Fairtrade: Going Beyond Certificates

Empirical Nuance of Drivers and Barriers to Transform the Global Coffee Sector

Julius Rathgens
Geboren am 11.10.1987 in Bad Oldesloe

Abstract

Globalization with its increasing emergence of global value chains is one of the main driving forces behind persisting unsustainable production and consumption patterns. The global coffee market provides a fitting example, as it is connected to many sustainability issues like the persisting poverty of coffee farmers, and degrading ecosystems. Many interventions, from state-led regulation to industry-led certification processes, exist, that try to change global value chains to shift societies back on more sustainable trajectories. However, due to the complexity and manifold connections between social and ecological factors, global value chains pose a wicked problem. To this date, it is still under debate if these interventions are an effective means to change global value chains. With climate change and persisting issues of social justice as strong accelerators, calls are increasingly made for a radical transformation of global production and consumption patterns.

Many frameworks try to inform research and real-world policies for a transformation of global value chains. In this dissertation, I use the framework of the practical, political and personal sphere proposed by O'Brien and Sygna (2013). The authors highlight that the interactions between these three spheres bare the greatest potential for a transformation towards sustainability. However, in this dissertation, I argue that it is exactly at the nexus between the three spheres of transformation where barriers towards a fundamental shift of systems occur. I, therefore, use three perspectives to bring empirical nuance to the problems that arise on the interplay between the different spheres of transformation. These perspectives are: (1) the scientific perspective: using a systematic review of alternative trade arrangements; (2) the producer perspective: facilitating a participatory network analysis of social-ecological challenges of Ugandan coffee farmers and their adaptive management practices; (3) the consumer perspective: through the use of a German consumer survey and a structural equation model to investigate into the Knowledge-Doing-Gap end-consumers are facing. These three perspectives bring empirical nuance to the interplay between the different spheres as they highlight the real-world barriers that arise within and at the nexus of the three spheres. Through the results from the scientific perspective, I am able to show that most of the research is investigating the certified market and that the effectiveness of labels rarely exceeding the practical sphere. My empirical research on the producer perspective highlights that Ugandan coffee farmers facilitate a variety of on-farm crop management (practical sphere) but their support structures rarely exceed informal exchange with neighboring communities (political sphere). Exchange with governmental actors and global traders is happening but has been assessed as not sufficient to cope with the social-ecological challenges the producers are facing. Through the results of the consumer perspective, I am able to highlight that even though end-consumers have pro-sustainable attitudes (personal sphere) they are facing situational constraints (political sphere) that create a gap between their attitudes and the respective behavior. Using these empirical insights about drivers and barriers for a transformation I propose that frameworks, aiming to inform research and policies, need to include two aspects: (1) the notion of a forced transformation as one of the major influencing factors for a deliberative transformation; and (2) the translational capacity of the frameworks to create meaningful interdisciplinary discourses in different contexts. I, therefore, propose two approaches that should function as a starting point for further development of transformation frameworks (1) a fourth sphere, called the "planetary force" to include the notion of a forced transformation that is already happening in different contexts, highlighted by the producer perspective in this dissertation; and (2) the consequent use of methods that create interdisciplinary exchange and rigorous testing.

Table of Contents

List of Tables

List of Figures

1. Introduction

Human activities have become the major driving force exceeding the planets carrying capacities (Cohen, 1995). One of the key driving activities is the phenomenon of globalization with its increasing emergence of complex global value chains (Liu et al., 2013). Global value chains consist of all necessary process steps that are needed to bring a product from its place of origin to geographically distant final consumers (Kaplinsky, 2004: 80). Especially many soft commodities, such as palm oil, tropical fruits, cocoa and coffee can only be produced in constraint regions with necessary abiotic factors (e.g. stable temperatures and precipitation patterns) and are thus sold through global value chains (Gereffi et al., 2005; Läderach et al., 2016). Ideally this international trade should bring prosperity to all actors that are part of the value chain and create positive spillover effects to involved regions. But almost all of these products are well-known examples of exploitative practices towards producers and detrimental effects to ecosystems in producing regions. Coffee production for example has been connected to land-use intensification, biodiversity loss and increasing poverty (Bacon, 2005; Blackman and Rivera, 2011).

Many real-world approaches are trying to radically change global value chains. These interventions range from state-led regulations (e.g. Emission Trading, Sustainable Supply Chain Laws) over multi-stakeholder approaches (e.g. Round table of Sustainable Palm Oil) to industry-led private regulation (e.g. Organic and Fairtrade Certification) (Dingwerth and Pattberg, 2009). There has been an increasing call that the private sector should address social and environmental issues (Wahl and Bull, 2014). Fairtrade certification is one example where a commonly accepted private regulation scheme is used to pursue the transformation of global value chains and create fair working conditions for producers, as well as flourishing ecosystems they rely on (Koos, 2021). However, businesses, especially after World War II, have evolved to primarily provide products, services and employment. Economic success, externalizing costs and optimizing shareholder value are the main incentives of businesses (Blowfield and Dolan, 2010). Changing these incentives requires tremendous efforts from different societal actor groups, ranging from governmental regulations to create a "level playing field", civil society organizations to internalize formerly externalized costs, change agents involved in traditional businesses, niche actors as role models to consumers demanding change. However, the past shows that the proclaimed radical interventions are prone to end up as promises of salvation with negligible changes (Raynolds et al., 2007). The share of the certified Fairtrade market for example remains marginal (ibid., 2010). In addition, the debate whether the certification process itself is a useful means for producers to increase their livelihoods is still ongoing, as well as it is questioned if certified products increase sustainable consumption (Kolk, 2013).

Due to these circumstances, an increasing number of scholars propose that incremental adaptation practices will not suffice in order to increase prosperity in the context of global value chains for all, without exceeding the planetary boundaries (Miller, 2013). On the contrary, changes need to be of radical nature, including systemic shifts ranging from governance systems, individual behavior to a radical change of values and paradigms (Blythe et al., 2017). This notion of radical, systemic change is connected with the terms "Transformation", "Structural Transformation" or even "Great Transformation" (WBGU, 2011; Herrendorf et al., 2014). However, a lack of a well-developed underpinning still remains that connects scientific theory

with real-world practices, strategies or policies (O'Brien and Sygna, 2013; Blythe, 2017; Westley, 2013).

Transforming global value chains therefore continues to be a wicked problem (Dentoni et al., 2018). Due to their organizational complexity and geographical distance, they inhibit linear cause-effect relationships, change dynamically over time and involve different stakeholders with conflicting values (Conklin, 2006; Dentoni et al. 2018). End-consumers are impacting the livelihoods of smallholder farmers through their demand for products. Still, due to the complex ramification of the production steps and the spatial expansion, this impact is oftentimes not visible to the end-consumers. The complexity increases even more through the interconnectivity of social and ecological systems, where global trade markets are a strong driving force for local biodiversity loss and vice versa (Hull and Liu, 2018). Climate change as one of the major ecological drivers amplifies local biodiversity loss and therefore has strong impacts on actors within these global value chains, but foremost the producers who continuously have to adapt to climate-induced weather extremes and spreading pests and diseases (O'Brien and Leichenko, 2000).

As global trade arrangements continue on unsustainable trajectories and provide no easy fix, the search of the impeding or inducing factors for a sustainable transformation remains. In this dissertation I, therefore, aim to bring nuance to the topic of transforming global value chains through the following overarching research question in the field of coffee industry:

What are the drivers and barriers towards a sustainable transformation of the coffee sector?

This dissertation tries to tackle the "wickedness" by incorporating three perspectives: (1) the scientific perspective: through a systematic review of research on alternative trade arrangements within the coffee industry; (2) the producer perspective: through a network approach of social-ecological challenges and the adaptive management practices of coffee farmers in Uganda; (3) the consumer perspective: through a survey-based study of German consumers about the "Knowledge-Doing-Gap" considering sustainable consumption. These three perspectives shed light on the many key issues that classify the transformation of the global coffee sector as a wicked issue.

In the next chapter, I will therefore describe the theoretical background, needed to understand sustainability issues connected to global trade arrangements, and present the theoretical framework. In chapter three, I present the research design of this dissertation by using the three spheres of transformation proposed by O'Brien and Sygna (2013). I then give a short overview of the scientific articles that are included in this dissertation. Chapter four presents all included studies in detail. In chapter five, I synthesize the contributions to give nuance to the theoretical framework of transformation. Based on the results I propose that the three spheres of transformation should be complemented by using a fourth sphere the "planetary force". This fourth sphere highlights the forced transformation that is a major driving force in many cases and needs to be accounted for. Finally, I propose that frameworks of transformation need the translational capacity to facilitate interdisciplinary exchange and relevance for different contextual settings. I provide an outlook on how certain methodological approaches can function as a boundary object for the interdisciplinary exchange that gives contextual meaning to frameworks of transformation.

2. Background

Issues in global value chains transgress national boundaries and dilute social and ecological domains (Liu et al., 2007). Forced child labor in cocoa production, persisting poverty of coffee smallholders, increasing occurrences of pests and diseases as well as weather extremes are just some examples of sustainability issues that are connected to global value chains (Mull and Kirkhorn, 2005; Tripathi et al. 2009; Adger et al. 2009). While one could argue that global value chains are not the causal factor for these challenges, an increasing body of literature connects the organization and governance of global value chains to forms of exploitation and increasing patterns of ecosystem degradation (Jaffee, 2014).

Many approaches try to change global value chains. They range from centralized state-led regulations over multi-stakeholder approaches to industry-led regulations. The first tries to tackle the problems through enforcing regulations (e.g. Emission regulation, supply chain law); the second one brings diverse actors from different fields together to deliberately discuss potential levers for change, like the roundtable for sustainable palm oil (Dingwerth and Pattberg, 2009). Above that, there has been an increasing call that interventions should be induced from within the market (Sachs, 2005; Blowfield and Dolan, 2010). Interventions in this category try to induce change from within the industry and use the innovative potential of different actors to change global value chains. However, up to this point it is still questionable if these forms of interventions have the potential to address the complex problems within value chains.

One of the most prominent examples for this contested debate is the Fairtrade labeling organization, which certifies products and processes. Fairtrade certification has been framed to induce positive change on the producer side through a change of demand on the consumer side. It explicitly calls for an involvement of end-consumers to change their buying behavior in order to create positive spillover effects in the producing regions and call for the support of farmers from the global south. However, it is still highly disputed if these approaches are able to shift global value chains on more sustainable trajectories (Wahl and Bull, 2014). On the producer side, Fairtrade-Certification schemes have been framed to create a positive outcome on social aspects, such as poverty alleviation, child schooling or gender equity. These claims are highly contested and scholars propose that the standards of the certification schemes are too low, making the certified market prone to co-optation (Jaffee, 2014). In addition, the bureaucratic hurdles for smallholder farmers to participate in these programs are too high, as many of the smallholder farmers do not have sufficient funds for the certification schemes or are illiterate (Tellman et al, 2011). On the consumer side, Fairtrade certification labels have been framed to symbolize better producing standards and proclaimed to impact the buying behavior towards sustainable consumption (Andorfer and Liebe, 2011). Indeed, an increasing body of literature is indicating a shift in awareness and a higher willingness to pay for Fairtrade products, however, these shifts seem not to translate into the real-world, as the share of Fairtrade products on the global market remains marginal. This phenomenon has oftentimes been framed as "Knowledge-Doing-Gap", where it is hypothesized that there exists a gap between self-reported willingness to act and actual behavior (Agyemann and Kollmuss, 2002).

As these established regulation schemes come with many shortcomings, more approaches have evolved that try to address the problems induced by Fairtrade (Borrella et al., 2015). They range from corporate social responsibility campaigns over church-led missions to forms of direct trading, where roasters from the global north try to directly work together with cof-

fee producers from the global south. However, since this sector is not formalized the effectiveness of these interventions is hard to trace and evaluate (MacGregor et al., 2017). These alternative trade arrangements outside the certified market have been suggested to pay higher prices to the farmers (Borrella et al., 2015) but also framed as being prone to the co-optation through market-driven actors, as they don't have formalized standards (MacGregor et al., 2017).

