underlying ontology and methodology of the research design. This research considers the firm as a unit of analysis, and firms are assumed to follow specific strategies and goals. Although in principle these firms could be viewed as higher-order entities or an emergent property of the various stakeholder groups *within* the firm, they are here ontologically treated as independent units with their own objective. However, the methodological approach relies on interviews as *representatives* of these firms, implicitly assuming that interviewees provide information on their enterprise rather than their own views. While one must keep this mismatch in mind when discussing the findings, it appears to be an acceptable compromise.

Since this study explores food product labeling to investigate the role of labels for an efficient provision of ecosystem services, there is a need to provide explanation along with the explored empirical facts. Abduction aims to construct a theory to explain those facts. This is why an abductive approach was found suitable. Following an abductive approach implies that observations are never treated as independent but as a sign for something else. They can be regarded as clues pointing towards some potential explanation (Watts & Stenner, 2012). However, it has to asserted that it is impossible to know certainly what these clues mean which makes it necessary to guess or, more formally, to come up with a likely hypothesis. Here, an

important feature of abduction can be emphasized, namely that in sharp contrast to deductive work, it is not necessary to derive a hypothesis from a pre-existing theory. According to Watts and Stenner (2012), working without a hypothesis or pre-existing theory supports abductive reasoning which aims for discovery and the generation of new theories.

3.2 Literature review

A literature review on label research served as the basis for the conducted study. It is the foundation of the study and relevant literature was reviewed throughout the research process to gain a better understanding of the subject and research field, as the study emerged. This process also helped to identify a research gap and, as Bryman and Bell (2015) state, is it important to conduct a literature review to detect a research gap and construct a basis for the theoretical background and framework. Within this study, the literature review was also helpful to develop the Q set (i.e. the statements described below), as it provided thought-provoking impulses and also helped to formulate ideas. During this process, the literature review clearly showed that label research is predominantly focused on consumers and that ecosystem services are still a rather unknown concept to be communicated with labels. In addition, it revealed that processors, retailers, and label organizations are currently not as involved within the research field which has to be addressed since they are responsible for the provision of ecosystem services in the first place.

3.3 Q methodology

This subsection will present the characteristics and the procedure of the applied Q methodology.

3.3.1 General overview of Q methodology

Q methodology has its origin in psychology and was established by William Stephenson "as a means of gaining access to subjective viewpoints" (Stenner et al., 2003, p. 2162). It is called Q methodology to highlight the reversal of the role of subject and variables and to distinguish it from R methodologies (Webler et al., 2009). The subjects in R methodologies are interviewees while the questions are variables. The goal is to uncover response patterns across the variables. Is there a relation between one valued variable and another one? An example is the question of whether people who support animal rights (variable 1) also are vegetarians (variable 2). Q, however, aims to reveal subjective viewpoints by including various key stakeholders (which become the variables), or more precisely their Q sorts, and a collection of statements (which become the subjects) covering any topic-related discourse in its different peculiarities (Webler et al., 2009). Q attempts to identify patterns within the Q sorts (i.e. the variables) for every statement (i.e. the subjects). It asks about relations between Q sorts and what stands out in these relations.

In a Q study, interviewees rank various statements by their level of agreement. This facilitates the quantitative development of social discourses via factor analysis. Qualitative analysis is applied in thematic and content analysis (Brown, 1996). Hence, a Q study combines qualitative and quantitative elements. The use of Q methodology limits the potential of interference by the researcher in the interviewee's expression of his/her opinion under the assumption that the statements (the so-called Q set) have undergone a careful and robust development (Stenner et al., 2008). These pre-prepared statements can safeguard against confirmation bias and the overall influence of the researcher on interviewees and their responses (Danielson et al., 2009). Q methodology has been applied to gain insight into people's attitudes, beliefs and overall opinions on various environmental debates such as ecosystems (Woolley et al., 1999), conservation values (Sandbrook et al., 2011) and global environmental change (Niemeyer et al., 2005). This study explores food product labeling for the communication of ecosystem

services to investigate the viewpoints of processors, retailers, and representatives of label organizations. Q methodology is well suited to address such complex questions, as it produces holistic and rich data that can help to advance an in-depth understanding of the subjects and phenomena under investigation. The explorative approach of this study makes it fitting for the application of Q methodology (Watts & Stenner, 2012).

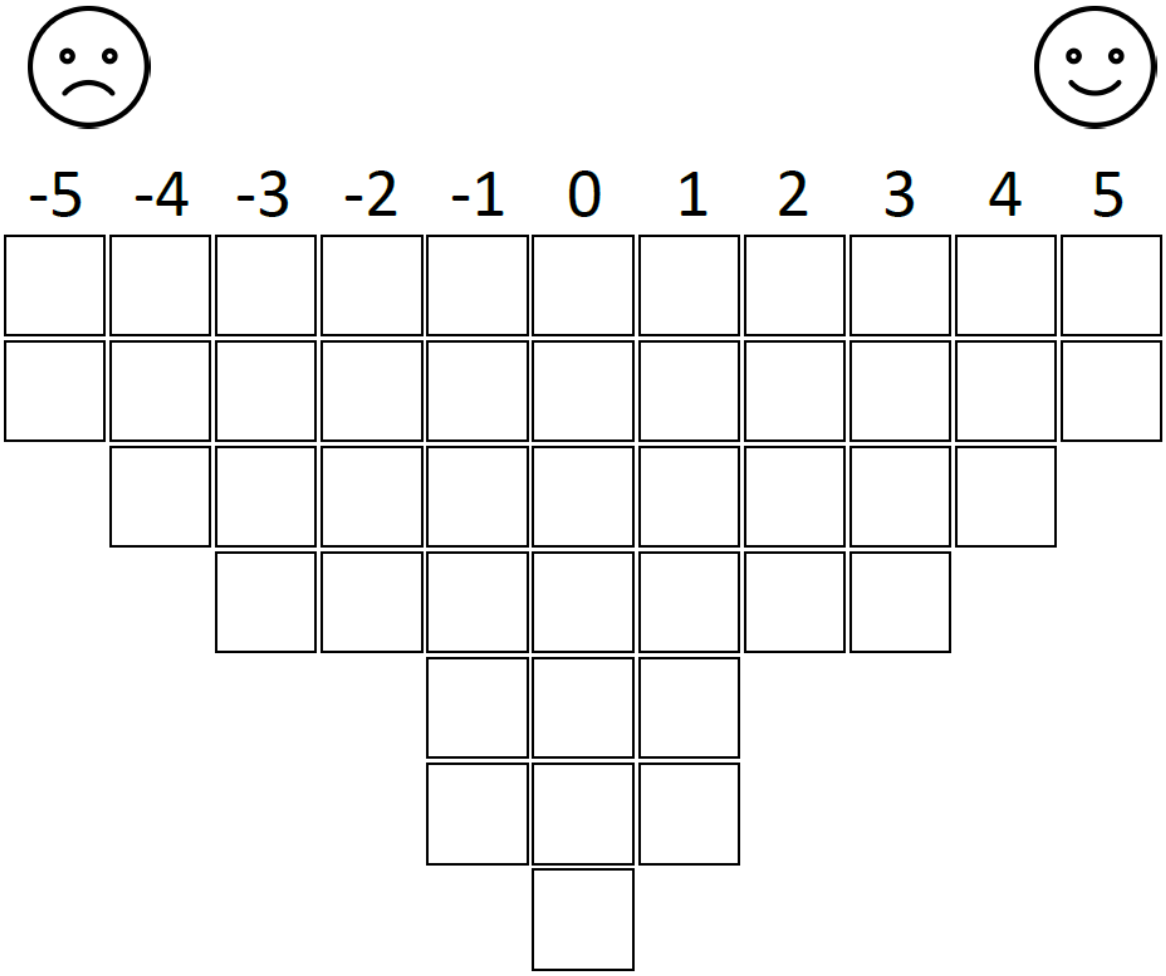


Figure 2. Empty Q grid

In a Q study, data are collected in the form of Q sorts in a first step which are later analyzed via an individual and intercorrelation analysis in a second step (Watts & Stenner, 2012). Figure 2 shows an example of an empty Q sort. Interviewees are asked to sort heterogeneous statements provided by the researcher into a bell-curve shaped grid. Sorting the statements produces a model of the interviewee's viewpoint. The finished Q sorts are then compared and contrasted using factor analysis with the goal to reveal similarities *within* the viewpoints of the interviewees (i.e. the variables). This, again, shows the peculiarity of Q methodology highlighting the subject/variable inversion (ibid).

The Q grid has a prearranged frequency distribution (see figure 2) which serves the purpose of standardizing the ranking process. The dimension used in this study is agreement/disagreement. It is up to the researcher to decide on the kurtosis of the distribution. A rather steep distribution, on the one hand, is advisable if interviewees are somewhat unfamiliar with the subject, or the subject is very complex. This way, more statements interviewees might feel unsure about can be placed closer to the center of the grid. A rather shallow distribution, on the other hand, could be used when interviewees are expected to be familiar with the subject or the subject is unambiguous. It enables the interviewees to make more precise and distinctive decisions

towards the outer boundaries of the distribution. The interviewees in this study were expected to be familiar with the subject, but due to the complexity of the subject, a moderate kurtosis for the distribution was found suitable (Watts & Stenner, 2012).
The Q sort in this study consists of an eleven-point ranking scale. It ranges from -5 for statements interviewees disagree most with, to +5 for statements interviewees agree most with. Thus, the number of statements that can be assigned to a singular ranking value is pre-determined. In the figure above, two statements can be assigned to each of the extremes (+5 and -5), three statements can be placed on +4 and -4 respectively and so forth. The "neutral" position in the center requires seven statements to be placed on the grid. This results in a forced distribution (Watts & Stenner, 2012).
The design of a set of statements in a Q study, the so-called Q set, can be entirely theoretical or based on naturally appearing conditions. It has to suit the specific needs of an investigation as well as the research question's demands. An effective Q set has two characteristics which are coverage and balance. The major goal of a Q set is the provision of good coverage related to the research question. This means it has to be broadly representative of the opinion spectrum. This, again, is done in the same way as the sampling of participants in R methodologies where the different participants broadly represent the population. For a Q set, this implies that items taken together must represent the opinion spectrum in a similar way. The coverage of the relevant ground has to be as accurate as possible (Watts & Stenner, 2012). One can think of a carpet tile as a suitable metaphor in this regard (Stenner et al., 2008). All carpet tiles sewed together have to cover the whole relevant ground. It follows that a balanced Q set can be achieved which will be very close to be able to fully capture the spectrum of perspectives and opinions related to the research question. However, this does not imply that 50% of the items must be pro replies and the other 50% contra replies to the research question since balance has a larger meaning than pros and contras. It is crucial that a Q set does not occur to be biased in relation to a specific viewpoint. Interviewees must be able to provide self-contained replies to the research question with a given Q set. They must not feel any sort of limitation, restriction or even frustration caused by coverage or balance issues of the Q set. This is important because the sorting process itself and the implications of a forced distribution might cause a feeling of limitation and restriction for some interviewees (Stenner et al., 2008). Therefore, it has to be guaranteed that interviewees come out of a Q study with the feeling they were able to successfully create a model of their viewpoint. This makes a carefully and rigorously constructed Q set indispensable.

The sorting of the statements into the grid, referred to as Q sorting works as follows: the researcher and the interviewee read through the statements one-by-one. During this stage the interviewees are to build three different piles. The first pile should consist of statements they generally agree with while the second one, contrarily, should consist of statements they disagree with. The third and last pile should consist of statements the interviewee is indifferent to or unsure about, or might have mixed feelings about (Watts & Stenner, 2012). The first pile should be placed on the right-hand side in line with the positive area of the distribution-grid. The second pile, accordingly, on the left-hand side and the third pile towards the middle. The single piles do not have any limit of statements which could cause interviewees to be concerned about being too positive or negative although this is not a problem since it is only a provisional step that should help to construct the final Q sort.