The examples of Fairtrade certification and Alternative Trade Arrangements show that any intervention is prone to the so-called "ingenuity gap" where the knowledge about the system is limited and the impact of any intervention might bear the risk of unintended side-effects (Westley, 2013). Changing global value chains therefore can be described as a wicked problem, as they are inherently complex, change over timeand therefore inhibit straightforward approaches. Thus, changing global value chains requires a deeper understanding of the system itself (Batie, 2008; Levin et al., 2012). I will elaborate on two aspects to showcase that changing global value chains like coffee indeed can be described as a wicked problem: (1) the complexity of global value chains; (2) and the interconnections of social and ecological factors.

Undoubtedly many complex value chains are differing in organizational management, trade arrangements and geographical span (e.g., the automotive, electronics or textile industry). Although one could assume that trading soft commodities is less complex, even coffee value chains can vary quite a lot (Grabs and Ponte, 2019): Differences are already seen at the production level, where different coffee plants need different management practices as they differ in their sensitivity to temperature and resistance against pests and diseases (Bunn et al., 2015). The management and organization of the coffee production can range from democratically organized smallholder farmer cooperatives to top-down managed single coffee plantations (Ruben and Heras, 2012). The vertical integration (how much of the value chain is directly managed through one business) can take the forms of a fully integrated value chain to a fully externalized value chain (Ponte, 2002). Finally, the organization of these value chains can differ through the incorporation of many intermediaries, like local and global managers, to a direct trade relation that works directly with certain farmers in the producing region (Borrella et al., 2015).

Additionally, global value chains are not decoupled from the natural environment from which they extract their commodities. On the contrary, they are usually deeply interconnecting human and natural systems through strong interactions and feedback loops (Liu et al., 2007). Coffee is a good example of the coupled interactions, as it can only be produced in constrained regions with stable temperatures on specific altitudes with certain precipitation thresholds (Jaramillo et al., 2011). Global market prices and local livelihoods are usually impacted through harvest quantities, which in turn are the result of a healthy and productive ecosystem. Spreading pests and diseases and changing temperatures have a strong impact on their health which in turn heavily impacts coffee production oftentimes leading to crop failure (Gay et al., 2006).

These complex interactions and feedback loops make it very hard to find a one-size-fits-all lever to reorganize these trade arrangements. As global value chains are in dire need to be radically changed towards more sustainable trajectories, actors along the value chains and researchers are calling for a transformation of global value chains. However, it is not always clear in what contexts whichsystem properties need to be transformed. One of the key functions of sustainability scientists is therefore to identify different sets of system properties that

induce a re-ordering of systems (Olsson et al. 2014, Moore et al. 2014). Thus, in this dissertation, I will focus on the underlying factors that form drivers and barriers towards a transformation towards sustainability of the coffee sector.

Transformations are usually defined as "physical and/or qualitative changes in form, structure, or meaning-making (O'Brien and Sygna, 2013)." Or as "the altering of fundamental attributes of a system." These transformations – in theory – have some qualitative characteristics. They differ from incremental change, in their extent of change and through their creation of a system that is fundamentally different from the status quo (Park et al., 2012; Kates et al., 2012). These transformations can be differentiated as being intentional or unintentional. Throughout history, transformation processes have mainly been induced in an unintentional manner and are oftentimes connected to societal collapse (Butzer, 2012). One of the main challenges today is to understand how these transformations can be induced deliberately and intentionally (Folke et al. 2010; Jackson, 2009). Many frameworks already researching these transformation factors. Abson et al. (2016) propose the concept of leverage points, where different points of leverage fundamentally change a system. These range from shallow leverage points (e.g., changing stocks and flows), arguably be easier to implement but hardly achieving a fundamental change, to deep leverage points (e.g., changing underpinning values and mindsets), which are quite hard to initiate but have a strong potential to fundamentally change systems (Abson et al., 2016). Kates et al. (2012) suggest the concept of transformational adaptation in contrast to incremental adaptations. They propose that incremental change is not sufficient to initiate adaptation processes in the face of large-scale vulnerabilities and severe consequences of climate change.

In this dissertation, I will use the framework of the three spheres of transformation proposed by O'Brien and Sygna (2013). This framework has been used to situate transformational approaches, identify leverage points and analyze their effectiveness. The authors set up a model that conceives three different domains where transformations can happen (See Fig.1): (1) In the center the practical sphere is located. It is considered the outcome variable which provides measurable results that indicate changed behavior or the effectiveness of technical responses; (2) The political sphere, in which the practical sphere is embedded within, is concerned with the systems and structures that facilitate or impede change in the practical sphere; (3) The outer sphere is called the personal sphere, it is the domain that addresses values and attitudes, as well as their underlying beliefs and societal paradigms as the causal factor in which transformation are envisioned. The interaction between the three spheres is important as they are not disconnected from each other. Moreover, particularly the interaction of the different spheres creates the breeding ground for a transformation. While this framework is an excellent example to assess and inform research about transformations, empirical nuance is missing to better understand the interactions of the three spheres in different contexts (O'Brien, 2021). But it is exactly this empirical nuance that can explain the drivers and barriers that can support or hinder a transformation towards sustainability.

3. Research Design

Being able to identify levers for a transformation requires extensive work on understanding the underlying system properties. In the case of global value chains, there are overwhelmingly diverse perspectives on multiple levels of social and ecological systems and different geographical scales that have been emphasized. Therefore, I conducted a systematic review of research on industry-led private regulation schemes. Based on the results it became evident that most of the research is focusing on the consumer or the producer. However, research approaches are quite diverse and contradict each other. I, therefore, investigated the social-ecological challenges coffee producers are facing as well as their adaptive management practices in order to better understand the perspectives of coffee farmers in global value chains. I then shed light on the underlying factors that can create barriers to the buying behavior of consumers, as it has been proposed that there exists a gap between the attitudes and proclaimed willingness to pay and the actual behavior of end-consumers.

Using these three perspectives, I aim to provide empirical nuance on the interplay between the different spheres of transformation within the coffee sector. They shed light on factors that support or impede the transformation of global value chains towards sustainability on the nexus between the different spheres.
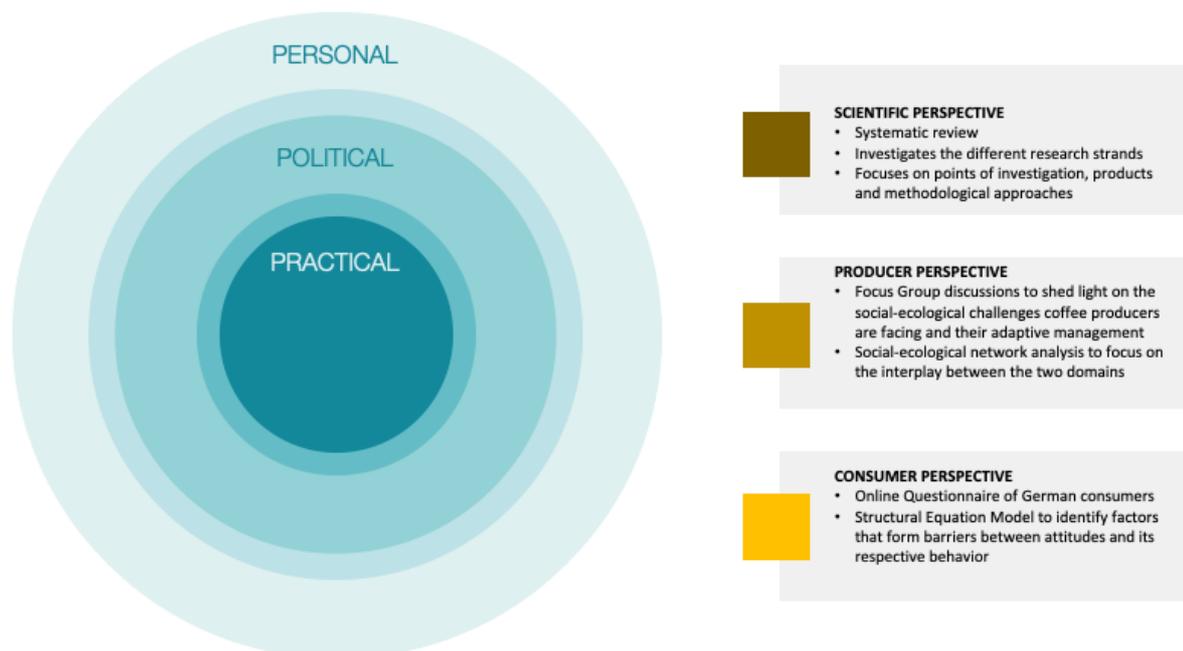
Fig. 1: Overview of the methodological approaches of the three perspectives to provide empirical nuance to the interplay between the different spheres of transformation based on O'Brien and Sygna (2013)

I highlight these nuances by using three perspectives: (1) The scientific perspective, through a systematic review about existing research approaches on alternative trade arrangements; (2) The producer perspective, through participatory mapping of social-ecological challenges and adaptive farming practices of two coffee farmer cooperatives from Uganda; (3) The consumer perspective, through a consumer survey about the role of situational constraints in explaining the Knowledge-Doing-Gap.

Table 1: Overview of the Publications that are included in this dissertation

	1. Scientific Perspective	**2. Producer Perspective**	**3. Consumer Perspective**
Article title	Going beyond certificates: A systematic review of alternative trade arrangements in the global food sector	Adapting to change: An empirical case study of the social-ecological challenges and adaptive management practices of smallholder coffee-farmers in Uganda	Broadening the perspective on the Knowledge-Doing-Gap: Analyzing a German consumer survey
Authors	J. Rathgens, S. Gröschner, H. von Wehrden	J. Rathgens, N. Chauhan, H. von Wehrden	J. Rathgens, J. Engler, H. von Wehrden
Publication Status	Published in Journal of Cleaner Production	Internal review	Under review in Ecological Economics
Research question	What is the state of research on alternative trade arrangements?	What are the social-ecological challenges coffee producers are facing and how do they adapt?	What are the constraints consumers are facing when trying to act based on their values and attitudes?
Methodological approach	Systematic literature review	Social-ecological network analysis	Online questionnaire
Data acquisition & sources	English peer-reviewed articles from Scopus: 649 academic articles	20 Focus group discussions with coffee farming communities in Uganda	575 questionnaires of German consumers
Data analysis	Quantitative word analysis, qualitative content analysis	Quantitative network analysis	Structural equation modeling

3.1 Scientific Perspective

In the first paper of this dissertation, we focused on the scientific perspective on global value chains. The main intention behind this article is to give a comprehensive overview of the different perspectives, epistemologies and methodological approaches that have been used in the scientific literature. We used a systematic review to generate a comprehensive overview and an in-depth analysis. By using a quantitative word algorithm of 649 peer-reviewed articles and qualitative in-depth analyses we could show that most of the literature is focusing on the certified market and coffee. Additionally, we were able to dissect the literature into three distinct clusters that are focusing either on producers or consumers. The majority of the literature is mainly focusing on certification schemes and its impact on consumers or producers.

3.2 Producer Perspective

In the second article, we pay attention to the producer perspective within the coffee sector. Sustainable production as one of the key challenges of sustainability science is increasingly affected through global value chains. These value chains have a strong impact on resource use in producing regions with effects on local ecosystems and economies (Dorninger et al., 2021). Additionally, climate change is one of the main drivers for ecological changes and exacerbates pressure on ecosystems where coffee is grown. Since most coffee producers are smallholder farmers their social well-being strongly depends on their farming practices (Rice, 2018). We, therefore, conducted a case-study in close collaboration with two coffee producer cooperatives from Uganda. Through a participatory network approach, this dissertation investigated the social-ecological challenges smallholder coffee communities are facing, their adaptive management practices and the social structures they rely on. By using a social-ecological network approach we want to better understand the interconnections coffee producers are facing and their adaptive management practices.

An important feature of a successful transformation is the creation of resilient communities that provide safe operating systems for present and future generations. Facing the consequences of climate change as one of the strongest drivers of a forced transformation it becomes evident that adaptation measures need to be considered (Folke et al. 2010; Kates et al., 2012). A key concept herein is the concept of adaptive management. Stemming from ecosystem management, it is based on the assumption that the ability to predict and influence key system drivers is limited. Thus, all management practices need to be aware of the dynamic and non-linear shifts of the ecosystem properties and create resilient social structures being able to adapt (Pahl-Wostl, 2006).

3.3 Consumer Perspective

Another essential part of a successful transformation is the change of human behavior. Increasing emphasis has been put on discussing the role of the psychological, as well as structural barriers that impede sustainable behavior. Arguments range from the literature of nudging as an approach to change the environment that makes sustainable behavior more likely, to reflexive approaches like "neurological reflexivity" which is about changing the underlying beliefs and assumptions as the causal driver for sustainable behavior. While the first has been criticized for not changing individuals' attitudes, beliefs and worldviews (the personal sphere), the latter is criticized for ignoring the underlying systems and structures that function as the basic foundation to provide behavioral options. However, still there remains the question of why people do not always behave in alignment with their attitudes and values. Through an online questionnaire of German consumers, we used a structural equation model approach to compare prevailing theories that inform consumption behavior and test the theory of situational constraints as an explanatory factor for the Knowledge-Doing-Gap.

4. Results

4.1 Going beyond certificates: A systematic review of alternative trade arrangements in the global food sector

Julius Rathgens, Stefan Gröschner, Henrik von Wehrden

Abstract

This systematic review provides an overview of the various perspectives that investigate alternative trade arrangements in the global food sector. With child labor in cocoa production, health issues of plantation workers in the global south and unsustainable consumption patterns of consumers in the global north, trade arrangements in the global food sector remain on largely unsustainable pathways with vast consequences for a sustainable development. Alternative Trade arrangements have been proposed as one way to tackle the above-mentioned issues and have been increasingly investigated through the scientific literature. However, evidence about the impact of alternative trade arrangements on consumption in the global north or production in the global south is disputed. While there have been efforts to review the scientific literature, existing reviews have focused only on specific aspects (e.g., consumer perception or effectiveness of producer certification schemes). We therefore systematically reviewed 649 peer-reviewed publications that investigated food products and alternative trade arrangements to create a more comprehensive overview of the strand of literature, its epistemic similarities and differences. We found that the scientific literature is predominantly investigating the certified market, focusing on certification schemes and its implementations. Furthermore, we show that the literature is either focusing on producers or consumers and has a strong bias towards social aspects of sustainability. Using a quantitative word-based analysis, we identified three substantially different clusters: first, producer impact assessment, dominated by econometrics; second, contextual producer perspectives, emphasizing the political and social sphere through qualitative single case study analyses; and third consumers' attitudes and willingness to pay for ethical products, characterized by psycho- logical and econometric measures. Based on our findings we propose three future directions for research in the field of alternative trade. First, scholars should put a stronger emphasis on going beyond the impact assessment of certification schemes and examine underlying aspects such as information asymmetries, smallholder empowerment and ethical consumption behavior. Second, interconnections between social and ecological factors needs further investigation as both factors have a strong influence on each other. Third, scholars should put a stronger focus on participatory approaches to gain a deeper understanding of root causes of unjust trade arrangements and enhance mutual understanding of scientific perceptions and real-world practices.

1. Introduction

Global trade arrangements have contributed to an emergence of complex value chains, which connect geographically distant regions through global markets. (Wahl and Bull, 2014; Gereffi et al., 2005). Many soft commodities, like coffee, tea or cocoa are produced at a different place than where they are consumed, leading to strong global interactions (Yu et al., 2013). Parts of the globalization literature refer to this phenomenon as teleconnection (Lenschow et al., 2016; Lopez et al., 2018), where demands through consumers can trigger unexpected outcomes, or positive spillovers in geographically remote regions (Stewart 1992).

Ideally, global trade arrangements may provide benefits for actors across the value chain and ecosystems they rely on. By creating stable market links to countries of origin, there may be incentives to foster biodiversity and material, as well as non-material benefits for producers (Raynolds et al., 2004). In addition, global trade arrangements may allow consumers from distant regions to get access to commodities that would otherwise not be available (Gereffi et al., 2006). Global trade arrangements have also been indicated to be highly exploitative towards producers and ecosystems in countries of origin and may perpetuate global disparities (Liu et al., 2013). The contribution of teleconnections to the excess of planetary boundaries and exploitation of producers has been widely discussed in the literature including different points of analysis and topical focus. Rockström et al (2009) identify human activities as the main driver for transgressing the planetary capacities and describe a tightly coupled earth-system where land-use change at one point could substantially influence outcomes at vastly different regions. Eakin et al. (2014) lay their focus on the influence of economic globalization and urbanization as factors for accelerated land-use change, describing the interconnections between social, institutional and natural systems between distant regions. Lenschow et al. (2015) describe how interdependencies between distal social-ecological systems require new governance approaches that include but also move beyond state-led approaches. Kolk (2013) examines whether alternative trade arrangements have the ability to create changes in perceptions of consumers in the global north or at farming practices of producers in the global south through certification programs. It is fair to say that teleconnections and especially global trade arrangements perpetuate the tendency to disconnect consumers from producers, leading to unsustainable consumption behavior without the awareness of triggering negative outcomes at the place of product origin (Dorninger et al., 2017; Ives et al., 2018). The problems that arise are manifold and associated with issues of social justice, information asymmetries as well as deforestation and land use intensification (Brooks, 2015; Jaffee, 2012). Krausmann & Langthaler argue that the increase in agricultural exports play an increasing role in political economy and are closely connected to agro-ecological crises (Krausmann/Langthaler 2012)
Due to its inherent complexity and geographical distances, global trade arrangements inhibit straightforward governmental efforts on different levels (e.g., international, regional, national or local) (Levy et al., 2016; Lenschow et al., 2016). In contrast to state-led approaches voluntary regulation schemes and alternative ways of trading evolved to tackle the abovementioned problems (Wahl and Bull, 2014). Even though they are mostly enforced through private regulation and market mechanisms they move beyond the dichotomy of state vs market. Raynolds (2012, 2004) claims that such movements can be described through the concept of social regulation that uses civic values and social embeddedness of individual and market actors to transform North/South relations.

Since the development of such regulation schemes, scientific interest in this topic has been growing. However, the wide array of research fields, methodologies and ontologies in the area of alternative trade arrangements and private regulation schemes make it difficult to gain a holistic overview. Many scholars focus on consumers and their buying behavior, whereas others are interested in producer perspectives. Methodological differences exist, that range from econometric assessments, over psychological frameworks of buying behavior to participatory research approaches. Ontological differences add another layer of complexity to a comprehensive analysis. Fairtrade, as one example, has been investigated in diverging ways in the literature. It is conceptualized as a set of certification criteria, counter-hegemonic or even as a tool for global development (Terstappen et al., 2013).

To date, the authors are not aware of a comprehensive overview of the scientific literature on alternative trade arrangements. Existing reviews focus on specific aspects. Terstappen et al (2013) for example provide an overview of the impacts of certification schemes on social aspects whereas Wahl and Bull (2014) review private regulation theories and give an overview of the studied sectors. Andorfer and Liebe (2011) provide a review of the research on fair trade consumption Han and Stoel (2016) use a meta-analysis to review studies on socially responsible behavior. Finally, Gregg et al. (2020) review the scientific literature concerning bio-residuals in the context of food waste. This raises the question of how fragmented the different approaches are and how cross-fertilization takes place. Therefore, this article aims to provide a more comprehensive overview of the different strands of literature within the topic of alternative trade arrangements to address the heterogeneity and foster learning between the different clusters. We therefore propose two research questions:

RQ1: *What are different perspectives, methodologies and ontologies within this inherently heterogeneous literature?*
RQ2: *What are the gaps between the different strands of literature and what are potential topics to foster learning between them?*

To address the abovementioned research questions, this article uses a systematic literature review approach to create an overview of the literature body on alternative trade arrangements. With this review, we aim to highlight the differences between existing strands of literature and fields of potential collaboration in order to stress the need for interlinkages between different actor groups as well as issues of ecological and social justice.

The goal of this review is to classify topics and research interests within the scientific literature on alternative trade arrangements in order to emphasize potential fields of cross-fertilization for sustainable development. Based on a quantitative text analysis, we show that the dominant research fields concern either producers and the respective effects of certification schemes (clusters 1 and 2) or consumers and their willingness to pay (cluster 3). On the producer side, these clusters are divided into research strands that dominantly deal with quantitative econometric assessment (cluster 1) or the political and justice issues of trading practices using qualitative case study approaches (cluster 2). We show that scientific papers predominantly focus on the certified market, participatory approaches that incorporate perceptions from actors outside academia are rare and scientific research focusing on social factors neglects the interrelations between social and ecological factors. Therefore, policy recommendations based on these studies may be flawed. In order to foster sustainable development, we propose a research agenda that brings together the perceptions of different actors within the respective supply chains and tries to include ecological aspects and its interrelations with social well-being of the producing actors in a participatory manner (Raworth, 2012).

2. Theoretical Background

Child labor in cocoa production (Mull et al., 2005), exploitation of plantation workers in coffee production (Bacon, 2005) and ecological disasters created by banana production (Tripathi et al., 2009) are prominent examples of wicked problems associated with global value chains. Wicked problems are complex in nature and inhibit straightforward policy solutions through national legislatives, standard public management or rational-technical approaches (Batie, 2008). The issue of wicked problems is of increasing interest for many scholars, especially in

the field of sustainability science, as they require a deeper understanding of root causes, path-dependencies and interconnections (Levin et al., 2012). A multitude of political and managerial approaches exist that try to address wicked problems in global value chains. They range from inter- and transnational regulation (e.g. carbon trading, peace settlements) over multi-stakeholder approaches (e.g. Round Table of Sustainable Palm Oil) to social regulation and alternative trade arrangements as market based approaches (Certification Schemes) (Levin et al., 2012; Dentoni et al., 2018; Raynolds, 2012).

Inter- and transnational regulations usually comprise of national governments working together to develop legislation to hold companies accountable for their global practices. Moreover, they set standards and rules to change business practices. For example the objectives of the sustainable development goals and the carbon trading systems, laid down in the Kyoto Protocol, are important means towards a sustainable development. However, little regulatory power and non-binding rules pose challenges to the practical implementation of these approaches (Wahl and Bull, 2014).

As a market-based approach alternative trade arrangements consist of a set of market actors who are trying to create trading conditions, which are driven by the ideal to generate regulations that benefit all actors in the value chain (Taylor, 2005). Trade is used as a means to empower producers, usually consisting of smallholders from the global south, by paying higher prices, facilitating stable market links and creating connections between consumers and producers (Raynolds, 2010). Proponents try to facilitate trust and long-term relationships that create reliable trade relations through frequent dialogue and transparency (Bacon, 2005). Consequently, efforts have been made to establish comparable regulation standards that resulted in certification schemes like Fairtrade, UTZ and Rainforest Alliance (Kolk, 2013). These schemes are used to create commonly accepted requirements and make them traceable and comparable (Raynolds, 2008). Additionally, product information and labels are used to communicate specific trading practices to the consumer (MacGregor et al., 2017).

Due to commonly accepted certification criteria, alternative trading schemes entered the mainstream market and bigger corporations were able to participate (Raynolds, 2008). It has been suggested that the entry of these actors had negative impacts on the mission behind alternative trade and corporations are now dominating the certified market (Tellman et al., 2011). Raynolds (2009) argues that corporations tend to violate founding principles and claims that commitments like long-term relationships, frequent dialogue as well as pre-financing tends to be avoided by this group of actors. Moreover, in order to access the Fairtrade market, producers have to initiate a certification process. Rueda and Lambin (2012) show that especially smallholders are facing barriers like quality requirements, export and certification fees, illiteracy and low levels of negotiation power ,making it often impossible for them to enter the certified market.