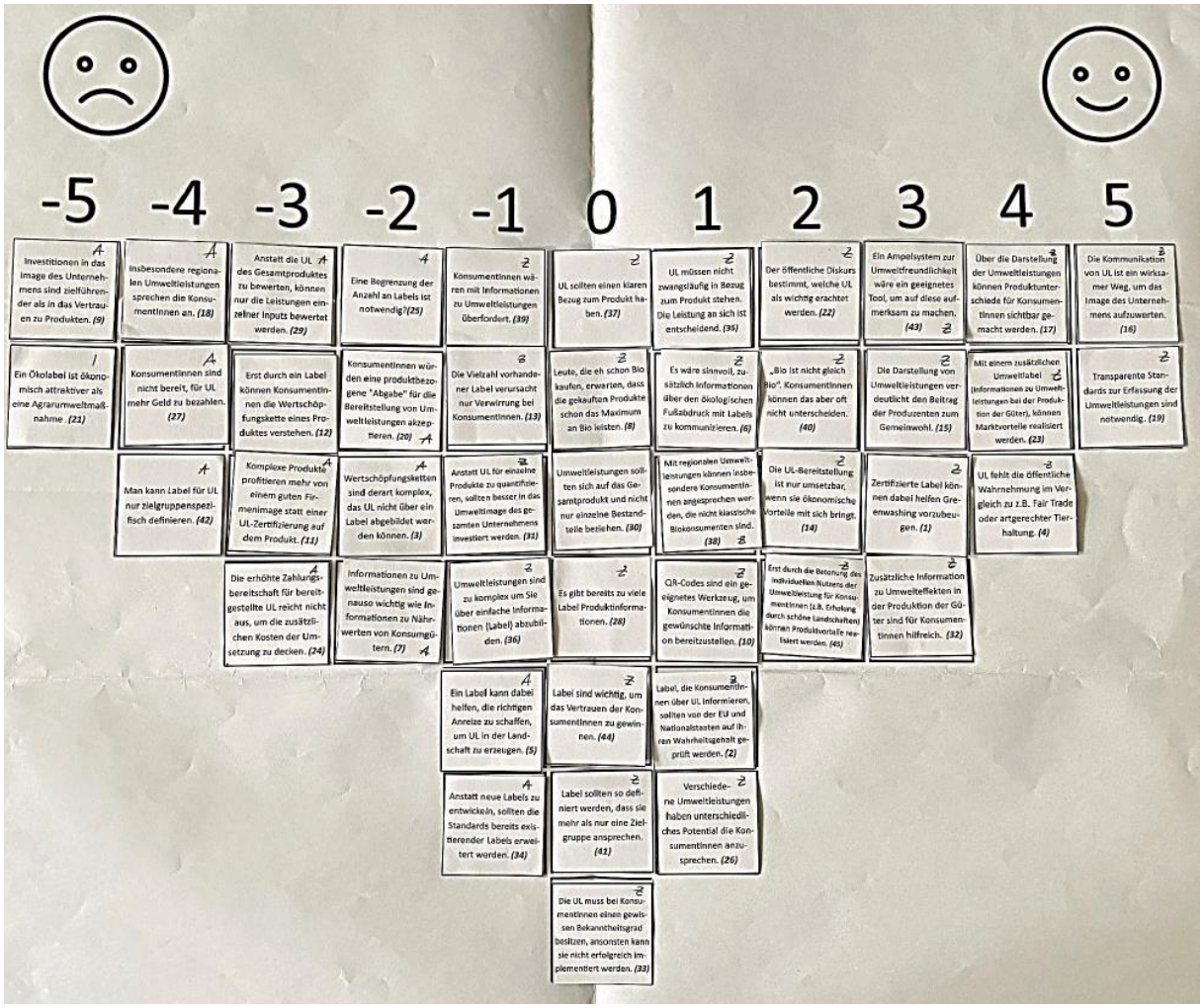


Figure 3. Q sort with allocated statements

In the next step, interviewees will progressively make more detailed value judgements until all statements have been placed in the distribution grid (see figure 3). This step begins with setting aside pile two and three. This is followed by spreading out the statements put in pile one allowing for a good overview. The distribution grid will be mentioned again, as it is the face-valid dimension from most disagree to most agree, and the interviewee then assigns pile one statements in the grid relative to each other beginning with those he/she agrees most with which will be put in the highest-ranking spots on the right-hand side of the grid. Subsequently, the interviewee is to assign pile three statements into the grid. Finally, pile two contains statements the interviewee disagrees most with to the lowest-ranking spots on the left-hand side of the grid. Alternatively, the participant could also continue with pile two statements after finishing the first pile and finally complete the pile three statements. The order in which the task is completed is the participant's own choice (Watts & Stenner, 2012).
This stage within the procedure also provides the opportunity to highlight the relativity of the ranking values. Allocating a statement to a field with a negative ranking does not mean disagreement, and the same applies to agreement and a positive ranking. The idea is to rank statements *relative* to each other (ibid).

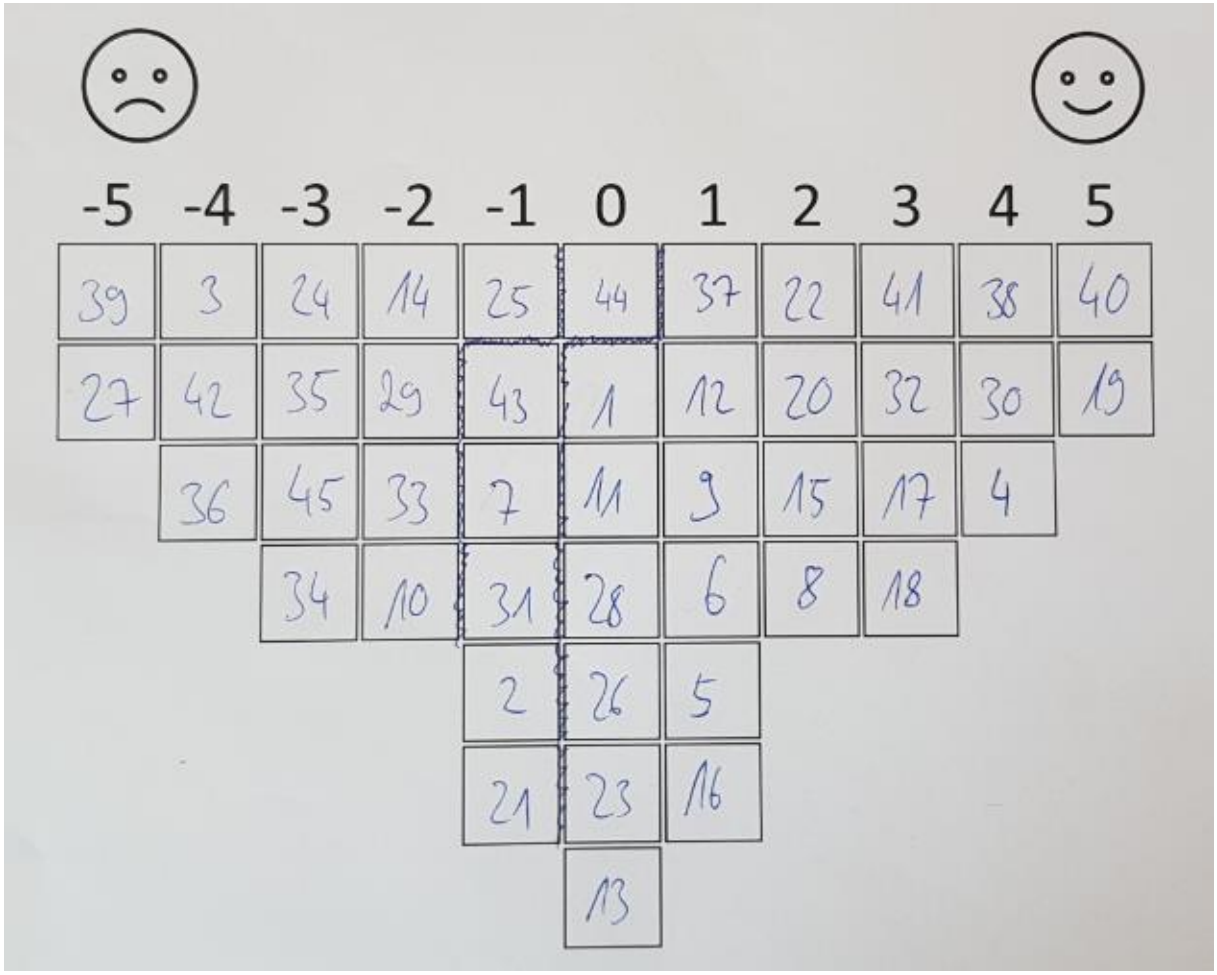


Figure 4. Finished Q sort

Figure 4 shows a completed Q sort. The bold lines reflect the three sorting piles initially build by the interviewee. Pile one statements are, therefore, on the right-hand side, pile three statements in the middle and pile two statements on the left side. Up to this point the interviewee can still make changes within the Q sort if desired. One might even encourage interviewees to rethink and change. Finally, the statement numbers should be written down into a blank distribution grid by either the researcher or the interviewee. This step is followed by an interview with the interviewee who can then use the opportunity to explain his/her allocation for the statements. This can reveal possible anomalies or issues an interviewee had with either certain statements, and how he/she interprets them or the allocation itself. It can also be useful as supporting data for the upcoming factor analysis.

3.3.2 Q set design and content

The development of the Q set began with a literature review of the available literature primarily on label-consumer relationships but also included studies investigating economic implications of ecosystem services. In accordance with best practice in Q, initial drafts of statement and ideas were developed early and then narrowed down (Watts & Stenner, 2012). Furthermore, the researcher participated in a workshop (on the 20th of February in Pfaffenhofen, Germany) on sustainable agricultural practices within supply chains. The workshop was embedded within the Contracts2.0 project and hosted by the German baby-food company Hipp. The workshop also included discussions of existing contracts of the company with farmers and a guided tour on a partner farm nearby the Hipp headquarters, providing additional contextual knowledge that

helped the study. Apart from resource suppliers and nature conservation advisors from Hipp, representatives from a German eco-brewery participated in the workshop. Both companies have a history in nature conservation engagement. In addition to their production activities, both companies are part of the "Association of Ecological Cultivation." Both companies also emphasized that the image of an enterprise is a crucial factor and can function as a label itself. It was further highlighted that the product itself determines the potential to communicate ecosystem services. An apple, for example, is a single component product and, therefore, it is relatively easy to promote production related ecosystem services in a way that is also easy to understand for the consumer. However, this becomes more complicated if a product consists of various components, as it makes it harder to communicate the information between product and ecosystem service. Therefore, another approach is to rely on a company's image and branding. If it is difficult to relate ecosystem services with certain products, a company's reputation can convince the conscious consumer if he/she has trust in the company and its practices.
During the literature review, workshop, and a subsequent expert interview with a German marketing professor, it became apparent that the communication of labels is crucial, and that a label can only be successfully implemented with good communication. This emphasizes different potentials, but at the same time, limitations of a label-based approach. On the one hand, product differences can be shown, but, on the other hand, this additional information can also overload consumers. This makes it inevitable for label standards to be transparent and easy to understand for the consumer. The expert interview particularly highlighted the threats of poor label communication and provided examples of failed attempts. However, it also showed good examples (for instance the online marketplace mentioned above) and emphasized tools such as QR codes that can be useful to improve the communication of labels.
Based on this deliberation process, the following broad categories were deemed important for the statements of the Q study:

1. Communication of labels
2. Relation to consumers
3. Image of the enterprise
4. Limits of labels
5. Ecosystem services and labels

Based on these categories, 45 statements were developed for the Q set (see results section for an overview of the statements in Table 5).

3.3.3 Interviewees

Ten interviews were conducted. Interviewees were selected out of three stakeholder groups (processors, retailers, and label organizations). A certain affinity for conservation of nature and past engagement in nature conservation projects were prerequisites. 13 possible interviewees were contacted (via telephone and email) of which ten were willing to participate in this study (response rate of 77%). A balanced gender ratio was another goal. Among the interviewees, there were five men and five women. Although there are certain rules of thumb on the optimal relationship between the number of statements and interviewees, one should keep in mind that Q methodology also has strong qualitative elements, and other criteria (such as saturation of knowledge) also apply to guide the number of interviews. *The numbering does not correspond with the latter numbering of interviewees used within the analysis (for reasons of anonymity).*

Respondent 1: Bohsener Mühle
The Bolsener Mühle is a German producer of flour and baking products. All their products are organic. The company has over 250 employees and had revenues of approximately € 42 million in 2017 (Wer zu Wem, 2020). It values a circular economy and is engaged in the protection of biodiversity and fostering soil fertility. Products from the Bohlsener Mühle are labeled with the Demeter and the EU organic label (Bohlsener Mühle, 2020).

Respondent 2: Bioland
Bioland is the leading organization for the certification of organic agriculture in Germany. Over 8,000 organic farmers are members in the Bioland organization. Approximately 1,100 producers, retailers, and restaurants collaborate with the organization. The organization has 260 employees. Bioland commits to seven principles: (1) circular economy, (2) fostering soil fertility, (3) animal welfare, (4) valuable foods, (5) fostering biodiversity, (6) protection of ecosystems, and (7) securing a livable future (Bioland, 2020).

Respondent 3: Taifun-Tofu
Taifun-Tofu is a German tofu producer. The company won Germany's sustainability award in 2020. Annual sales were € 38.4 million in 2019 (Thomas, 2020). About 270 employees work for Taifun-Tofu. The company values quality, ecologic responsibility, and fair social engagement. Their soybeans are exclusively sourced from Europe. In 2019, their self-developed soybean "Tofina" was registered, which is more resistant to the European climate. Taifun-Tofu is member of Demeter Germany (Taifun-Tofu, 2019).

Respondent 4: Edeka
The Edeka group is Germany's largest food retailer. It employs of over 381,000 people. There are approximately 3,700 independent (cooperatively organized) Edeka merchants in Germany. Annual sales were € 55.7 billion in 2019 (Edeka, 2020). Since 2009, Edeka has been collaborating with the World Wildlife Fund (WWF) for environmental protection, sustainability, and biodiversity within agriculture. With "EdekaBio", the company has its own organic brand. Around 400 products are labeled with the WWF logo. These products are also certified by independent organizations such as Bioland or the EU Organic Label (Edeka, 2020).

Respondent 5: Alnatura
Alnatura is a German retailer for organic products. In 2019, the company had annual sales of € 901 million. There are 136 stores in 62 cities, and the retailer has over 3,200 employees. It has its own organic "Alnatura" brand with approximately 1,400 products. Via its commercial partners (such as Edeka), Alnatura products are sold in approximately 12,700 stores in 16 countries. Additionally, many of Alnatura's products are labeled by other organizations for organic agriculture (such as Bioland and Demeter). The company has its own support program for farmers facilitating the transition from conventional to organic farming (Alnatura, 2020).

Respondent 6: Hipp
The Swiss-German company Hipp is Germany's largest producer for baby food products and one of the largest processors of organically produced food. The company has around 3,500 employees and annual sales of ca. € 950 million (2017). Their slogan is: "The best from nature. The best for nature". Hipp is engaged in climate change mitigation projects and owns, besides the premises close to Munich, other production sites in Austria, Hungary, and Croatia that are CO2-neutral. Hipp aims to be CO2-neutral across the whole value chain via compensation projects and enhanced packaging and logistics (Deutsche-Standards, 2020). Labeling plays an important role to the company with its own organic label: the "Hipp-Bio-Siegel" (Hipp, 2020).

Respondent 7: Biokreis
1,285 organic farmers are members of the Biokreis organization (Ökolandbau, 2020), of which about 200 producers and retailers are also members. Biokreis' values are biodiversity, environmental protection and animal welfare (Biokreis, 2020). The organization has its own "regional & fair" certification. Firms have to verify their commitment to local collaboration and fair bargaining and pricing with suppliers to receive the "regional & fair" label (Ökolandbau, 2020).

Respondent 8: Neumarkter Lammsbräu
Neumarkter Lammsbräu is the producer of Germany's first organic beer (Neumarkter Lammsbräu, 2017). It has more than 100 employees. The company had a turnover of € 28.9 million in 2019 (Lebensmittel Praxis, 2020). They are engaged in organic agriculture, water protection and biodiversity. Labels play an important role for this company, as Lammsbräu is cooperating with various label organizations such as Biokreis, Bioland, and the EU Organic Label organization (Neumarkter Lammsbräu, 2017).

Respondent 9: Lobetaler Bio
The Lobetaler Bio company is an organic dairy. Annual sales are ca. € 3.5 million (Bernau Live, 2019). Social dairy farming is the company's main principle. This results the integration of social and ecological responsibility within their business (Lobetaler Bio, 2020). They are engaged in various environmental conservation projects and particularly value biodiversity (Naturschutzbecher, 2020).

Respondent 10: Demeter
The Demeter organic brand is represented worldwide. It is the oldest organization for organic agriculture in Germany. It substantially values a sustainable circular economy. Approximately 1,600 German organic farmers are members of Demeter. About 330 producers and retailers collaborate with the organization. Globally, 5,300 organic farmers are members in over 60 countries (Ökolandbau, 2020). Demeter's principles are sustainable animal breeding, biodynamic agriculture, natural foods, and social cooperation (Demeter, 2020).

3.3.4 Procedure
Initially, it was planned to conduct the interviews face-to-face. Due to the difficult situation of the corona pandemic, this was not possible. It was decided to conduct the interviews via Zoom or Microsoft Teams depending on the interviewee's preference. The interviews were recorded after the interviewees gave their formal consent. The interviews lasted between one and two hours each. It was regarded as appropriate and helpful if the interviewee had a physical version of the statements and the grid to simplify the sorting process. This was regarded as the closest option to an in-person interview procedure. The materials were sent via regular mail to each interviewee (see figure 5 for a sample package and Appendix 3 for the interview instructions). The printouts were carefully designed. The physical material has the advantage that subjects have easy access to it. They can familiarize themselves with the study objectives, physically sign a consent form, and they do not need a computer with a certain software. Sending material physically can also serve as a "costly signal" (Spence, 1973). In other words, by investing some visible effort, the researcher shows to the interviewee that they value their research and take it seriously, which could make interviewees reciprocate, and take the research more seriously. The final Q sorts were sent to the researcher by email. More specifically, interviewees were asked to take a photo of the sorted grid.

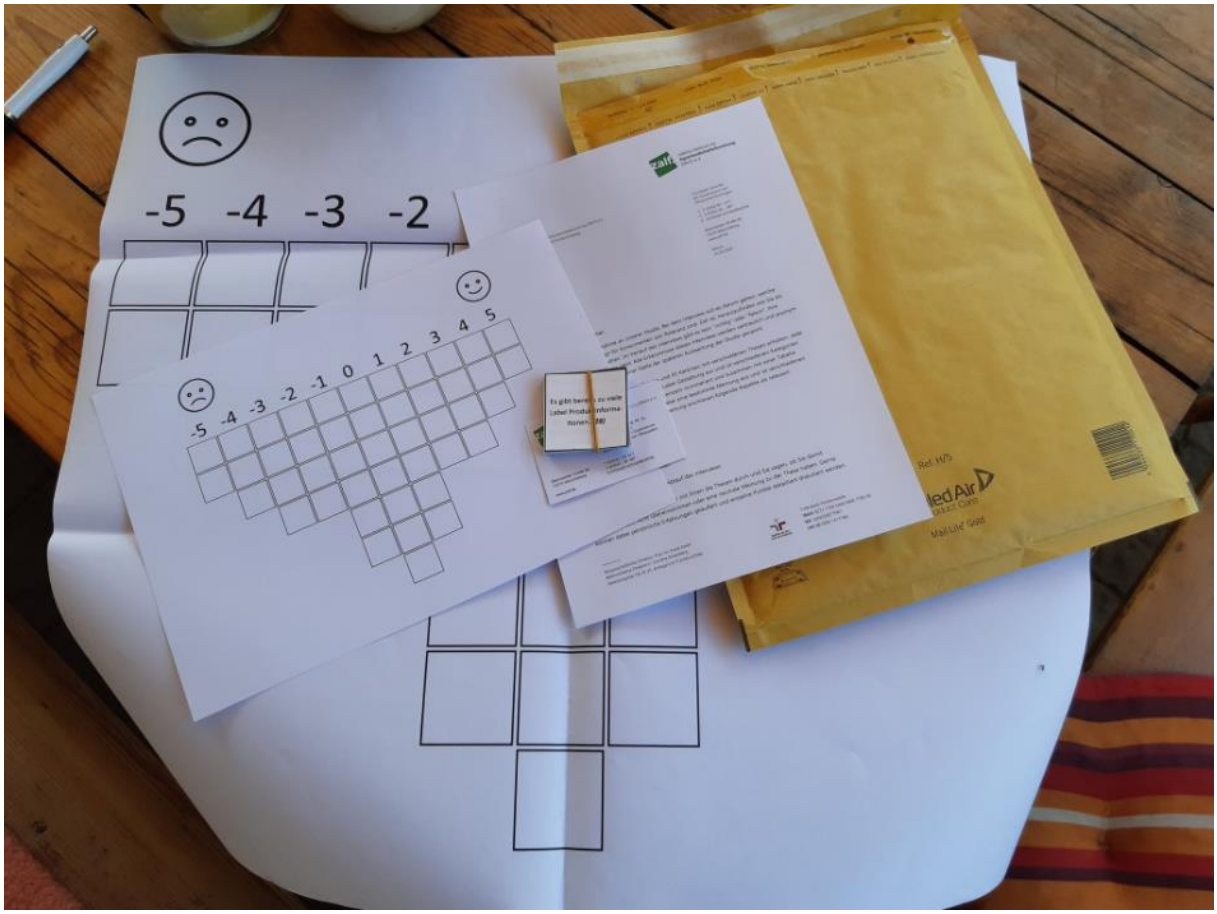


Figure 5. Q materials

3.3.5 Statistical analysis

The statistical analysis in a Q study comprises three methodological transitions. Transitioning from Q sorts to factors being the first (factor extraction), from factors to factor arrays being the second, and from factor arrays to factor interpretation being the third.

The transition from Q sorts to factors is done using correlation and factor analysis of the Q sorts. Ten Q sorts were intercorrelated and their factors were individually analyzed. This was done using the "qmethod" package in R (Zabala, 2020).

3.3.5.1 Factor extraction

The process of factor extraction starts with the question of how many factors shall be extracted (see the results section for demonstration). It is recommended to run the analysis in R with a higher number of extracted factors first and then progressively work towards lower numbers which are expected to result in factors that also have significant factor loadings. A factor loading is a score that signifies how much a Q sort loads on a factor, or in other words how similar Q sort and factor are. R will then calculate which Q sort is significantly loading on which factor and flag it. The software performs two statistical significance tests and only if a Q sort passes both tests, it will be flagged by R as statistically significant.

First, R will calculate a Q sort's minimum factor loading in order to be statistically significant at the 95% level. Subsequently, the software checks which Q sorts surpass the threshold. The following formula was used to calculate the significance level (Equation 1):

$$\textit{significance level} = 1.96 * \frac{1}{\sqrt{n}}\textit{, where n is the number of statements (1)}$$

The significance level in a study with 45 statements, therefore, is (Equation 2):

$$1.96 * \frac{1}{\sqrt{45}} = 0.29 \textit{ (2)}$$

This means that in order to load significantly on a factor, a Q sort must have a factor loading of 0.29 or higher. However, there is the possibility that a Q sort loads significantly on several factors and, therefore, could be regarded as confounded. It would be better to say that the Q sort has the potential to load significantly on several factors. This *potential* to load significantly is subsequently subject to the second significance test the software runs to determine whether a Q sort loads onto a single factor or is confounded because it does not significantly load onto a single factor (e.g. it loads on more than one factor).
The test makes a comparison between the squared factor loadings for each Q sort and aims to find out whether a Q sort that passes the first test loads onto a single factor having a large enough margin to be regarded as a factor exemplar. This is done by checking if any of the squared factor loadings is larger than the remaining squared factor loadings combined.
Mathematically, only the highest factor loading has the potential to meet the test criteria. It could be the case, however, that the largest factor loading is not large enough to surpass the sum of the remaining squared factor loadings. This would imply, that the Q sort does not load significantly onto a single factor and should be considered to be confounded. Thus, the software would not flag any of such a Q sort's factor loadings as statistically significant.
Finally, it can be decided whether the right number of factors has been extracted or if fewer (or more) are needed. The following tests are used to determine whether the analysis should be run again using a smaller number of extracted factors each time (Watts & Stenner, 2012).