Apart from the certified market, other forms of alternative trade arrangements exist that are not formalized under a label or a certification scheme. Direct trading practices and the specialty coffee industry are prominent examples. These movements mainly consists of coffee roasters who are maintaining direct connections to the producers to guarantee a reliable supply of high-quality specialty coffee in a sustainable manner (Borrella et al., 2015). Raynolds (2009) refers to this group of stakeholders as quality-driven actors, whose main incentive is to explore coffee beans with high cupping scores and innovative taste profiles. Because of their

direct relationships and trading commitments, coffee roasters and producers also have the ability to exchange knowledge. They are establishing and fostering relationships, as well as creating mutual learning processes. Consequently, roasters pay higher prices for coffee beans and are actively engaged in bilateral exchange with the producers (MacGregor et al., 2017). However, since this is not a formalized sector, commonly agreed requirements as well as third party validation is missing, which make the practices hard to trace and evaluate (MacGregor et al., 2017). There have been studies about how alternative trade arrangements are paying higher prices to the farmers (Borrella et al., 2015) and also about the co-optation of the Direct Trade sector through market-driven actors (MacGregor et al., 2017). However, there is no comprehensive overview of how alternative trading practicesare designed and investigated in the scientific literature. Therefore, this article examines the peer-reviewed literature on alternative trade arrangements to examine the status quo of the scientific discourse.

3. Methods

In this article, we follow the methodology of Abson et al. (2014) to obtain a quantitative, bibliometric overview of the peer reviewed literature and get inductive insights in different research fields. Based on the quantitative results, we then use a qualitative approach to gain deeper insights into the commonalities and differences of research approaches and thus find out how alternative trade arrangements are perceived and addressed in the academic literature (Hoon, 2013; Tranfield et al., 2003).

Table 2: Overview of the consecutive steps within the systematic review

	Review Steps	Rationale
1	Define concept of interest/ research question	Specify the concept of interest and/or research question through an initial (p)review of literature
2	Development of search string	Generate a comprehensive sample of suitable publications that provide appropriate search terms. Optimising the search string through a scanning of the results.
3	Define inclusion/exclusion criteria	Create specific inclusion/exclusion criteria to narrow down the scope of research through the exclusion of false positives e.g. articles that result through the search string but do not fit the scope of the research.
4	Preselection of Publications and descriptive analysis	Exclude false positives and gaining broad information about the sample through abstract screening (e.g. paper type, lead affiliation of authors, and development of publications over time).
5	Context specific analysis of included articles	Analysis of publications based on the concept of interest (Step 1) of the systematic review to find commonalities and research gaps (e.g. methodologies, disciplines, ontologies).
6	Multivariate analysis of empirical articles	Statistical mapping of the fragmentation of literature, through quantitative agglomerative clustering based on indicator words.
7	Focused review of individual clusters	Qualitative thematic analysis of the included articles based on the different clusters to understand similarities and differences of clusters

For this purpose, we use the electronic database Scopus to search for all relevant scientific articles. We are aware that in order to create a holistic overview of the literature a cross comparison with other databases (e.g. Web of Science or google scholar) might be helpful for systematic reviews. However, Beckmann and von Wehrden (2009) show that using google scholar generated a high amount of false positives (papers that are falsely included in the review process). Additionally, previous reviews have shown that when dealing with emerging topics, the

inclusion of many databases did not show a substantial difference in results (Ives et al., 2017; Lüderitz et al., 2015, Rau et al., 2018.

The database was queried using a search string consisting of a variety of terms related to 'alternative trade arrangements', 'ethical trading' and 'fairtrade' (See supplementary material for the detailed search string). Only peer-reviewed English journal articles were considered. Conference papers and business reports were excluded (e.g. Doherty, 2005). We included all articles that dealt with fair, ethical or alternative trade on a business, governance or certification level. Although the authors acknowledge that, there are similarities between local and global value chains and that macro-economic factors play an important role in these dynamics, this review focuses solely on scientific insights from value chains on a global scale. Articles dealing with trade relations within a region or a country (e.g. Feyereisen et al., 2017) and trade relations relating to macroeconomic issues (e.g. Lowe, 2014), or agent-based modelling of food systems(Namany et al. 2020) were therefore excluded (See Fig. 1). We also acknowledge that effective packaging and waste management is a crucial part of the governance of value chains. However this review is interested in the different perceptions of trade relations and their regulation within the scientific literature. Therefore, we did not include articles that dealt with waste-reducing innovations (Simms et al. 2020), supply chain risks on food wastage production (Mithun Ali et al. 2019).

Even though a large number of products (e.g. minerals, fabrics, clothing and electronics) are distributed via global value chains, we focus specifically on food. Papers dealing with apparel (e.g. Miller and Williams, 2009) or the flower industry (e.g. Wright and Madrid, 2007) were not included. Our interest is on trade relations and global value chains. We therefore excluded perspectives of corporate social responsibility (e.g. Wildes, 2008) or corporate-driven ethical sourcing initiatives such as the Ethical Trade Initiative from the United Kingdom (Terstappen, 2012). In doubtful cases, besides abstract screening, the full paper was examined.

Of the potential 1718 documents, 649 matched the inclusion criteria and were considered for full-text analysis. Abstract screening and full text analysis were used to identify descriptive characteristics of the respective articles (e.g. focus of the supply chain, certified market, product, geographical region). Under the hypothesis that co-abundance of different conceptual vocabulary can be used as a proxy for separated research streams, we performed a bibliographic full-text, multivariate word analysis. Building on the methodological analysis developed by Abson et al. (2014), we conducted all statistical analysis in R (R Core Team, 2012). We generated a word matrix, which we then filtered in order to delete buzzwords that generated no conceptual insight ("SMART" from the function "stopwords"; library "tm"). We then checked for co-abundancy of words between papers. The rationale behind this step is to reduce the bias of favoring longer articles (e.g. that contain more words).

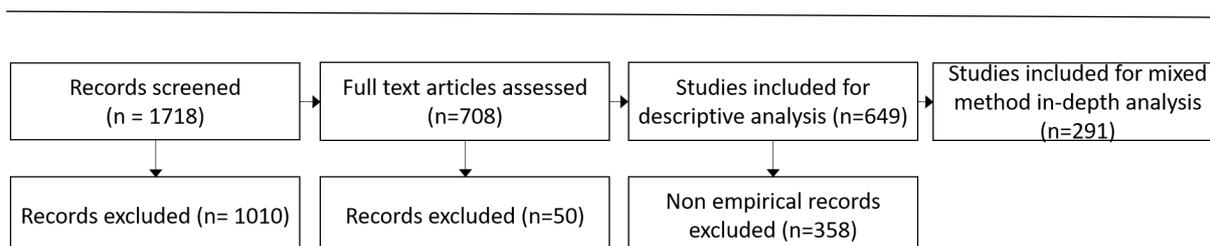| Records screened (n = 1718)	Full text articles assessed (n=708)	Studies included for descriptive analysis (n=649)	Studies included for mixed method in-depth analysis (n=291)
Records excluded (n= 1010)	Records excluded (n=50)	Non empirical records excluded (n=358)	

Fig. 1: 1718 documents were identified through the use of the database scopus. Based on the abovementioned criteria, 1010 of these initial publications were excluded. 649 publications were used for descriptive statistics whereof 291 where identified as empirical papers. These were used for a qualitative as well as quantitative in-depth analysis.

To identify words that characterize the differences between the clusters, we used the indicator species analysis brought forward by Legendre and Legendre (1998). This method uses multivariate statistics to identify and compare habitats through characteristic species. In this review, the "characteristic species" are words that characterize a semantic cluster within the literature. We used 15-20 indicator words that characterize the respective clusters ("indval" with 1000 iterations to calculate probabilities; library "labdsv"). We then used a detrended correspondence analysis to locate the indicator words, their distribution in the respective clusters and the interrelations between those clusters (See Fig. 4b).

A combined co-abundancy of words was used to group the scientific articles into different clusters. Articles that use a similar set of words are more likely to belong to the same cluster. To do this we used agglomerative hierarchical clustering. This method uses the "minimum variance" criterion in order to aggregate two elements (in this case scientific articles) into one cluster. This method reduces within-group variance and increases dissimilarities between groups and therefore results in relatively even distributions of elements per cluster and a high agglomerative cluster coefficient. Based on the cluster affiliation of the scientific articles, qualitative thematic characteristics were examined in the full text analysis to gain conceptual insights into the specific research mode and problem framing of the respective clusters.

4. Results

4.1 Descriptive Analysis

Research in the topic of alternative trade arrangements is increasing since 1999, with the majority of papers being published between 2007 and 2017 (83, 3%). Over time, empirical work has been gaining interest in the scientific communities with 291 published papers after 2005 and account for 45% of all publications. Publication of conceptual papers also increased during the last 20 years and account for 52, 1% of the total amount. Reviews have been conducted since the early 2000's but account for a very small amount of the publications (2, 2%) (See Fig. 1).
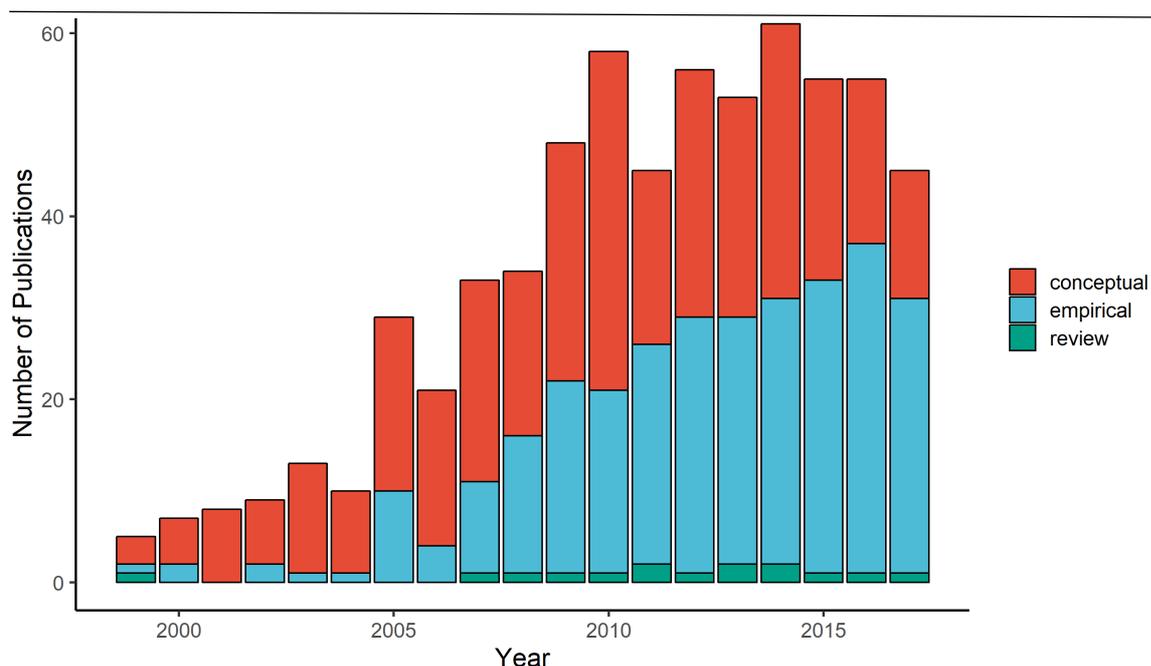
Fig. 2: Increase in the number of published studies on alternative trade arrangements by year. Colors within bars relate to the identified types of publication (conceptual, empirical, review). Eight publications before 1999 were not included in this graph

A variety of soft commodities is subject to inquiry. Within this variety coffee was by far the most investigated product (52, 8%), followed by cocoa (7, 3%) and tea (7, 3%). Other products that are investigated account for 19, 3% of all empirical papers. The high variety of products (e.g. pork, breakfast cereals, ready meals, ice cream and soft drinks) can be explained through the empirical testing of consumer-based studies, where the product itself was not of particular interest to the researchers.

Although global supply chains can be complex, this review shows that consumers (45, 3%) and producers (39, 6%) are of particular interest to researchers. On the consumer side, researchers are particularly interested in the question, why consumers buy ethical products. This issue is investigated through economic (e.g. willingness to pay or theory of planned behavior), psychological (e.g. intrinsic motivation, subjective norms or perceived behavioral control) or sociological lenses (e.g. self-identity or socialization processes). On the producer side the most prevalent question is, if certification schemes have an impact on factors of social-well-being. Other actor groups that are investigated in the literature are intermediaries, multinational companies, social enterprises and retailers (9, 3%).