(1) Eigenvalues

These are used as indicators for the statistical strength and explanatory power of a factor. A factor's Eigenvalue must be greater than 1 to be accepted. This is also known as the Kaiser-Gutmann criterion. A factor with an Eigenvalue smaller than 1 would imply that it accounts for less study variance than a single Q sort which again would mean that it captures less information compared to the data of a single participant.

(2) Percentage of explanatory variance

The combined variance of all extracted factors must exceed 35%. The goal is to have as much of the variance within the dataset explained as possible. The higher the factor loadings are the more variance is explained. Thus, in this context: the higher the better.

(3) Number of Q sorts flagged

A factor must represent at least two Q sorts.

(4) Scree plot

R can generate a scree plot which plots the Eigenvalues. The point where the slope becomes almost flat indicates how many factors should be extracted. This indicates that only little to no additional variation in the data is explained by the following factors. Therefore, it is likely that

these factors would not contribute much new to the study, in fact, they would probably be overlapping with regard to their information content compared with the remaining factors.

(5) Humphrey's rule

The cross-product of a factor's two highest factor loadings determines whether a factor is significant (the sign is ignored). It has to be greater than twice the standard error (Equations 3,4).

$$\textit{Standard error} = \frac{1}{\sqrt{n}}\textit{, where n = number of statements (3)}$$

$$\textit{Humphrey's rule threshold} = \frac{2}{\sqrt{n}}\textit{, where n = number of statements (4)}$$

The Humphrey's rule threshold in a study with 45 statements, therefore, is (Equation 5):

$$\frac{2}{\sqrt{45}} = 0.30 \textit{ (5)}$$

In conclusion, according to Stenner et al. (2003), Q sorts which load significantly on the same factor have similar sorting patterns and, therefore, the assumption can be made that the respective number of exemplars of one factor share a specific understanding considering the topic.

3.3.5.2 From factors to factor arrays

Regarding a factor as a shared viewpoint explains the process of merging all exemplars of one factor together to model an ideal-typical Q sort for every factor. This is called a "factor array", which is calculated using weighted averages. This means Q sorts with a higher factor loading for a certain factor are given more weight in this procedure because they represent the factor to a greater extent.

Table 1. Factor array for factor 1

Factor 1

-5	**-4**	**-3**	**-2**	**-1**	**0**	**1**	**2**	**3**	**4**	**5**
39	9	3	12	7	5	1	6	4	15	19
42	27	20	21	10	8	2	28	13	17	32
	31	36	24	11	22	23	30	16	34	
		43	29	14	35	25	44	26		
				18	37	33				
				45	38	40				
					41					

Table 1 shows a factor array for factor 1. It looks the same as a normal finished Q sort since it is the merged average.

3.3.5.3 From factor arrays to factor interpretation

With the second transition being completed, subsequently, the last transition follows, from factor arrays to factor interpretations. Factor interpretation "takes the form of a careful and holistic inspection of the patterning of items in the factor array" (Stenner et al., 2003, p. 2165). The factor arrays serve as the basis for the different factor interpretations which serve the purpose to fully understand and explain the viewpoints the different factors are capturing and the significantly loading interviewees are sharing. The interviewees' comments have also been utilized to support the procedure (Watts & Stenner, 2012).

3.4 Quality criteria

One advantage of Q methodology is that there is no need for a large number of study participants (Watts & Stenner, 2012). A possible limitation to that, however, might be that the selection of the study participants influences the outcome of such a study to a greater extent. Different companies and people have different interests and, therefore, the results or the emerging viewpoints are contextual. Thus, replicating this study with different participants would provide important knowledge on how consistent, representative, generalizable, and sensitive the results obtained in this study are.

3.5 Ethical considerations

It is important to consider possible ethical challenges which can occur during a study. This study adheres to several important ethical principles. It is based on informed consent (see Appendix 1 for the consent form), that is, interviewees know about the research in advance and voluntarily decide whether or not they want to be a part of the study. Informed consent also makes explicit how the data will be used. Furthermore, the interviewees' integrity and anonymity are protected (Kvale & Brinkmann, 2009). Each interviewee signed a letter of consent to guarantee the interviewees' integrity and to protect personal data, which is in line with the European Union's General Data Protection Regulation. There are very few personal data being collected, and no sensitive issues such as religious beliefs or political attitudes are discussed. The developed statements use inclusive language and were carefully reviewed for potential emotional harm. Physical contact was avoided to minimize harms for researchers and interviewees, as the data collection took place during the COVID-19 pandemic.

4 Results and analysis

4.1 Quantitative Results

Three factors have been extracted since the following quantitative criteria have been met.

- Significant factor loadings: each Q sort exceeded the threshold value for the factor it loaded on
- Confounded Q sorts: each Q sort loaded significantly onto only one single factor (e.g. none of them are considered confounded)

Table 2. First and second significance test demonstration with Q sort 6

Factor	A Factor Loading	B Squared Loading	C Sum of other squared loadings	Criteria met (B>C)
1	0.5260	0.3158	0.3643 + 0.0247 = 0.3890	NO
2	0.6036	0.3643	0.3158 + 0.0247 = 0.3405	YES
3	0.1570	0.0247	0.3158 + 0.3643 = 0.6801	NO

The software performs the following operations:

(1) The software checks which factor loadings (column A) exceed the threshold value.
(2) The factor loadings are squared (column B) and become in the case for Q sort 6: 0.3158, 0.3643 and 0.0247.
(3) Each squared factor loading is compared to the remaining squared factor loadings combined.

The demonstration with Q sort 6 shows that it has potential to load significantly on several factors (see table 2; two factor loadings exceed the threshold value of 0.29), however, Q sort 6 meets the criteria for the second test only for factor 2. Therefore, it does not meet the criteria for factors 1 and 3 for the second test and, consequentially, Q sort 6's factor loading on factor 2 (which only passes both tests) is statistically significant and Q sort 6 is not regarded as confounded. This Q sort can, therefore, be regarded as an exemplar for factor 2.

Table 3. General factor characteristics

General factor characteristics			
	# Q sorts	Eigenvalues	Explained variance
Factor 1	5	2.51	25.07
Factor 2	3	1.89	18.88
Factor 3	2	1.56	15.57
Total variance explained: 59.52%			

- Eigenvalues (Kaiser-Guttman criterion): all Eigenvalues were larger than one.
- Percentage of explanatory variance: all factors together explain 60%, thus exceeding the threshold value (35%)

- Number of Q sorts flagged: each factor represents two or more Q sorts
- Scree plot: After factor 3, the slope becomes almost flat which indicates to extract three factors

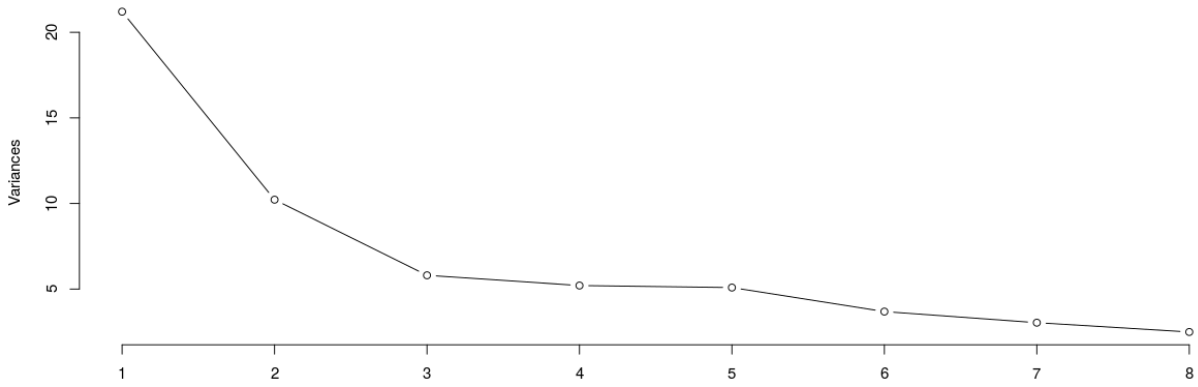


Figure 6. Factor scree plot

- Humphrey's rule was met (demonstration for factor 1): the largest factor loadings for factor 1 were 0.72 and 0.67 (see table 4). Their cross-product equals 0.48 which is greater than 0.30. This means the factor is valid and, therefore, that it represents an opinion set on the contrary to one that is a product of the dataset.

Table 4. Viewpoints with corresponding representatives and factor loadings

Defining Viewpoint Representatives with backgrounds		**Factor 1**	**Factor 2**	**Factor 3**
Viewpoint 1: Grass-roots Labelists				
Interviewee 2	Producer	0.6720	0.2358	-0.0325
Interviewee 3	Label-Organization	0.6705	0.1702	0.0317
Interviewee 5	Label-Organization	0.6721	0.2037	0.0576
Interviewee 7	Producer	0.7188	-0.0911	0.1688
Interviewee 10	Retailer	0.4812	0.1480	0.3157
Viewpoint 2: Local Believers				
Interviewee 1	Producer	0.0859	0.8239	-0.2015
Interviewee 4	Label-Organization	0.2527	0.7094	0.2108
Interviewee 6	Producer	0.5260	0.6036	0.1570
Viewpoint 3: Skeptics				
Interviewee 8	Retailer	0.2409	-0.3550	0.7132
Interviewee 9	Producer	-0.0036	0.2444	0.8971

All ten Q sorts loaded significantly onto a single factor (e.g. the Q sorts can be regarded as exemplars for their factor). All factors represent a unique social viewpoint on the discourse. Each viewpoint is represented by an idealized Q sort (e.g. factor array) which was derived from the z-scores R produced. Z-scores are an especially important tool in Q methodology since they allow comparisons between the factors (which can consist of different numbers of significantly loading Q sorts) as they are normalized or standardized factor scores (Watts & Stenner, 2012).

Whether or not a statement is significantly distinguished by a factor depends on the standard error of the difference of the respective z-score of that statement. This measure indicates if two factors evaluated a certain statement differently, by looking at the dispersion of the z-scores for each factor (see Appendix 2 for the z-score dispersion graph).

4.2 Qualitative Results

Three factors were extracted, and each interviewee was assigned to one specific factor depending on their Q sorts. The qualitative data collected throughout the interviews was used for the characterization of the three factors. They were named and interpreted as follows (also see deliberations below): 1) Grass-roots labelists, 2) local believers and 3) skeptics. Interestingly, all factors consist of different stakeholder groups (see table 4). *The statement number and the respective statement score are written in parenthesis*.

Table 5. Statements with respective scores for each factor

	Statement	**Factors**		
		1	2	3
1	Certified labels can help to prevent greenwashing	1	1	3
2	The EU and individual countries should verify labels	1	-1	0
3	Value chains are complex to such an extent that ecosystem services cannot be displayed using a label	-3	-3	3
4	Ecosystem services do not benefit from the same public perception as e.g. Fair Trade or animal welfare	3	-2	5
5	A label could help to create incentives to produce ecosystem services in agriculture	0	-1	-1
6	It would be useful to provide information on the ecological footprint of products, using labels	2	0	0
7	Information on ecosystem services is as important as nutritional values of consumables	-1	2	0
8	Consumers who buy organic products expect that these products attain the highest possible standards of organic production	0	0	3
9	Investments in a company's image are more effective than investments in consumers' trust in a product	-4	3	3
10	QR-Codes are a suitable tool to provide consumers with the desired information	-1	1	-4
11	Complex products benefit more from a company's positive image than an ecosystem service certification	-1	1	2
12	Consumers only can understand a product's value chain with a label	-2	-1	-5
13	The multiplicity of labels only confuses consumers	3	0	4
14	Ecosystem service provisions are only viable when they entail economic benefits	-1	4	-2
15	The presentation of ecosystem services illustrates its contribution to common welfare	4	-2	-1
16	The communication of ecosystem services is an effective way to improve a company's image	3	3	-1
17	The presentation of ecosystem services can highlight differences between products to consumers	4	4	1
18	Local ecosystem services particularly appeal to consumers	-1	5	1

19	Transparent norms are essential for the quantification of ecosystem services	5	3	0
20	Consumers would be willing to pay a product-related "fee" for the provision of ecosystem services	-3	1	-1
21	Organic labels are more attractive than agri-environmental schemes	-2	-4	-1
22	The public discourse dictates which ecosystem services are perceived as important	0	2	0
23	An additional ecosystem label could be used to realize market advantages	1	-1	0
24	An increased willingness-to-pay for ecosystem services is not enough to cover the additional costs of implementing the services	-2	-3	-3
25	A limitation in the number of labels is necessary	1	-4	2
26	Different ecosystem services have different potentials to appeal to consumers	3	1	0
27	Consumers are not willing to pay more for ecosystem services	-4	-5	-2
28	There is already to much labelled product information	2	0	1
29	Rather than focusing on ecosystem services of a whole product assessments should focus on the services of each component individually	-2	-3	-4
30	Ecosystem services should relate to the whole product and not on single components	2	2	2
31	Rather than quantifying the ecosystem services of single products, companies should focus on investments which benefit their image	-4	-1	-1
32	Additional information on ecological consequences regarding production processes is useful for consumers	5	3	-3
33	Consumer awareness must be beyond a certain threshold for ecosystem services to be successfully implemented	1	0	1
34	The norms of existing labels should be extended rather than creating new labels	4	-2	4
35	Ecosystem services do not necessarily have to be linked to the product. The service itself counts	0	0	-5
36	Information regarding ecosystem services is too complex to be reduced to a label	-3	-3	3
37	Ecosystem services should have a clear reference to the product	0	-1	1
38	Local ecosystem services especially have potential to reach out to the average consumer	0	4	-2
39	Consumers would be unable to cope with information on ecosystem services	-5	-5	2
40	Information on organic products provided by labels is not consistent, but consumers cannot tell the difference	1	5	4
41	Ecosystem service labels should target more than only one consumer group	0	2	1
42	Ecosystem service labels can only target specific groups	-5	-4	-3
43	A traffic light system for environmental friendliness would be a suitable tool to draw attention to it	-3	0	-3
44	Labels are important to create consumers' trust	2	1	-4
45	Product advantages can only be realized through emphasizing individual benefits of ecosystem services for consumers (e.g. beautiful landscapes for recreation)	-1	-2	-2

4.2.1 Viewpoint 1: Grass-roots labelists

This viewpoint explains 25% of the variance. It represents the largest stakeholder group (Interviewees 2, 3, 5, 7 and 10 loaded on viewpoint 1). Interviewees from all different stakeholder groups loaded onto this viewpoint.

Interviewees who loaded on viewpoint 1 regard transparent norms for the quantification of ecosystem services as essential (S19/+5). Interviewee 2 stated that *"norms have to hold for everybody and be understood by everybody, too."* According to interviewee 3, *"there are too many worthless labels with a lack of transparency which, again, reduces the overall consumer trust in labels."*

Representatives of this viewpoint do think that consumers would appreciate additional information regarding a product's environmental impacts (S32/+5) and are of the opinion that consumers are also able to understand and process this information (S39/-5). Consumers are regarded as responsible and representatives of this viewpoint share the belief that consumers are willing to pay more for products providing ecosystem services (S27/-4). They acknowledge that it can be difficult for consumers to distinguish between different organic labels (S40/+1), however, representatives of this viewpoint regard consumers as most capable of dealing with that issue.

Furthermore, grass-roots labelists think that the presentation of ecosystem services (through labels) can be used as a means to show the contribution of the producers providing ecosystem services to common welfare (S15/+4). Possible product differences (especially within the production/resource sourcing process) can also be shown to the consumer (S17/+4). Interviewee 2, for example, believes that these differences can influence the consumers' decision at the point of sale and nudge him/her towards the more environmentally friendly choice.

They also believe that existing labels should be extended rather than to create new ones (S34/+4). This was especially emphasized by the two representatives of the label organizations within factor 1 since *"many labels are too basic and, therefore, an extension of such labels would make sense (Interviewee 3)."* Also, they view it as their *"task to communicate the development process of a label to the consumers (Interviewee 3)."* However, both acknowledged that this is a challenge that might be harder than introducing a new label. This was complemented by the two representatives of the processors within this viewpoint who similarly stated that a new label could have the larger effect on consumers as wells as that new labels are even needed within certain contexts like ecosystem services because eco-labeling is very limiting.

Representatives of this viewpoint believe that a company's image is the result of consumers' trust in their products and not the other way around (S9/-4, S31/-4). Furthermore, they believe that labels should be understandable for everyone (S42/-5, S41/0) as target group specific labels would also *"imply a higher number of labels in total (Interviewee 10)."*

4.2.2 Viewpoint 2: Local believers

This viewpoint explains 19% of the variance. It represents three interviewees of which two are food processors and one a label organization representative (Interviewees 1, 4 and 6 loaded on viewpoint 2).

Interviewees who loaded on viewpoint 2 especially appreciate locally produced ecosystem services (S18/+5). They belief 'local' has the biggest opportunity to promote ecosystem services compared to the other viewpoints. According to interviewee 6, the term *"local has an even bigger impact on consumers than organic."* Interviewee 1 highlighted the potential of the combination of both. Local believers specifically believe that coining ecosystem services as 'local' has a great potential to convince non-organic shoppers of the more sustainable choice since it appeals to their local connection (S38/+4).

Representatives of this viewpoint point out that labels have to be more distinguishable as the consumers of today struggle in doing so (S40/+5). However, they also regard the consumer as responsible and capable of dealing with additional information on ecosystem services (S39/-5). The problem is more connected to labels and their setup. Interviewee 6 stated that if there was a quality differentiation between different organic labels (including true costs), *"the consumers would be enabled to make more specific purchasing decisions."* According to this viewpoint, consumers are willing to pay more for ecosystem services (S27/-5). Interviewee 4 said that *"the environmental consciousness among the people is growing"* and, therefore, their priorities in food purchasing decisions are also changing. Interviewee 6 emphasized in that regard that *"it is essential to clearly communicate any additional benefit."* They believe that, if this can be achieved, these differences at product level can influence consumers' purchasing decisions (S17/+4).

Representatives of this viewpoint also emphasize economic implications connected to the provision of ecosystem services (S14/+4). Economic sustainability is especially important to local believers since, otherwise, the long-term pursuit of ecosystem service provision is not feasible. Interviewee 4 stated that *"farmers or food processors are only willing to provide ecosystem services if they gain some economic/financial advantage."* Interviewee 6 referred to a market economy's traits but also emphasized that *"there is a value system behind it which shifts the focus from short-term to a more sustainable long-term orientation."*

Local believers think that labels have to be understandable for a majority of people (S42/-4). According to this viewpoint, a limitation in the number of labels is not necessary (S25/-4), and new labels can be more efficient than the extension of existing labels (S34/-2). Interviewee 6 pointed out that *"it is more important to avoid consumer deception in that regard."*

The public discourse is, according to local believers, an important indicator influencing which ecosystem services are trending, and also have impact on the provision (e.g. which services are chosen to be provided) (S22/+2). Local believers regard traffic light systems as tools to highlight environmental friendliness as being more applicable as the two remaining viewpoints since they are easily understandable, however, they are aware that the process of reducing these in a manner which is both interpretable and informative is a challenge (S43/0).

4.2.3 Viewpoint 3: Skeptics

This viewpoint explains 16% of the variance. It represents two interviewees, of which one is a label organization representative and the other a food processor (Interviewee 8 and 9 loaded on viewpoint 3).

Skeptics believe that ecosystem services are not well-represented in the media and, therefore, other topics like animal welfare or Fair Trade are considered as more important by consumers (S4/+5). According to interviewee 9, *"ecosystem services are unimportant as of today."* Skeptics believe the least of all that the communication of ecosystem services is a means to improve a company's image compared to other viewpoints (S16/-1). Similarly, they believe that ecosystem services displayed on products have the least potential to influence a consumer's decision at the point of sale (S17/+1) and that additional information on ecosystem services would not be useful to consumers (S32/-3).

Furthermore, they are of the opinion that labels are already difficult to understand and differentiate, and that the multitude of existing labels causes confusion among consumers (S13/+4, S40/+4). Interviewees in this viewpoint believe that consumers cannot process information on ecosystem services to a greater extent than interviewees in the other viewpoints (S39/+2).

Interviewee 9 said that *"this is resulting in a lower trust in labels in general"*, which also limits the potential to promote ecosystem services using labels. According to this viewpoint, ecosystem services are too complex to be narrowed down efficiently in a way that is

understandable to consumers (S36/+3). Skeptics are more concerned with this issue than the other viewpoints.
Skeptics believe that the focus should be put on well-established labels, and also that these labels should rather be extended to comprise ecosystem services (S34/+4). They believe that these well-established labels have the capacity to avoid greenwashing, which they see as a risk of newly created labels (S1/+4).
In general, label skeptics believe that labels do not help consumers at all in understanding the value chain behind a product (S12/-5). They believe that using QR-Codes as a tool to provide information to consumers is not a suitable option (S10/-4), even though they like the idea, however, both interviewees emphasize that QR codes are a tool which is simply not used by consumers.
The complexity of value chains would hinder labels to efficiently display ecosystem services to make them understandable to consumers (S3/+3). Skeptics are most pessimistic in this regard compared to the other two viewpoints. They also regard labels as less important to gain consumer trust (S44/-4). Interviewee 9 emphasized *"transparency is crucial to gain trust,"* and, *"that this is also possible without having a label."*
It is essential to skeptics that ecosystem services and products belong together (S35/-5). Interviewee 8 highlighted that *"this would make it easier for consumers to understand,"* and, according to interviewee 9, *"anything else would be greenwashing."* The connection between a product and an ecosystem service is more important to this viewpoint compared to the remaining two viewpoints.
Thus, it is important to this viewpoint that during the assessment of ecosystem services the product as a whole should be focused on and not only single components although this might be difficult to put into effect (S29/-4).

4.3 Points of consensus

The quantitative analysis revealed seven points of consensus.
All viewpoints believe that an increased willingness-to-pay for ecosystem services would be high enough to cover the additional costs of implementing the services (S24). Furthermore, it is regarded as beneficial if the consumer awareness is beyond a certain threshold for ecosystem services to be successfully implemented (S33). All viewpoints agree that ecosystem services should make a clear reference to products (S37). This reference, additionally, should be related to the whole product and not to single components (S30). According to all viewpoints, labels should also target different consumer groups. Furthermore, consumers are considered to appreciate the altruistic benefits of ecosystem services more than individual benefits. Thus, the altruistic character of ecosystem services is regarded as a convincing product trait (S45). Lastly, all viewpoints think that a label has the potential to incentivize an increased production of ecosystem services within agriculture (S5).