Most of the empirical publications (241 of 291) deal explicitly with the topic of alternative trade arrangements through the lenses of certification schemes (e.g. Fairtrade, Rainforest Alliance, bird friendly and UTZ). The aim is to find out about impacts and perceptions of different actors within the respective supply chains (See Fig. 2).
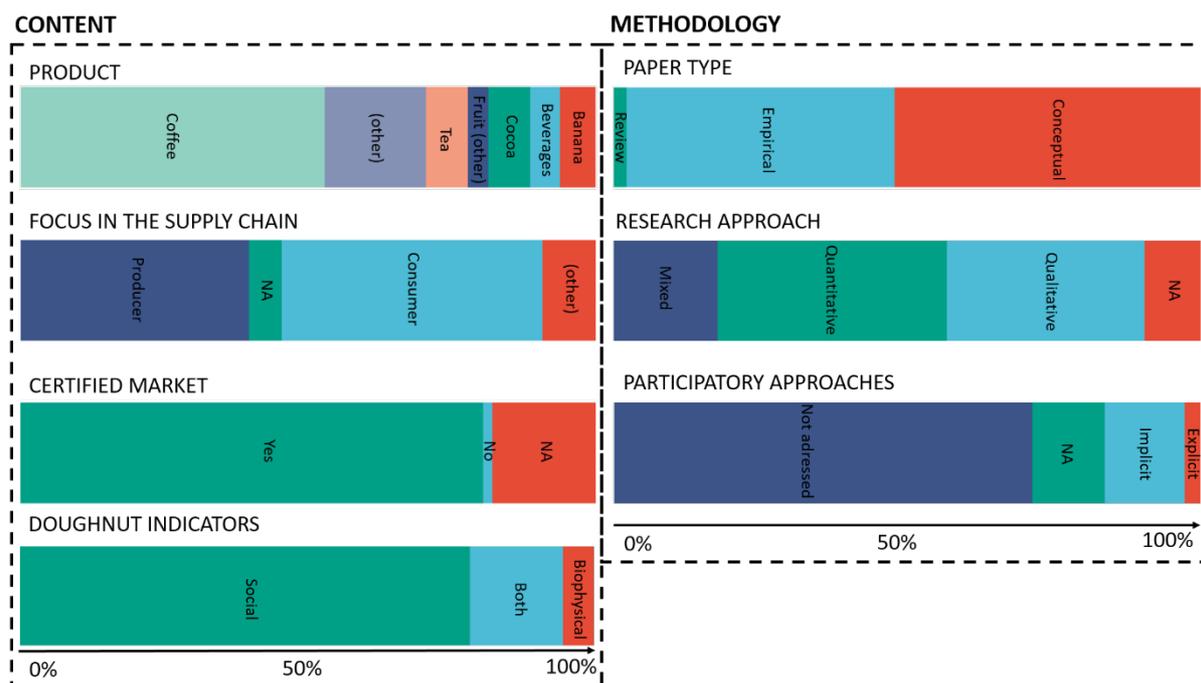
CONTENT

METHODOLOGY

Fig. 3: Overview of the proportional results of different review categories. The first column gives an overview of the review categories that focus on content, whereas the second column summarizes the methodological approaches.

One further criterion analyzed in this review is the degree to which both social and environmental aspects are considered in the respective literature. We use the framework of the "doughnut economy" proposed by Raworth (2012) to assess producers focused empirical papers (161 of 291) based on the doughnut indicators. Apart from not containing any indicator (56 of 161), the majority of empirical papers with a producer focus are dealing solely with social indicators (82). Only a small amount is dealing with biophysical indicators (6) or with both (17).

The mode of research can be distinguished between qualitative (101), quantitative (117) and mixed method approaches (53), although some publications could not be allocated (20). However, this review also highlights those modes of research that include stakeholders from outside academia within the process are rare. Less than 3% of the peer-reviewed literature is explicitly using participatory approaches.
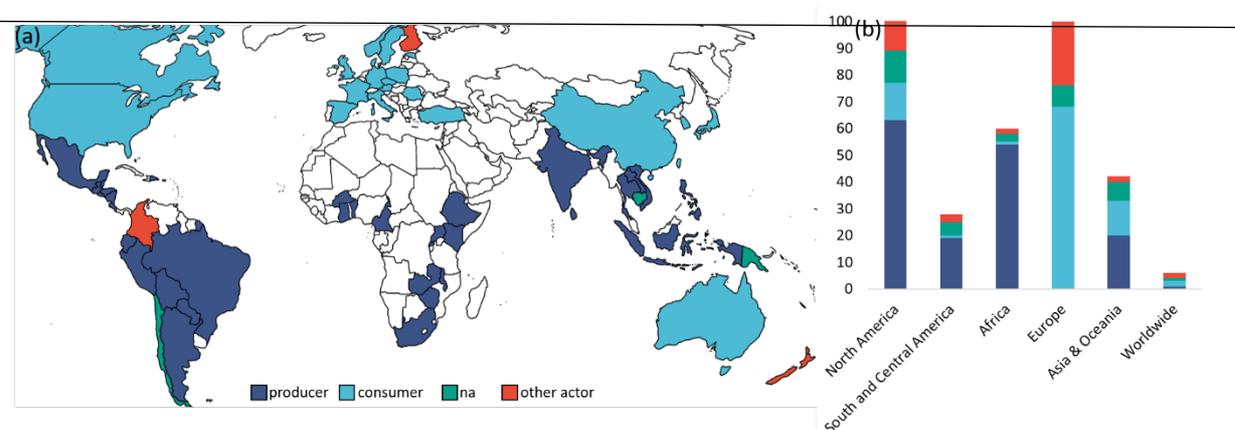

Fig. 4: (a) World map showing the distribution of case studies per country. Countries are colored according to the most abundant focal points. The total amount of case studies is n=327 due to multiple focal points of some studies. (b) Stacked bar plots show the frequencies of focal points from the empirical case studies per region.

Most of the consumer-based studies are allocated in Europe (50 of 136) followed by North America (18) and Asia (8). Many of the consumer-based studies are in vitro experiments, thus the authors did not clarify where they conducted the study (56). Almost no consumer-based study was conducted in Africa and most countries are not part of any research concerning alternative trade arrangements. The vast majority of producer-based studies has been conducted in North America (44 of 119), followed by Africa, South America (20) and Asia (14). The majority of producer-based studies in North America took place in Nicaragua (18) and Mexico (15).

4.2 Bibliographic, full-text analysis

With a full-text, multivariate analysis we were able to cluster the 291 empirical papers into three significantly different clusters. The indicator words for each cluster are shown in a detrended correspondence analysis. An in-depth full-text analysis of all papers within the three clusters was conducted accordingly. We are aware that each of the articles present unique contributions to the landscape of the scientific literature. For a detailed overview of the included articles, see Appendix B.
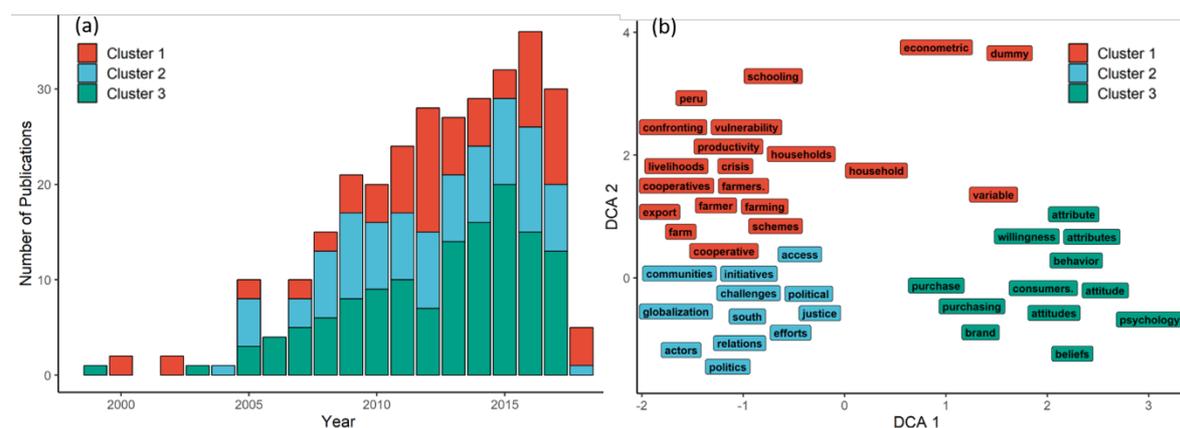
Fig. 5: (a) Overview of the publications per year based on the three derived clusters from the bibliometric full text analysis. (b) Ordination plot highlighting indicator words of the three distinct clusters.

Cluster 1: Econometric Impact Assessment

Addressed Problem

This cluster focuses on producers and analyses the impact of certificates on producer well-being. (68 of 72). The main theme of this cluster is to test whether the proclaimed goals of increasing social well-being at the place of origin can be fulfilled. One dominant topic within this debate is the performance of different certifications. Some authors are trying to test if there is a difference in performance between Fairtrade certified and conventional producer groups (Becchetti et al., 2012). Other authors are investigating the performance measurements of different certificates (Beuchelt et al., 2013).

Another perspective within this cluster is the focus on issues of ecological economics: Biodiversity conservation, the well-being and performance of the producers' ecosystems are being investigated and tested against the occurrence of certificates. Many authors from this field are examining the combination of organic and Fairtrade certificates and test the performance of producers groups on an ecological and economic level. Barham and Weber (2011) use a

survey to assess the influence of certificates on ecological perceptions of different producer groups whereas Elder et al. (2013) investigate the influence of Fairtrade certification on agricultural practices.

Methodology

A unifying theme in that cluster is the disciplinary background and ontology of the publications. The articles are mostly written from an economic background (34 of 72) and hence often use econometrics to investigate the issue whether alternative trade arrangements are actually reaching their proclaimed goals (e.g. facilitating producer's well-being, supporting gender equity and conserving biodiversity). Therefore, quantitative methods such as regression analysis, equation modelling and propensity score matching are used to measure impact within the case studies (e.g. Elder et al., 2012; Francesconi and Ruben, 2014). The lenses used to assess well-being are quite different: Whereas e.g. Becchetti et al. (2013) use a quantitative impact assessment to study the effects of Fairtrade certification on child schooling, authors like Chiputwa and Qaim (2016) use an econometric analysis to investigate the implications of sustainability standards on nutrition and gender.

Cluster 2: Political social science

Addressed Problem

This cluster also investigates the producers and their well-being. In contrast to Cluster 1, this cluster mainly focuses on the complex contexts and political implications of global trade arrangements. Apart from the effects of certificates on producers, publications in this cluster mainly examine other factors that play a role in affecting the wellbeing of producers. These factors cover a broad range of topics reaching from structural dependencies, capacity building and socioeconomic status to gender equity. While Dolan (2010) is analyzing the influence of mainstreaming on the structures and outcomes of Fairtrade, Bacon (2005) focuses on the implications of changing market conditions in Fairtrade on the farmers' livelihood vulnerability. Other authors, such as von Geibler (2013), also discuss the legitimacy and effectiveness of standard setting in general, as well as the consequences of time poverty on the participation of women in the governance of producer organizations (Lyon et al. 2017). Consequently, many of the respective empirical studies have a mode of research that attempts to investigate the "role", "reasons", "tensions", development", "influence", "connections" of alternative trade issues. Moberg (2005), for instance, is analyzing the role of Fairtrade in anti-globalization politics, while Jaffee (2012) is exploring the intra-movement tensions within Fairtrade, whereas Wilson (2010) investigates why Fairtrade farmers in Nicaragua are falling in debt. Furthermore, Huybrechts (2017) focuses on the reasons for social enterprises to collaborate with mainstream businesses in the Fairtrade sector.