4.4 Points of polarization

The quantitative analysis revealed that there are only 4 statements with a pure polarization (e.g. where each viewpoint has a different opinion).
Skeptics believe that ecosystem services lack the public perception in comparison to Fair Trade or animal welfare (S4/+5). The assignment of a +5 implies that this is a large obstacle which has to be overcome to promote ecosystem services efficiently, according to this viewpoint. Grass-roots labelists think that public perception of ecosystem services is lower (S4/+3), the difference is just not as significant. Interviewee 7 stated, for instance, that *"the trend is developing in favor of ecosystem services."* Interviewee 10 added that *"this issue can be overcome with appropriate marketing campaigns."* Local believers, however, do not consider this issue to be as big a problem as the others do (S4/-2). Interviewee 4 responded that *"the*

public interest is increasing" and interviewee 6 said that *"consumers do have an environmental consciousness"* which is covering ecosystem services.
Statement 13 (the multiplicity of labels only confuses consumers) is showing the same pattern as statement 4. Skeptics agree most (S13/+4), grass-roots labelists agree less (S13/+3), and local believers are rather neutral (S13/0). Interviewee 10 (grass-roots labelists) replied that *"there is already a label flood many consumers cannot cope with."* Interviewee 6 (local believers) agreed that *"the orientation is difficult,"* interviewee 1 (local believers) added, however, that *"it does not work without labels, too."*
Local believers think, as the name suggests, that especially local ecosystem services appeal to consumers (S18/+5 see viewpoint description above). Skeptics believe that 'local' has a certain (positive) influence (S18/+1). 'Local', or rather its effect is dependent on the organizational structure of a company. Interviewee 9 (food producer) stated that they *"are anchored locally"* themselves and, therefore, 'local' plays an important role, specifically for them and their clientele, but not necessarily for others. Interviewee 8 said, environmentally speaking, that *"local has its influence but in the end, it does not matter where an ecosystem service is produced."* Grass-roots labelists acknowledge the potential of 'local' but only to a certain extent (S18/-1). Interviewee 3 stated that it is also appealing to consumers *"when something is getting done in the rainforest."* Interviewee 3 also expressed concern that *"local is not questioned enough"* and that *"people are not critical enough and it can be difficult to find out which processes (e.g. animal feed) within a value chain are really local."*
As shown previously, grass-roots labelists especially appreciate transparent norms for the quantification of ecosystem services (S19/+5). Local believers think that transparency is important (S19/+3) but also highlight the difficulty of creating transparency. Interviewee 1 pointed out that *"it is very difficult to assess"*, whereas interviewee 6 stated that *"there is the danger that many layers are not captured"*. Skeptics, however, are rather neutral (S19/0). According to interviewee 9, *"ecosystem services are too diverse to standardize, therefore one should attempt to include ecosystem services within existing norms."*

A large amount of statements was semi-polarizing (e.g. two viewpoints sided togehter, whereas the remaining had a different opinion). Grass-roots labelists and local believers sided together for five Statements (S3, S16, S17, S39, S44). Local believers and skeptics sided togehter for five statements (S9, S15, S31, S40, S42). Grass-roots labelists and skeptics share views for four statements (S22, S25, S34, S43). *The respective statement number and the statement score of the first mentioned viewpoint followed by the second mentioned viewpoint are written in parenthesis.*
Grass-roots labelists and local believers share similar opinions regarding statements that cover the applicability of labels to promote ecosystem services (S3/-3/-3, S39/-5/-5). Both believe that it would not be too complex to display ecosystem services, as well as that consumers would very well be able to cope with additional information on those services. Furthermore, both think that that the presentation of ecosystem services is a means to show product differences to consumers (S17/+4/+4). Grass-roots labelists and local believers also think that the communication of ecosystem services is a way to improve a company's image (S16/+3/+3) and that a label is, to some extent, an important tool to gain consumer trust (S44/+2/+1).

Local believers and skeptics share similar opinions regarding the consumers' ability to tell the difference between different eco-labels (S40/5/4). According to them, it can be very difficult for consumers to differentiate eco-labels. Both think that labels should be designed to reach out to different consumer groups as both disagree with statement 42 (ecosystem service labels can only target specific consumer groups/-4/-3). One could make the argument for statement 42 that there is some sort of broad consensus since all viewpoints disagree (viewpoint 1 assigned S42 a -5), however, viewpoint 1 disagrees even more (significantly larger z-score than the remaining

viewpoints). Furthermore, local believers and skeptics sided together, as they do not think that the display of ecosystem services is illustrating the producers' contribution to common welfare (S15/-2/-1). Both viewpoints believe that investments in a company's image are more effective than investments to gain trust (S9/+3/+3). However, at the same time, both slightly disagreed with statement 31, implying that it could make sense to quantify ecosystem services for single products rather than investing in a company's environmental image (S31/-1/-1).

Grass-roots labelists and skeptics share similar views regarding the influence of the public discourse on which ecosystem services are perceived as important as both of them are rather neutral toward this statement (S22/0/0). Both strongly emphasize the norm extension of existing labels (as shown in the respective viewpoint descriptions) rather than creating new labels (S34/+4/+4). In line with this, both agree, at least to some extent, that a limitation in the number of labels is necessary (S25/1/2). Regarding a traffic light system for a product's environmental friendliness, both viewpoints do not regard them as a suitable tool (S43/-3/-3).

5 Discussion

The purpose of this study was to uncover distinct viewpoints on various aspects of food product labeling from the perspective of food processors, retailers, and label organizations. The findings shall then be linked to a label-based approach to promote ecosystem services. The application of Q methodology uncovered three distinct viewpoints amongst the three stakeholder groups. The selection process of the interviewees was based on their affinity towards conservation of nature and past engagement in nature conservation projects. In line with their viewpoints, groups of interviewees were interpreted as grass-roots labelists, local believers, and skeptics. Belonging to a certain stakeholder group did coincide with a viewpoint, as each viewpoint represents at least two different stakeholder groups. This can be viewed as a success of Q methodology to reveal and access subjective viewpoints.

The first viewpoint (grass-roots labelists) regards transparent norms for the quantification of ecosystem services as essential to gaining consumers' trust. As van Amstel et al. (2006) and Knoefel et al. (2018) pointed out, it is crucial for a label to generate trust which can be achieved via good communication and high transparency. This viewpoint stresses that consumers would appreciate additional information on ecosystem services, and that consumers can understand and process the presented information. An eco-label is regarded as a means to bridge the information gap between consumers and producers which is in accordance with Goossens et al. (2016). Furthermore, this viewpoint regards consumers as responsible and willing to pay more for products providing ecosystem services. This matches the consumer related results of Bougherara and Combris (2009). Viewpoint 1 acknowledges, however, that it can be difficult for consumers to distinguish between different organic labels which makes a certain amount of educational work necessary. The multitude of existing labels is also problematic. According to viewpoint 1, the presentation of ecosystem services can be used as a means to show the contribution of the producers providing ecosystem services to common welfare. Product differences can also be shown to consumers.

The second viewpoint (local believers) especially appreciates locally produced ecosystem services. Labeling ecosystem services as 'local' has great potential to convince non-organic shoppers, according to this viewpoint. Labels have to be more distinguishable as the consumers of today struggle in doing so which is connected to the results of a study of Janssen and Hamm (2014). However, consumers are regarded as responsible and willing to pay more for ecosystem services. Economic sustainability is particularly important to this viewpoint since, otherwise, a long-term pursuit of ecosystem service provision is not feasible. New labels can be more efficient than the extension of existing labels which also displays a major difference compared to the other two viewpoints. This viewpoint stresses that the public discourse is an important indicator influencing which ecosystem services are trending.

In contrast, the third viewpoint (skeptics) emphasizes that ecosystem services are not well-represented in the media and, therefore, that ecosystem services only have a low potential to influence a consumer's decision at the point of sale. Additional information on ecosystem services would not be useful to consumers as labels are already difficult to understand and to differentiate and the multitude of existing labels causes confusion among consumers. Labels should be further extended to comprise ecosystem services. It is essential to this viewpoint that ecosystem service and product belong together. Viewpoint 3 regards consumers as unlikely to be able to cope with any information on ecosystem services because ecosystem services are too complex to be narrowed down. Labels do not help consumers in understanding value chains and are not essential to gain consumer trust.

There are clear similarities between the different viewpoints. Areas of consensus provide a starting-point for establishing label-based approaches to promote the provision of ecosystem

services. It was clear from all three viewpoints that product and ecosystem service should be directly linked. All viewpoints found this suitable in order to make it more understandable to consumers, and the discussion also revealed that this may reduce greenwashing. A certain consumer awareness of various ecosystem services was found suitable by all viewpoints. However, consumer awareness was not an essential criterion in any of the viewpoints. Furthermore, all viewpoints agreed that an increased willingness-to-pay for ecosystem services would be high enough to cover additional costs to implement the services. Interestingly, across all viewpoints, altruistic motivations of consumers to support ecosystem services by purchasing pricier products were found to be sufficient. This would also mean that altruistic motivations (promoting public goods) are more important than private benefits to consumers regarding ecosystem services which is also in line with the findings of Bougherara and Combris (2009).

There are distinct differences and points of polarization between the viewpoints on how to approach a label-based solution for more ecosystem services. The data showed that there are few points of pure polarization. However, several viewpoints were semi-polarizing, e.g. two viewpoints were shared while the remaining viewpoint had a different opinion. It was an even distribution as grass-roots labelists and local believers, as well as local believers and skeptics, sided together for five statements, and grass-roots labelists and skeptics sided together for four statements. Hence, this study shows that different people, represented by three different viewpoints, regard a label-based approach for ecosystem services in different ways. The notions of the usage of a label-based approach are positive (viewpoints 1 and 2, different approaches however) and negative (viewpoint 3). The role of the consumer, or how the consumer is viewed by the three different viewpoints is crucial regarding the promotion of ecosystem services. Viewpoints 1 and 2 consider issues the most important that, at least to some extent, inform consumers and simplify consumers' choices for more ecosystem services. Already, both viewpoints regard the presentation of ecosystem services as a product trait that has the potential to convince the consumer at the point of sale. One could say they are one step ahead compared to viewpoint 3 which is most concerned with the consumers' actual ability and willingness to engage with ecosystem services or environmentally friendly products more generally which, according to Thøgersen et al. (2009), also determines a label's success. Thus, the public discourse is perceived as crucial, since, according to viewpoint 3, ecosystem services have to be somewhat present in public consciousness to actively influence purchasing decisions. Only if something is 'trending' it can make a difference and influence purchasing behavior.

The role of 'local', or the concept's extension to local ecosystem services was especially highlighted by viewpoint 2. Accordingly, two of the viewpoint's representatives are food producers acting on a more local level compared to other interviewees. The whole viewpoint regards 'local' as very important as it is a means to show the connection between producer, consumer, products, and surroundings. It serves as an additional starting point for marketing products and the interviewees reported their personal success stories with referring to their products as 'local.' This approach could also be applicable for promoting ecosystem services with labels. There might be a high potential for locally produced ecosystem services especially appealing to the consumers' sense of regional connectedness. Some products may be more prone to the complexity inherent in communicating local ecosystem services. For instance, it could be easier to present a longer story of pollination services on the back of a cereal package that might be placed on a breakfast table. In contrast, a small product with many ingredients, some of which could be non-local (e.g. a protein bar), would probably rely on consumers' willingness to engage with the product via a QR code.

Viewpoint 1 and 3, as opposed to viewpoint 2, regard the extension of existing labels for the quantification of ecosystem services as better than the creation of new labels. If possible, it should be avoided to create new labels to avoid the 'label-flood' as interviewee 10 termed it. In addition, the extension of existing labels could build on accumulated consumer trust and knowledge of that label. Viewpoint 2 on the other hand stresses the impact a new label could

have, because something new has a larger potential to appeal to and to be recognized by consumers. Since both criteria are valid, it makes necessary an in-depth assessment to evaluate a specific situation.

This study has some caveats. The concept of ecosystem services has become increasingly relevant in recent years. During the interviews it became apparent that the interviewees were also familiar with the concept. However, the concept itself is perceived differently and open to interpretation. Hermelingmeier and Nicholas (2017) found five different perspectives on ecosystem services using Q methodology, each of them applying different assessments and approaches. This alone should probably caution producers. There may be several obstacles in communication, depending on the people involved within the process. An in-depth discussion with the interviewees about their views on the ecosystem concept could further enrich the debate. Some statements are open to interpretation, for instance viewpoint 2 stressed an economic sustainability in order to provide ecosystem services in the long-term (S14: Ecosystem service provisions are only viable when they entail economic benefits). This statement, however, could be understood differently. One might understand economic benefits compared to a non-provision of ecosystem services, or simply positive profits despite ecosystem been provided. This first definition implies that the provision of ecosystem services is expected to yield a positive outcome. Product and service are bundled together as a joint product (Froger et al., 2015). The latter definition, however, implies that an economic sustainability is inevitable if a long-term provision is pursued. Given this assumption, this does not exclude a willingness to accept profit setbacks on the part of the producers who are also concerned with their environmental consciousness and not only profit.

This study did not involve any consumer representatives, as the focus was placed on aspects of food product labeling that are most important to food processors, retailers, and label organizations. Yet, of course, consumer perspectives are important, and the results of this study may inform research with consumers.

The methodological approach relies on interviews with *representatives* of firms/organizations, implicitly assuming, that interviewees provide information on their enterprise rather than their own views which is a weakness of the study. Future work could achieve a greater triangulation by conducting interviews with different representatives from the same firm and extending the use of secondary data such as corporate social responsibility reports.

6 Conclusions

This study demonstrated that there are broad viewpoints on label-based approaches for ecosystem services among German food industry stakeholders. Three major viewpoints were identified and discussed. Various aspects are important in the communication of ecosystem services. For instance, the study established one viewpoint that emphasized the local connectedness of ecosystem services. Regarding the "how" of communication there was also heterogeneity. Some viewpoints highlighted that communication must be simple and should rely on established labels; others were more optimistic regarding the complexity consumers can digest and the innovation potential of labels. Q methodology ensured that the interviewees compared statements relative to each other and sorted them based on their subjective valuation which yielded distinct viewpoints as outcomes.

Eco-labeling and ecosystem services are broad concepts. Consequently, the heterogeneity in viewpoints is not surprising. This makes the detailed assessment of markets, products, consumers, regions, and ecosystem services absolutely crucial. Context matters and tailored solutions are necessary, but the viewpoints revealed in this study can provide some guidance on the tradeoffs companies in the food industry may face when dealing with the communication of ecosystem services.

It would be informative to repeat the study in a different country or sector to investigate how consistent, representative, generalizable, and sensitive to context the identified viewpoints are. It would also be instructive to test labels with consumers. This may be done by means of a consumer survey but could also involve online marketplaces which link farmers and processors, and which could provide rich information on the exact services agriculture provides. If a label were to be designed based on this readily available detailed and contextualized knowledge, one could test consumer responses in real life. Similarly, the presented flower label format and other aspects of communication could be tested using experimental or other methods.

The role of information asymmetries in the communication of credence attributes of food products is crucial. Comparing the trust consumers place in labels with the trust emerging from more direct and personal forms of engagement and experiences with agriculture would be important as well. Whether or not there is a shortcut to the deep understanding of and engagement with farming that community supported agriculture and other grassroots initiatives aim for is an interesting open question. By having established distinct viewpoints, the present study may provide some guidance for such future undertakings.

Bibliography

AgoraNatura, 2020. *AgoraNatura.* [Online]
Available at: http://dev.agora-natura.codelords.de/naturleistungen/
[Accessed 02 07 2020].

Alnatura, 2020. *Alnatura.* [Online]
Available at: https://bernau-live.de/lobetaler-bio-molkerei-praesentiert-sich-auf-der-gruenen-woche-in-berlin/
[Accessed 03 07 2020].

Banerjee, A. & Solomon, B. D., 2003. Eco-labeling for energy efficiency and sustainability: a meta-evaluation of US programs. *Energy Policy*, 01, pp. 109-123.

Bernau Live, 2019. *Bernau Live.* [Online]
Available at: https://bernau-live.de/lobetaler-bio-molkerei-praesentiert-sich-auf-der-gruenen-woche-in-berlin/
[Accessed 03 07 2020].

Biokreis, 2020. *Biokreis.* [Online]
Available at: https://www.biokreis.de/bio-fuer-dich/-bio/darum
[Accessed 03 07 2020].

Bioland, 2020. *Bioland.* [Online]
Available at: https://www.bioland.de/ueber-bioland
[Accessed 02 07 2020].

Bohlsener Mühle, 2020. *Bohlsener Muehle.* [Online]
Available at: https://bohlsener-muehle.de/was-uns-antreibt/so-sehen-wir-das-in-bohlsen
[Accessed 03 07 2020].

Bougherara, D. & Combris, P., 2009. Eco-labelled food products: what are consumers paying for?. *European Review of Agricultural Economics*, 20 08, pp. 321-341.

Brown, S. R., 1996. Q Methodology and Qualitative Research. *Qual Health Res (Qualitative Health Research)*, 01 11, p. 561–567.

Bryman, A. & Bell, E., 2015. *Business research methods.* Oxford: Oxford University Press.

CBD, 1992. *Convention on Biological Diversity.* [Online]
Available at: https://www.cbd.int/convention/articles/?a=cbd-02
[Accessed 11 05 2020].

Chen, X. et al., 2018. Eco-labeling in the Fresh Produce Market: Not All Environmentally Friendly Labels Are Equally Valued. *Ecological Economics*, 24 07, pp. 201-210.

Colman, D., 1994. Ethics and externalities: agricultural stewardship and other behaviour: presidential address. *Journal of Agricultural Economics*, 09, p. 299–311.

Contracts2.0, 2020. *Contracts2.0.* [Online]
Available at: https://www.project-contracts20.eu/objectives/
[Accessed 05 05 2020].

Costanza, R. et al., 1997. The Value of the World's Ecosystem Services and Natural Capital. *Nature*, 15 May, pp. 109-123.

Danielson, S., Webler, T. & Tuler, S. P., 2009. Using Q Method for the Formative Evaluation of Public Participation Processes. *Society & Natural Resources*, 02 12, p. 92–96.

de Groot, R. et al., 2010. Integrating the ecological and economic dimensions in biodiversity and ecosystem service valuation. In: *The Economics of Ecosystems and Biodiversity (TEEB): Ecological and Economic Foundations.* s.l.:s.n.

Demeter, 2020. *Demeter.* [Online]
Available at: https://www.demeter.de/biodynamisches
[Accessed 03 07 2020].

Deutsche-Standards, 2020. *Deutsche-Standards.* [Online]
Available at: https://www.deutsche-standards.de/marken/detail/hipp-85/
[Accessed 02 07 2020].
Edeka, 2020. *Edeka.* [Online]
Available at: https://www.edeka.de/nachhaltigkeit/unsere-wwf-partnerschaft/die-partnerschaft/intro.jsp
[Accessed 03 07 2020].
Edeka, 2020. *Geschäftsbericht.Edeka.* [Online]
Available at: https://geschaeftsbericht.edeka/edeka-im-profil/
[Accessed 03 07 2020].
FAO, 2020. *Food and Agriculture Organization of the United Nations.* [Online]
Available at: http://www.fao.org/organicag/oa-faq/oa-faq6/en/
[Accessed 25 05 2020].
Froger, G. et al., 2015. Market-Based Instruments for Ecosystem Services between Discourse and Reality: An Economic and Narrative Analysis. *Sustainability*, 25 08, p. 11595–11611.
Goossens, Y. et al., 2016. Qualitative assessment of eco-labels on fresh produce in Flanders (Belgium) highlights a potential intentioneperformance gap for the supply chain. *Journal of Cleaner Production*, 20 May, pp. 986-995.
Grunert, K. G., Hieke, S. & Wills, J., 2014. Sustainability labels on food products: Consumer motivation, understanding and use. *Food Policy*, 02, p. 177–189.
Guba, E. G. & Lincoln, Y. S., 1994. Competing paradigms in qualitative research. In: N. K. Denzin & Y. S. Lincoln, eds. *Handbook of qualitative research.* Thousand Oaks, CA: Sage, pp. 105-117.
Hermelingmeier, V. & Nicholas, K. A., 2017. Identifying Five Different Perspectives on the Ecosystem Services Concept Using Q Methodology. *Ecological Economics*, 08 03, p. 255–265.
Hipp, 2020. *Hipp.* [Online]
Available at: https://www.hipp.de/ueber-hipp/bio-qualitaet-nachhaltigkeit/nachhaltige-bio-produkte/das-hipp-bio-siegel/
[Accessed 02 07 2020].
Iraldo, F., Griesshammer, R. & Kahlenborn, W., 2020. The future of ecolabels. *The International Journal of Life Cycle Assessment*, 11 03, pp. 833-839.
Janssen, M. & Hamm, U., 2014. Governmental and private certification labels for organic food: Consumer attitudes and preferences in Germany. *Food Policy*, 04 07, pp. 437-448.
Jensen, A. A. et al., 1997. *Life cycle assessment (LCA) - a guide to approaches, experiences and information sources.* Luxembourg: European Environment Agency.
Knoefel, J. et al., 2018. A consumer perspective on corporate governance in the energy transition: Evidence from a Discrete Choice Experiment in Germany. *Energy Economics*, pp. 440-448.
Kühling, I. & Trautz, D., 2013. The Role of Organic Farming in Providing Ecosystem Services. *International Journal of Environmental and Rural Development*, 27 03, pp. 175-178.
Kvale, S. & Brinkmann, S., 2009. *InterViews.* Los Angeles: SAGE.
Lakner, S. et al., 2019. Impacts of the EU's Common Agricultural Policy on Biodiversity and Ecosystem Services. In: *Atlas of Ecosystem Services.* Cham: Springer International Publishing, p. 383–389.
Lebensmittel Praxis, 2020. *Lebensmittelpraxis.* [Online]
Available at: https://lebensmittelpraxis.de/industrie-aktuell/26475-lammsbraeu-

umsatz-gesteigert-2020-02-12-10-48-53.html
[Accessed 02 07 2020].
Lobetaler Bio, 2020. *Lobetaler-Bio.* [Online]
Available at: https://www.lobetaler-bio.de/soziale-milchwirtschaft/
[Accessed 03 07 2020].
Markandya, A., 2015. *The Economic Feedbacks of Loss of Biodiversity and Ecosystem Services*, s.l.: s.n.
McCluskey, J. J. & Loureiro, M. L., 2003. Consumer Preferences and Willingness to Pay for Food Labeling: A Discussion of Empirical Studies. *Journal of Food Distribution Research*, 11, pp. 95-102.
Meeus, J., 1993. The transformation of agricultural landscapes in Western Europe. *Science of The Total Environment*, 16 02, p. 171–190.
Naturplus-Standard, 2020. *Naturplus-Standard.* [Online]
Available at: http://www.naturplus-standard.de/english/
[Accessed 02 07 2020].
Naturschutzbecher, 2020. *Naturschutzbecher.* [Online]
Available at: https://www.naturschutzbecher.de/
[Accessed 03 07 2020].
Neumarkter Lammsbräu, 2017. *Lammsbräu.* [Online]
Available at: https://www.lammsbraeu.de/ueber-uns
[Accessed 02 07 2020].
Niemeyer, S., Petts, J. & Hobson, K., 2005. Rapid climate change and society: assessing responses and thresholds. *Risk analysis : an official publication of the Society for Risk Analysis*, p. 1443–1456.
Ökolandbau, 2020. *Ökolandbau.* [Online]
Available at: https://www.oekolandbau.de/erzeuger/umstellung/oeko-verbaende-und-standards-im-vergleich/
[Accessed 02 07 2020].
Pe'er, G. et al., 2019. A greener path for the EU Common Agricultural Policy. *Science (New York, N.Y.)*, 03 08, p. 449–451.
Rahmann, G., 2011. Biodiversity and Organic farming: What do we know?. *Journal of applied research in agriculture and forestry*, pp. 189-208.
Sandbrook, C., Scales, I. R., Vira, B. & Adams, W. M., 2011. Value plurality among conservation professionals. *Conservation biology : the journal of the Society for Conservation Biology*, p. 285–294.
Sandhu, H. S., Wratten, S. D. & Cullen, R., 2009. Organic agriculture and ecosystem services. *Environmental Science & Policy*, 09 12, p. 1–7.
Sharpe, A., Dewey, J., Ratner, S. & Boydston, J. A., 2008. *The collected works of John Dewey.* Carbondale: Southern Illinois University Press.
Spence, M., 1973. Job Market Signaling. *The Quarterly Journal of Economics*, 1 08, pp. 355-374.
Stenner, P. H., Cooper, D. & Skevington, S. M., 2003. Putting the Q into quality of life; the identification of subjective constructions of health-related quality of life using Q methodology. *Social Science & Medicine*, 12, p. 2161–2172.
Stenner, P., Watts, S. & Worrell, M., 2008. Q Methodology. In: C. Willig & W. S. Rogers, eds. *The SAGE Handbook of Qualitative Research in Psychology.* 1 Oliver's Yard, 55 City Road, London England : SAGE Publications Ltd, pp. 212-235.
Stoate, C. et al., 2001. Ecological impacts of arable intensification in Europe. *Journal of environmental management*, 12 05, p. 337–365.