Methodology

While the nature of the impact on the Fairtrade farmers surveyed varies widely, authors in this cluster characterize factors as usually difficult to measure based on quantitative inference. Thus qualitative data collection such as interviews (72 out of 89) is the most commonly used method, and in many cases observations (n=26) and ethnographic fieldwork methods (n=17) are used to collect detailed contextual information. Reynolds (2013) is assessing how faith identity of actors is influencing their involvement in Fairtrade through participant observation and interviews. Loconto (2015), apart from conducting observations, uses focus groups to acquire more in-depth knowledge of the observed actors.

Cluster 3: Consumer attitudes and willingness to pay

Addressed Problem

This cluster deals predominantly with consumers in alternative trade arrangements. It investigates their buying behavior or their respective willingness to pay for ethically labeled and traded products (Han and Stoel, 2016). This body of literature is mainly based on social psychological studies, followed by econometric and sociological approaches (Andorfer and Liebe, 2012). In order to investigate consumer's values, attitudes and consumption behavior in the context of ethical consumption goods this cluster mainly uses frameworks like theory of planned behavior (TPB) and Theory of Basic Human Values (Schwartz values). The key objective of the publications in this cluster is to find relationships, influencing factors and determinants between the consumer demographics (e.g. gender, age, and income), their values, attitudes and their willingness to pay. Fewer studies investigate in the actual purchasing behavior. In general, the data collection serves mostly to obtain self-assessment of consumers with regard to their past buying behavior, consumption preferences and values (n=76). In comparison, experiments in which real behavior is studied, are less frequent (n=30). While self-assessments are a very important methodology to assess the self-reflection of consumers, they need to be accompanied by "in vivo" experiments (Caniglia et al., 2017). Our results show that 17% of the literature use real world studies to investigate into the actual buying behavior of consumers. This includes the consideration of product characteristics such as taste, information, labelling etc. and other factors like economic situation. De Ferran and Grunert (2007) study the motives and values underlying the respective purchase decision. Lotz et al. (2013) analyze the influence of Fairtrade foods and beverages on the reported taste experience of consumers with a view to product properties.

Methodology

In order to investigate these relationships, surveys, questionnaires, panels and interviews are used (n=97). The data collected is mainly used for hypothesis testing to determine modelling purposes, so that e.g. structural equation modelling, conjoint analysis, conditional logic models and confirmatory factor analysis are applied. Consequently, this cluster deals with questions of willingness to pay and buying behavior through quantitative methods. For example, Cranfield et al. (2010) investigate the impact of socioeconomic and demographic factors on the acceptance of Fairtrade coffee through choice experiments. Besides, Morrell and Jayawardhena (2010) examine the influence of age and gender on ethical purchase decisions and social advocacy through a quantitative survey.

5. Discussion

Global trade arrangements are a prominent cause of increased interconnectivity of social and ecological systems worldwide. This interconnectivity poses a challenge for researchers to give adequate policy recommendations based on available studies. No fixed spatial level suits appropriately for the governance of social-ecological systems, since either local officials or distant managers lack awareness of linkages to larger systems or local ecosystems that are not physically present (Brondizio et al., 2009)

Alternative trade arrangements have the potential to contribute to strengthening this multiperspective. Raynolds (2002) argues that these trade relations shorten the social distances between consumers and producers and create ecological as well as social benefits for the producers. An increasing number of case studies show that alternative trade agreements are getting more consumer attention, reflected particularly in their willingness to pay (Andorfer and

Liebe 2012). Additionally, the perspectives of producers are increasingly investigated within the scientific literature. Kolk (2013) reports on the complex interdependencies between certified markets and the empowerment of coffee producers. Blackman and Rivera (2011) are criticizing the methodological approaches authors in the field use to find out about the impact certification can have on the well-being of producers.

However, on the consumer side, publications, which investigate the interrelations between attitudes and behavior, are still rare. One approach to investigate into this topic is to use a combination of self-reported information and in vivo behavior. Koppel and Schulze (2013) analyze the determinants of consumers' willingness to pay for ethically traded products through observation of the customers' behavior in a natural field experiment as well as the consideration of their self-reported information via standardized questionnaires. Another fruitful approach is to critically reflect and evaluate the explanatory potential of competing theories (e.g. econometric, psychological and sociological) when trying to analyze the gap between attitudes and behavior. Liebe et al. (2011) criticize that research that focuses on willingness to pay is mainly based on economic models but must be complemented by psychological and sociological theories.

On the producer side, especially case studies from Central America highlight the potential alternative trade relations can have on the producer's well-being. While the diversity of focus areas and methods used in the second cluster (see Fig. 4b) assessing contextual producer practices facilitates theory building and captures the complexity of global trade relations, most studies are individual case studies without comparative counterfactual groups. Therefore, the results are context-dependent and mostly exploratory. In addition, some publications in this cluster are not explicitly mentioning methods of data gathering, which makes it harder to differentiate between empirical results and conceptual thoughts. Meanwhile, the first cluster deals with the goal to find generalizable results. Some authors are criticizing the methodological setup of impact assessments and say that many case studies have systematic biases. Ruben and Fort (2012) for example are indicating that impact assessments have a strong selection bias. Additionally, Blackman and Rivera (2011) show that many publications are lacking a reliable counterfactual in order to eliminate other describing variables apart from certificates. The distinction of three different research strands suggests that research on this topic is highly heterogeneous which inhibits the integrative potential of empirical results. In order to facilitate cross-learning, the scientific discourse must be transformed into an interdisciplinary discourse, both in terms of methodology and content. Thus, the combination of different methods prevailing in different clusters and contextual aspects could lead to new insights to understand the complexity of global value chains. In order to support this shift we advocate three aspects future research on alternative trade arrangements needs to consider: first, going beyond certificates; second, social and ecological factors; third, science and practitioners.

Going beyond certificates
As shown in the results, the vast majority of literature focuses its attention on the certified market as a form of alternative trade relation. Since its introduction, certifications have created a lot of resonance in the scientific field. Unquestionably, certification schemes have contributed to the popularity of alternative trade arrangements with proposed prospects of increased income for producers and transparency for consumers. This review shows that scholars are interested in whether certificates have the potential to create a difference in producer's well-being and consumers' buying behavior. The indicated results show however that

the presence or absence of certificates has mixed outcomes. On the consumer side, different empirical studies show that certificates have a positive perception by potential customers (Murphy and Jenner-Leuthart, 2011; Lazzarini et al., 2017). It is however questionable if this positive perception results in a change of consumption patterns. As Andorfer and Liebe (2012) point out, empirical testing is often lacking social psychological and sociological perspectives that go beyond narrow economic explanations. An increasing body of literature in the field of sustainability science laid focus on the disconnection between knowledge/values and the respective behavior (e.g. self-assessment and actual buying behavior). Yet, this review shows that many publications still explore consumption behavior based on self-assessment or in vivo studies of potential consumers. This becomes problematic as these kinds of studies can only investigate the question of attitudes and not into the shift of changing consumption patterns. From a sustainability perspective, it must therefore be questioned if certification schemes alone have the potential to transform consumption patterns and issues of global justice.

On the producer side, methodological as well as theoretical limitations hamper knowledge integration (Blackman and Rivera, 2011). This review shows that on the one hand, missing counterfactuals leave a blind spot for other factors than certification on the issue of impact assessments. On the other hand, single case studies can only deliver explorative results that need further testing to conclude about other important factors for impact assessment (Kolk, 2013). Additionally, many contextual aspects make it hard to test for the impact of certification. Arnould et al. (2009) for example argue that even though coffee producers are part of Fairtrade certification schemes, they do not sell their complete harvest within this market. Additionally, other case studies show that many producers use crop diversification in order to cope with fluctuating prices of single crops, like coffee (Makita; 2016). Rueda and Lambin (2012) explain that many smallholders are not adequately addressed by the certified market since they face different barriers when trying to enter this market segment. These aspects are just examples to demonstrate the particularities that make it hard to test for the impact of certification.

Social and Ecological Factors
We show that the literature of alternative trade arrangements has a strong focus on topics of social well-being. We reveal that the majority of literature is mostly focusing on topics of education, equality and income of producers according to the indicators of the doughnut economy by Raworth (2012). While these issues are undoubtedly of great importance, publications that neglect human-environmental interactions potentially jeopardize trajectories to sustainable development (Mastrángelo et al.; 2019). Crises in local and global populations are oftentimes connected or exacerbated through to crises in ecosystems. Mace (2014) elaborates about different paradigms in the area of social-ecological systems and explains that for decades society has been conceptualized apart from nature. Future research however needs to put emphasis on the interactions between societies and nature in order to develop sustainable social-ecological systems. Biodiversity improvements are consistent with maximizing ecosystem services for people, however, as the growth of human population needs the conversion of ecosystems through the construction of canals, agriculture or the drainage of wetlands which results in a loss in biodiversity (Mace, 2014).

Scientific studies that solely focus on issues of social well-being are prone to the risk to give biased policy recommendations. From a social well-being perspective, land use intensification seems like a viable option to tackle the problem of poverty amongst smallholders in the global

south. Through the increase of crop yield, farmers can sell more harvest and therefore increase their income. However, case studies from the field of sustainability science show that the increase in land use intensification has a negative impact on the provisioning functions of ecosystems. Flynn et al (2008) argue that intensifying land use reduces functional diversity beyond species diversity and thus endangers the functioning of the ecosystem. Coscieme et al. (2019) highlight that an increase in efficiency leads to an environmental rebound effect ("Jevons Paradox"). Renton (2009) and Raworth (2012) claim environmental stress has a strong influence on social well-being. In the case of coffee Moguel and Toledo (1999) show that the way plantations are managed has a significant effect on animal diversity. Additionally, Mach et al. (2019) argue that climatic factors play an ever-increasing role as an aspect of armed conflicts in the future. Therefore, scientific studies need to account for these interdependencies.

Science and Practitioners
The complex characteristics and interconnections of social-ecological systems in global settings require scientific approaches that go beyond disciplinary lenses and explore participatory approaches that consist of meaningful collaborations with stakeholders from outside academia. While analytical descriptive studies are very important for advancing the understanding of global value chains, another branch of scientific approaches is needed in order to address and intervene in the complex characteristics and interconnections of social-ecological systems in global settings. New modes of research have been proposed to tackle the complexities by generating outcomes that claim to be meaningful to researchers as well as practitioners (Lang et al., 2012). These approaches – often referred to as transformational, mode-two or post-normal science – aim to develop real-world changes in close collaboration with affected stakeholders involving real-world experimentation and iterative learning (Wiek and Lang, 2016). The collaboration and co-creation of knowledge with perspectives from outside academia is a crucial intervention point for addressing the complexities and uncertain futures of sustainability research (Schoon and Cox, 2018). Transdisciplinary and participatory research has been proposed as fitting approaches to better identify social needs and desired outcomes that consequently include stakeholders from outside academia (Simon and Schiemer, 2015). However, this review shows that participation with actors from outside academia is very scarce (only 3% of the empirical studies explicitly focus on participatory approaches). Norström et al (2020) argue that these approaches do not only generate context-specific knowledge but also support capacity building, generate networks and enhance the implementation of knowledge. Including these approaches within the research on alternative trade arrangements could bear potential intervention points to transform global value chains towards sustainability. From a sustainability science perspective, future research needs to put more focus on research *with* stakeholders to complement existing research. Factors like information asymmetries, stable market links and perceived mutual understanding as well as the effect of poverty on social well-being and ecosystem conservation can play a major role in affecting the positive outcome of alternative trade arrangements.

We acknowledge that these approaches are not a panacea for complex issues and that there is not a "one-size-fits-all"-model for participation. On the contrary, it remains unclear if collaborative governance leads to improved environmental and social outcomes (Koontz and Thomas, 2006). Bodin (2016, 2017) shows that participation sometimes delivers unintended or symbolic outcomes. He argues that there is no "blueprint" for the ideal-typical participatory research process and that analytical-descriptive modes of research should be aligned with

participatory processes that are empirically informed. However, frameworks have been advanced to enhance the quality of participatory research and to deliver practical guidance on meaningful execution and evaluation (Lang et al., 2012; Norström et al. 2020).