Taifun-Tofu, 2019. *Taifun-Tofu.* [Online]
Available at: https://www.taifun-tofu.de/de/wir-tun-was
[Accessed 03 07 2020].
TEEB, 2008. *An interim report,* Germany: European Communities
TEEB, 2010. Ecological and Economic Foundations. In: Earthscan, ed. *The Economics of Ecosystems and Biodiversity.* London and Washington: Pushpam Kumar.
TEEB, 2010. *The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB.,* s.l.: s.n.
Thøgersen, J., Haugaard, P. & Olesen, A., 2009. Consumer responses to ecolabels. *European Journal of Marketing,* 06, p. 1787–1810.
Thomas, P., 2020. *Chili-Freiburg.* [Online]
Available at: https://www.chilli-freiburg.de/gastro-gusto/auszeichnung-vorm-aufbruch-taifun-tofu-erhaelt-deutschen-nachhaltigkeitspreis-und-will-expandieren/
[Accessed 03 07 2020].
van Amstel, M., Driessen, P. & Glasbergen, P., 2006. Eco-labeling and information asymmetry: a comparison of five eco-labels in the Netherlands. *Journal of Cleaner Production,* 06 10, pp. 263-276.
van Loo, E. J., Caputo, V. & Nayga, R., 2015. Sustainability labels on coffee: Consumer preferences, willingness-to-pay and visual. *Ecological Economics,* 07 August, pp. 215-225.
Watts, S. & Stenner, P., 2012. *Doing Q methodological research.* London: SAGE.
Webler, T., Danielson, S. & Tuler, S., 2009. *Using Q Method to Reveal Social Perspectives in Environmental Research.* Greenfield MA: Social and Environmental Research Institute.
Wer zu Wem, 2020. *wer-zu-wem.* [Online]
Available at: https://www.wer-zu-wem.de/firma/bohlsener-muehle.html
[Accessed 03 07 2020].
Wingfield, K., 2016. Introduction to Food Labeling in the US and Canada. In: G. W. Smithers, ed. *Reference module in food science.* Amsterdam: Elsevier.
Woolley, J., McGinnis, M. & Herms, W., 1999. Survey Methodologies for the Study of Ecosystem Restoration and Management: The Importance of Q- Methodology. In: K. M. F. G. E. J. M. L. a. H. D. E. (. Scow, ed. *Integrated Assessment of Ecosystem Health.* Boca Raton, FL: CRC Press LLC, p. 321–332.
Zabala, A., 2020. *Github.* [Online]
Available at: https://github.com/aiorazabala/qmethod
[Accessed 02 07 2020].
Zhang, W. et al., 2007. Ecosystem services and dis-services to agriculture. *Ecological Economics,* 15 12, p. 253–260.

Appendix 1: Consent form

Appendix 1 shows the written consent form in German.

Einwilligungserklärung zur Erhebung und Verarbeitung personenbezogener Interviewdaten

Forschungsprojekt/Thema des Interviews:	Contracts2.0 - Co-Design neuer Vertragsmodelle für innovative Agrarumwelt-Klimaschutzmaßnahmen und zur Inwertsetzung öffentlicher Umweltgüter
Durchführende Institution:	Leibniz-Zentrum für Agrarlandschaftsforschung (ZALF) e.V. Eberswalder Str. 84, 15374 Müncheberg
Datenschutzbeauftragter:	Dr. Stephan Wirth, Kontakt: datenschutz@zalf.de
Projektleitung:	Prof. Bettina Matzdorf, matzdorf@zalf.de
Ansprechperson:	Prof. Bettina Matzdorf, matzdorf@zalf.de
Interviewer/in:	Christoph Schulze, christoph.schulze@zalf.de Andrej Hagenmüller
Datum und Uhrzeit:	xx.xx.xxxx, Uhrzeit: xx.xx Uhr

Sehr geehrte XX,

vielen Dank für Ihre Teilnahme an unserer Untersuchung. Sie haben während des Interviews zu jeder Zeit die Möglichkeit, ihre Teilnahme zurückzuziehen. Ihre Teilnahme ist freiwillig.

Zu Zwecken der besseren Auswertbarkeit würden wir das Gespräch gerne aufzeichnen. Für die wissenschaftliche Auswertung verschriftlichen und anonymisieren wir die Interviews unter Einhaltung der ZALF Leitlinie zum Umgang mit Forschungsdaten sowie der EU-DSGVO (Art. 6 Abs. 1 Buchst. a)

- Darf das Gespräch aufgezeichnet werden? ja ☐ nein ☐

Auf Wunsch erhalten Sie die Abschrift unseres Gesprächs.

- Möchten Sie vor der weiteren Auswertung Einsicht in den Interviewtext nehmen?
  ja ☐ nein ☐

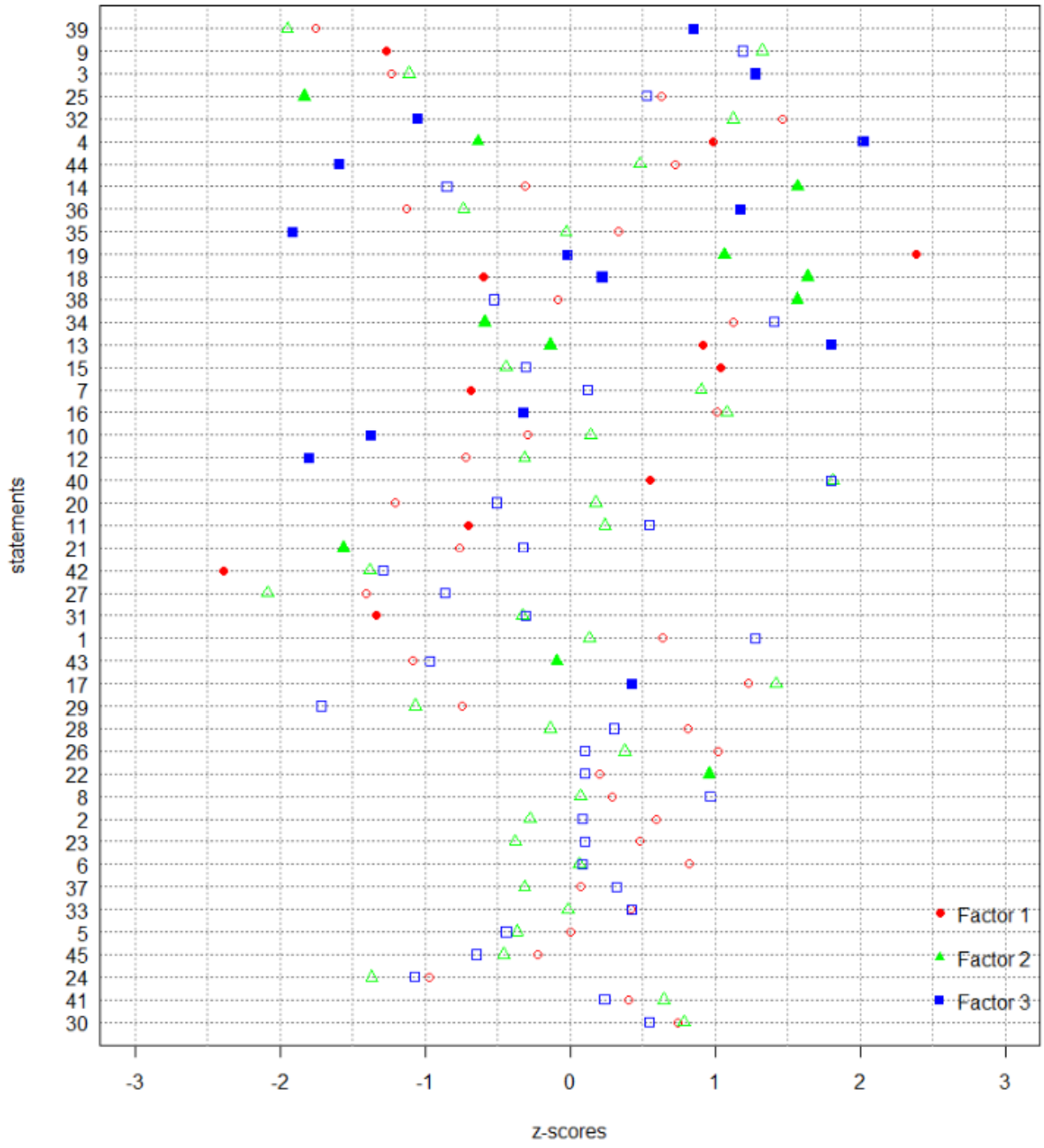
Sämtliche Inhalte unseres Gesprächs werden vertraulich und ausschließlich zu Zwecken unserer Forschung verwendet. Es werden keine persönlichen oder firmenspezifischen Daten weitergegeben oder veröffentlicht. Die anonymisierten Interviews und die Auswertungsdateien werden von den Wissenschaftlern auf verschlüsselten Datenträgern gespeichert. Personenbezogene Kontaktdaten werden von Interviewdaten getrennt für Dritte unzugänglich gespeichert. Die erhobenen Daten werden unter Einhaltung der Regeln der Guten Wissenschaftlichen Praxis der Leibniz-Gemeinschaft für 10 Jahre gespeichert und anschließend gelöscht.

_____ _____

Name Interviewer/in Name Interviewte/r

Appendix 2: Z-score dispersion graph

Appendix 2 shows the dispersion of the z-scores for all statements.



Appendix 3: Q interview instructions

Appendix 3 shows the Q interview instructions in German.

Interviewanleitung

Sehr geehrte XX,

Vielen Dank für Ihre Teilnahme an unserer Studie. Bei dem Interview soll es darum gehen, welche Aspekte beim Label Design für Konsumenten von Relevanz sind. Ziel ist, herauszufinden wie Sie als Experte zu dem Thema stehen. Im Verlauf des Interviews gibt es kein "richtig" oder "falsch". Ihre persönliche Meinung ist was zählt. Alle Erkenntnisse dieses Interviews werden vertraulich und anonym behandelt. Ihr Name wird an keiner Stelle der späteren Auswertung der Studie genannt.

Sie haben im Vorfeld per Post eine Tabelle und 45 Kärtchen mit verschiedenen Thesen erhalten. Jede These drückt eine Meinung im Diskurs um Label-Gestaltung aus und ist verschiedenen Kategorien zugeordnet. Diese sind anbei auf Kärtchen einzeln nummeriert und zusammen mit einer Tabelle mitgeschickt worden. Jede These drückt dabei eine bestimmte Meinung aus und ist verschiedenen Kategorien zugeordnet. Bei unserer Vorbereitung erschienen folgende Aspekte als relevant:

- Allgemeines zu Labels
- Kommunikation von Labels
- Die Rolle des Konsumenten
- Umweltleistung und Produkt
- Ökonomische Implikationen

Zur Vorbereitung hier ein kurzer Ablauf des Interviews:

1. Im ersten Schritt gehen wir mit Ihnen die Thesen durch und Sie sagen, ob Sie damit übereinstimmen, nicht übereinstimmen oder eine neutrale Meinung zu der These haben. Gerne können dabei persönliche Erfahrungen geäußert und einzelne Punkte detailliert diskutiert werden.
2. Im zweiten Schritt werden die Thesen in die mitgeschickte Tabelle eingeordnet. Insgesamt werden wir 45 Thesen diskutieren und ebenso sind in der Tabelle 45 Felder vorhanden, um die jeweiligen Thesen einzusortieren. Die Tabelle soll Ihnen die Möglichkeit geben, die Thesen relativ zueinander mithilfe eines Meinungsspektrums von -5 bis 5 zu gewichten. Um eine bessere Vergleichbarkeit zwischen den verschiedenen Interviews herstellen zu können, ist die Anzahl der Felder pro Spalte vorgegeben. So haben Sie beispielsweise die Möglichkeit 2 Kärtchen bei 5 einzuordnen und 3 Kärtchen bei 4. Ziel dieser Vorgabe soll sein, die wichtigsten Themenfelder auf einige wenige zusammenzufassen und diesen damit die stärkste Gewichtung zu geben.

3. Auf den jeweiligen Kärtchen befinden sich Nummerierungen der einzelnen Thesen. Diese bitten wir Sie dann in die Tabelle einzutragen. Sobald alle Thesen eingeordnet

und Sie mit der Anordnung zufrieden sind, bitten wir Sie von der fertigen Tabelle ein Foto zu machen und uns zuzuschicken.

Mit freundlichen Grüßen,

Christoph Schulze

Anlage:
Q-Grid im Posterformat
Statements