6. Conclusion

Globalization and global trade arrangements in particular have a strong influence on sustainability issues. This paper shows that the teleconnection, where consumption of food products in one place can have strong sustainability implications on another distant place. Addressing this topic creates a potential pathway for shifting humanity on more sustainable trajectories. However, our paper also shows that sustainability issues concerned with global trade arrangements are characterized by inherent complexity. This so-called "wickedness" inhibits straightforward governance solutions and requires a deeper investigation and bares the potential for unintended outcomes. One increasingly prominent way to deal with the issue of trade arrangements in the global food market is to create alternative ways of trade relations. This systematic review shows that the topic of alternative trade arrangements is getting more and more prominent within the last 20 years, with an increasing amount of empirical, as well as conceptual publications concerning this topic. However, due to the inherent complexity, scientific investigations are substantially fragmented. With this review, we provide a more comprehensive overview of the scientific literature in order to emphasize the research gaps as well as the potential fields of collaboration. This review provides an extensive overview of the literature and highlights the following points:

(1) The scientific literature is either focusing on the producer or on the consumer. While these are important perspectives, we think that the interconnections through actors within the global value chains need more emphasis in future research.

(2) We show that the literature is predominantly dealing with trade regulations in the form of certification schemes. While we acknowledge that certifications are an important means to change the governance of global value chains, we show that there, is no conclusion if certification schemes create a positive impact on the producer level or change consumption behavior.

(3) Most of the research can be characterized by an analytical-descriptive mode of research. Participatory approaches that include stakeholders from outside academia are rare.

(4) We provide a quantitative word-based analysis to underscore the different epistemic perspectives and show that the literature can be divided into three substantially different strands of literature. Points of investigation are either consumers and their buying behavior (Cluster 3) or impacts of certification schemes on producers' well-being (Cluster 1 and 2) (See Fig. 4b). To support cross-learning between the characterized clusters we provide three aspects that scholars should consider when dealing with the topic of alternative trade arrangements.

(5) Future investigations should go beyond certificates in order to shift the focus to underlying patterns, like information asymmetries, smallholder cooperation and empowerment, or factors that increase ethical consumption behavior.

(6) Future research needs to address the interconnections of social and ecological factors, where land-use intensification can lead to undesired ecological outcomes or land protection can disempower the resource users.

(7) The "wickedness" of the sustainability issues connected to global trade arrangements requires new forms of collaboration between scientists and practitioners. This co-creation of knowledge with the explicit involvement of stakeholders outside academia has been proposed as fitting approach to better identify different perspectives and enhance social robustness of the created outcomes. We think that these aspects are only a starting point, but are crucial for a true interdisciplinary discourse.

Acknowledgements

References

Abson, D.J., von Wehrden, H., Baumgärtner, S., Fischer, J., Hanspach, J., Härdtle, W., Heinrichs, H., Klein, A.M., Lang, D.J., Martens, P., Walmsley, D., 2014. Ecosystem services as a boundary object for sustainability. Ecol. Econ. 103, 29–37. https://doi.org/10.1016/j.ecolecon.2014.04.012

Andorfer, V.A., Liebe, U., 2012. Research on Fair Trade Consumption---A Review. J. Bus. Ethics 106, 415–435. https://doi.org/10.1007/s10551-011-1008-5

Arnould, E., Plastina, A., Ball, D., 2009. Market Disintermediation and Producer Value Capture: The Case of Fair Trade Coffee in Nicaragua, Peru, and Guatemala, in: Cheng, J.L.C., Hitt, M.A., Rosa, J.A., Viswanathan, M. (Eds.), Product and Market Development for Subsistence Marketplaces, Advances in International Management. Emerald Group Publishing Limited, Bingley, pp. 319–340. https://doi.org/10.1016/S1571-5027(07)20014-2

Bacon, C., 2005. Confronting the Coffee Crisis: Can Fair Trade, Organic, and Specialty Coffees Reduce Small-Scale Farmer Vulnerability in Northern Nicaragua? World Dev. 33, 497–511. https://doi.org/10.1016/j.worlddev.2004.10.002

Barham, B.L., Weber, J.G., 2012. The Economic Sustainability of Certified Coffee: Recent Evidence from Mexico and Peru. World Dev. 40, 1269–1279. https://doi.org/10.1016/j.worlddev.2011.11.005

Batie, S.S., 2008. Wicked Problems and Applied Economics. Am. J. Agric. Econ. 90, 1176–1191. https://doi.org/10.1111/j.1467-8276.2008.01202.x

Becchetti, L., Castriota, S., Michetti, M., 2013. The effect of fair trade affiliation on child schooling: Evidence from a sample of Chilean honey producers. Appl. Econ. 45, 3552–3563. https://doi.org/10.1080/00036846.2012.727980

Becchetti, L., Conzo, P., Gianfreda, G., 2012. Market access, organic farming and productivity: The effects of Fair Trade affiliation on Thai farmer producer groups*. Aust. J. Agric. Resour. Econ. 56, 117–140. https://doi.org/10.1111/j.1467-8489.2011.00574.x

Beckmann, M., von Wehrden, H., Palmer, M., 2012. Where you search is what you get: Literature mining - Google Scholar versus Web of Science using a data set from a literature search in vegetation science. J. Veg. Sci. 23, 1197–1199. https://doi.org/10.1111/j.1654-1103.2012.01454.x

Beuchelt, T.D., Zeller, M., 2013. The role of cooperative business models for the success of smallholder coffee certification in Nicaragua: A comparison of conventional, organic

and Organic-Fairtrade certified cooperatives. Renew. Agric. Food Syst. 28, 195–211. https://doi.org/10.1017/S1742170512000087

Blackman, A., Rivera, J., 2011. Producer-level benefits of sustainability certification. Conserv. Biol. 25, 1176–1185. https://doi.org/10.1111/j.1523-1739.2011.01774.x

Bodin, Ö., 2017. Collaborative environmental governance: Achieving collective action in social-ecological systems. Science 357. https://doi.org/10.1126/science.aan1114

Bodin, Ö., Robins, G., McAllister, R.R.J., Guerrero, A.M., Crona, B., Tengö, M., Lubell, M., 2016. Theorizing benefits and constraints in collaborative environmental governance: A transdisciplinary social-ecological network approach for empirical investigations. Ecol. Soc. 21. https://doi.org/10.5751/ES-08368-210140

Borbolla-Pérez, V., Iglesias-Andreu, L.G., Luna-Rodríguez, M., Octavio-Aguilar, P., 2017. Perceptions regarding the challenges and constraints faced by smallholder farmers of vanilla in Mexico. Environ. Dev. Sustain. 19, 2421–2441. https://doi.org/10.1007/s10668-016-9863-y

Borrella, I., Mataix, C., Carrasco-Gallego, R., 2015. Smallholder Farmers in the Speciality Coffee Industry: Opportunities, Constraints and the Businesses that are Making it Possible. IDS Bull. 46, 29–44. https://doi.org/10.1111/1759-5436.12142

Brondizio, E.S., Ostrom, E., Young, O.R., 2009. Connectivity and the Governance of Multilevel Social-Ecological Systems: The Role of Social Capital. Annu. Rev. Environ. Resour. 34, 253–278. https://doi.org/10.1146/annurev.environ.020708.100707

Brooks, T., 2015. Is Fair Trade a fair deal? Cambridge Rev. Int. Aff. 29, 548–561. https://doi.org/10.1080/09557571.2015.1025037

Caniglia, G., Schäpke, N., Lang, D.J., Abson, D.J., Luederitz, C., Wiek, A., Laubichler, M.D., Gralla, F., von Wehrden, H., 2017. Experiments and evidence in sustainability science: A typology. J. Clean. Prod. 169, 39–47. https://doi.org/10.1016/j.jclepro.2017.05.164

Cheng, J.L.C., Hitt, M.A., Rosa, J.A., Viswanathan, M. (Eds.), 2009. Product and market development for subsistence marketplaces, Advances in International Management. Emerald Group Publishing Limited, Bingley.

Chiputwa, B., Qaim, M., 2016. Sustainability Standards, Gender, and Nutrition among Smallholder Farmers in Uganda. J. Dev. Stud. 52, 1241–1257. https://doi.org/10.1080/00220388.2016.1156090

Coscieme, L., Sutton, P., Mortensen, L.F., Kubiszewski, I., Costanza, R., Trebeck, K., Pulselli, F.M., Giannetti, B.F., Fioramonti, L., 2019. Overcoming the Myths of Mainstream Economics to Enable a New Wellbeing Economy. Sustainability 11, 4374. https://doi.org/10.3390/su11164374

Cranfield, J.A.L., Henson, S., Northey, J., Masakure, O., 2010. An assessment of consumer preference for fair trade coffee in Toronto and Vancouver. Agribus. an internat. J. 26, 307–325.

de Ferran, F., Grunert, K.G., 2007. French fair trade coffee buyers' purchasing motives: An exploratory study using means-end chains analysis. Food Qual. Prefer. 18, 218–229. https://doi.org/10.1016/j.foodqual.2005.11.001

Dentoni, D., Bitzer, V., Schouten, G., 2018. Harnessing Wicked Problems in Multi-stakeholder Partnerships. J. Bus. Ethics 150, 333–356. https://doi.org/10.1007/s10551-018-3858-6

Doherty, B., Tranchell, S., 2005. New thinking in international trade? A case study of The Day Chocolate Company. Sustain. Dev. 13, 166–176. https://doi.org/10.1002/sd.273

Dolan, C.S., 2010. Virtual moralities: The mainstreaming of Fairtrade in Kenyan tea fields. Geoforum 41, 33–43. https://doi.org/10.1016/j.geoforum.2009.01.002

Dorninger, C., Abson, D.J., Fischer, J., von Wehrden, H., 2017. Assessing sustainable biophysical human--nature connectedness at regional scales. Environ. Res. Lett. 12, 55001. https://doi.org/10.1088/1748-9326/aa68a5

Eakin, H., DeFries, R., Kerr, S., Lambin, E.F., Liu, J., Marcotullio, P.J., Messerli, P., Reenberg, A., Rueda, X., Swaffield, S.R., Wicke, B., Zimmerer, K., 2014. Significance of Telecoupling for Exploration of Land-Use Change, in: Seto, K.C., Reenberg, A. (Eds.), Rethinking Global Land Use in an Urban Era. The MIT Press, pp. 141–161. https://doi.org/10.7551/mit-press/9780262026901.003.0008

Elder, S.D., Zerriffi, H., Le Billon, P., 2013. Is Fairtrade certification greening agricultural practices? An analysis of Fairtrade environmental standards in Rwanda. J. Rural Stud. 32, 264–274. https://doi.org/10.1016/j.jrurstud.2013.07.009

Feyereisen, M., Stassart, P.M., Mélard, F., 2017. Fair Trade Milk Initiative in Belgium: Bricolage as an Empowering Strategy for Change. Sociol. Ruralis 57, 297–315. https://doi.org/10.1111/soru.12174

Flynn, D.F.B., Gogol-Prokurat, M., Nogeire, T., Molinari, N., Richers, B.T., Lin, B.B., Simpson, N., Mayfield, M.M., DeClerck, F., 2009. Loss of functional diversity under land use intensification across multiple taxa. Ecol. Lett. 12, 22–33. https://doi.org/10.1111/j.1461-0248.2008.01255.x

Fortin, D., Murphy, A., Jenner--Leuthart, B., 2011. Fairly sold? Adding value with fair trade coffee in cafes. J. Consum. Mark. 28, 508–515. https://doi.org/10.1108/07363761111181491

Francesconi, G.N., Ruben, R., 2014. FairTrade's theory of change: An evaluation based on the cooperative life cycle framework and mixed methods. J. Dev. Eff. 6, 268–283. https://doi.org/10.1080/19439342.2014.918164

Gereffi, G., Humphrey, J., Sturgeon, T., 2006. The governance of global value chains. Coporate Gov. Glob. 180–205.

Gregg, J.S., Jürgens, J., Happel, M.K., Strøm-Andersen, N., Tanner, A.N., Bolwig, S., Klitkou, A., 2020. Valorization of bio-residuals in the food and forestry sectors in support of a circular bioeconomy: A review. J. Clean. Prod. 267, 122093. https://doi.org/10.1016/j.jclepro.2020.122093

Han, T.-I., Stoel, L., 2017. Explaining Socially Responsible Consumer Behavior: A Meta-Analytic Review of Theory of Planned Behavior. J. Int. Consum. Mark. 29, 91–103. https://doi.org/10.1080/08961530.2016.1251870

Heinrichs, H., Martens, P., Michelsen, G., Wiek, A. (Eds.), 2016. Sustainability Science: An Introduction. Springer Netherlands, Dordrecht.

Hoon, C., 2013. Meta-Synthesis of Qualitative Case Studies. Organ. Res. Methods 16, 522–556. https://doi.org/10.1177/1094428113484969

Huybrechts, B., Nicholls, A., Edinger, K., 2017. Sacred alliance or pact with the devil? How and why social enterprises collaborate with mainstream businesses in the fair trade sector. Entrep. Reg. Dev. 29, 586–608. https://doi.org/10.1080/08985626.2017.1328905

Ives, C.D., Abson, D.J., von Wehrden, H., Dorninger, C., Klaniecki, K., Fischer, J., 2018. Reconnecting with nature for sustainability. Sustain. Sci. 13, 1389–1397. https://doi.org/10.1007/s11625-018-0542-9

Ives, C.D., Giusti, M., Fischer, J., Abson, D.J., Klaniecki, K., Dorninger, C., Laudan, J., Barthel, S., Abernethy, P., Martín-López, B., Raymond, C.M., Kendal, D., von Wehrden, H., 2017. Human--nature connection: A multidisciplinary review. Curr. Opin. Environ. Sustain. 26–27, 106–113. https://doi.org/10.1016/j.cosust.2017.05.005

Jaffee, D., 2014. Brewing Justice: Fair Trade Coffee, Sustainability, and Survival, Updated edition. ed. University of California Press, Oakland, California.

Jaffee, D., 2012. Weak Coffee: Certification and Co-Optation in the Fair Trade Movement. Soc. Probl. 59, 94–116. https://doi.org/10.1525/sp.2012.59.1.94

Jianguo Liu, Vanessa Hull, Mateus Batistella, Ruth DeFries, Thomas Dietz, Feng Fu, Thomas W. Hertel, R. Cesar Izaurralde, Eric F. Lambin, Shuxin Li, Luiz A. Martinelli, William J. McConnell, Emilio F. Moran, Rosamond Naylor, Zhiyun Ouyang, Karen R. Polenske, Anette Reenberg, Gilberto de Miranda Rocha, Cynthia S. Simmons, Peter H. Verburg, Peter M. Vitousek, Fusuo Zhang, Chunquan Zhu, n.d. Framing Sustainability in a Telecoupled World.

Kolk, A., 2013. Mainstreaming sustainable coffee. Sustain. Dev. 21, 324–337. https://doi.org/10.1002/sd.507

Koontz, T.M., Thomas, C.W., 2006. What Do We Know and Need to Know about the Environmental Outcomes of Collaborative Management? Public Adm. Rev. 66, 111–121. https://doi.org/10.1111/j.1540-6210.2006.00671.x

Koppel, H., Schulze, G.G., 2013. The Importance of the Indirect Transfer Mechanism for Consumer Willingness to Pay for Fair Trade Products---Evidence from a Natural Field Experiment. J. Consum. Policy 36, 369–387. https://doi.org/10.1007/s10603-013-9234-0

Krausmann, F., Langthaler, E., 2019. Food regimes and their trade links: A socio-ecological perspective. Ecol. Econ. 160, 87–95. https://doi.org/10.1016/j.ecolecon.2019.02.011

Lang, D.J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., Swilling, M., Thomas, C.J., 2012. Transdisciplinary research in sustainability science: Practice, principles, and challenges. Sustain. Sci. 7, 25–43. https://doi.org/10.1007/s11625-011-0149-x

Lazzarini, G.A., Visschers, V.H.M., Siegrist, M., 2017. Our own country is best: Factors influencing consumers' sustainability perceptions of plant-based foods. Food Qual. Prefer. 60, 165–177. https://doi.org/10.1016/j.foodqual.2017.04.008

Legendre, P., Legendre, L., 1998. Numerical ecology, 2. engl. ed. ed, Developments in environmental modelling. Elsevier, Amsterdam.

Lenschow, A., Newig, J., Challies, E., 2015. Globalization's limits to the environmental state? Integrating telecoupling into global environmental governance. Env. Polit. 25, 136–159. https://doi.org/10.1080/09644016.2015.1074384

Levin, K., Cashore, B., Bernstein, S., Auld, G., 2012. Overcoming the tragedy of super wicked problems: Constraining our future selves to ameliorate global climate change. Policy Sci. 45, 123–152. https://doi.org/10.1007/s11077-012-9151-0

Levy, D., Reinecke, J., Manning, S., 2016. The Political Dynamics of Sustainable Coffee: Contested Value Regimes and the Transformation of Sustainability. J. Manag. Stud. 53, 364–401. https://doi.org/10.1111/joms.12144

Liebe, U., Preisendörfer, P., Meyerhoff, J., 2009. To Pay or Not to Pay: Competing Theories to Explain Individuals' Willingness to Pay for Public Environmental Goods. Environ. Behav. 43, 106–130. https://doi.org/10.1177/0013916509346229

Liu, J., Hull, V., Batistella, M., DeFries, R., Dietz, T., Fu, F., Hertel, T.W., Izaurralde, R.C., Lambin, E.F., Li, S., Martinelli, L.A., McConnell, W.J., Moran, E.F., Naylor, R., Ouyang, Z., Polenske, K.R., Reenberg, A., de Miranda Rocha, G., Simmons, C.S., Verburg, P.H., Vitousek, P.M., Zhang, F., Zhu, C., 2013. Framing Sustainability in a Telecoupled World. Ecol. Soc. 18. https://doi.org/10.5751/ES-05873-180226

Loconto, A., 2015. Can Certified-Tea Value Chains Deliver Gender Equality in Tanzania? Fem. Econ. 21, 191–215. https://doi.org/10.1080/13545701.2014.1001765

4. Results

Lotz, S., Christandl, F., Fetchenhauer, D., 2013. What is fair is good: Evidence of consumers' taste for fairness. Food Qual. Prefer. 30, 139–144. https://doi.org/10.1016/j.food-qual.2013.05.010

Lowe, E.R., 2014. Technical regulations to prevent deceptive practices: Can WTO members protect consumers from [un] fair-trade coffee and [less-than] free-range chicken? J. world trade law, Econ. public policy 48, 593–628.

Luederitz, C., Meyer, M., Abson, D.J., Gralla, F., Lang, D.J., Rau, A.-L., von Wehrden, H., 2016. Systematic student-driven literature reviews in sustainability science -- an effective way to merge research and teaching. J. Clean. Prod. 119, 229–235. https://doi.org/10.1016/j.jclepro.2016.02.005

Lyon, S., Mutersbaugh, T., Worthen, H., 2017. The triple burden: The impact of time poverty on women's participation in coffee producer organizational governance in Mexico. Agric. Human Values 34, 317–331. https://doi.org/10.1007/s10460-016-9716-1

MacGregor, F., Ramasar, V., Nicholas, K.A., 2017. Problems with Firm-Led Voluntary Sustain-ability Schemes: The Case of Direct Trade Coffee. Sustainability 9, 651. https://doi.org/10.3390/su9040651

Mach, K.J., Kraan, C.M., Adger, W.N., Buhaug, H., Burke, M., Fearon, J.D., Field, C.B., Hendrix, C.S., Maystadt, J.-F., O'Loughlin, J., Roessler, P., Scheffran, J., Schultz, K.A., von Uexkull, N., 2019. Climate as a risk factor for armed conflict. Nature 571, 193–197. https://doi.org/10.1038/s41586-019-1300-6

Makita, R., 2016. A Role of Fair Trade Certification for Environmental Sustainability. J. Agric. Environ. Ethics 29, 185–201. https://doi.org/10.1007/s10806-016-9604-0

Mastrángelo, M.E., Pérez-Harguindeguy, N., Enrico, L., Bennett, E., Lavorel, S., Cumming, G.S., Abeygunawardane, D., Amarilla, L.D., Burkhard, B., Egoh, B.N., Frishkoff, L., Galetto, L., Huber, S., Karp, D.S., Ke, A., Kowaljow, E., Kronenburg-García, A., Locatelli, B., Martín-López, B., Meyfroidt, P., Mwampamba, T.H., Nel, J., Nicholas, K.A., Nicholson, C., Oteros-Rozas, E., Rahlao, S.J., Raudsepp-Hearne, C., Ricketts, T., Shrestha, U.B., Torres, C., Winkler, K.J., Zoeller, K., 2019. Key knowledge gaps to achieve global sustain-ability goals. Nat. Sustain. 113, 6105. https://doi.org/10.1038/s41893-019-0412-1

Miller, D., Williams, P., 2009. What Price a Living Wage? Glob. Soc. Policy An Interdiscip. J. Public Policy Soc. Dev. 9, 99–125. https://doi.org/10.1177/1468018108100400

Mithun Ali, S., Moktadir, M.A., Kabir, G., Chakma, J., Rumi, M.J.U., Islam, M.T., 2019. Frame-work for evaluating risks in food supply chain: Implications in food wastage reduction. J. Clean. Prod. 228, 786–800. https://doi.org/10.1016/j.jclepro.2019.04.322

Moberg, M., n.d. Fair trade and Eastern Caribbean banana farmers: Rhetoric and reality in the anti-globalization movement.

Moguel, P., Toledo, V.M., 1999. Biodiversity Conservation in Traditional Coffee Systems of Mexico. Conserv. Biol. 13, 11–21. https://doi.org/10.1046/j.1523-1739.1999.97153.x

Morrell, K., Jayawardhena, C., 2010. Fair trade, ethical decision making and the narrative of gender difference. Bus. ethics a Eur. Rev. 19, 393–407.

Mull, L.D., Kirkhorn, S.R., 2005. Child labor in Ghana cocoa production: Focus upon agricul-tural tasks, ergonomic exposures, and associated injuries and illnesses. Public Health Rep. 120, 649–655. https://doi.org/10.1177/003335490512000613

Namany, S., Govindan, R., Alfagih, L., McKay, G., Al-Ansari, T., 2020. Sustainable food security decision-making: An agent-based modelling approach. J. Clean. Prod. 255, 120296. https://doi.org/10.1016/j.jclepro.2020.120296

Parvathi, P., Waibel, H., 2015. Adoption and impact of black pepper certification in India. Q. J. Int. Agric. 54, 133–161.

Rau, A.-L., Bickel, M.W., Rathgens, J., Schroth, T.N., Weiser, A., Hilser, S., Jenkins, S., McCrory, G., Pfefferle, N., Roitsch, D., Stålhammar, S., Villada, D., Wamsler, C., Krause, T., von Wehrden, H., 2018. Linking concepts of change and ecosystem services research: A systematic review. Chang. Adapt. Socio-Ecological Syst. 4, 33–45. https://doi.org/10.1515/cass-2018-0004

Raworth, K., 2012. A safe and just space for humanity: Can we live within the doughnut. Oxfam Policy Pract. Clim. Chang. Resil. 8, 1–26.

Raynolds, L.T., 2012. Fair Trade: Social regulation in global food markets. J. Rural Stud. 28, 276–287. https://doi.org/10.1016/j.jrurstud.2012.03.004

Raynolds, L.T., 2009. Mainstreaming Fair Trade Coffee: From Partnership to Traceability. World Dev. 37, 1083–1093. https://doi.org/10.1016/j.worlddev.2008.10.001

Raynolds, L.T., 2002. Consumer/Producer Links in Fair Trade Coffee Networks. Sociol. Ruralis 42, 404–424. https://doi.org/10.1111/1467-9523.00224

Raynolds, L.T., Murray, D., Leigh Taylor, P., 2004. Fair trade coffee: Building producer capacity via global networks. J. Int. Dev. 16, 1109–1121. https://doi.org/10.1002/jid.1136

Raynolds, L.T., Ngcwangu, S.U., 2010. Fair Trade Rooibos tea: Connecting South African producers and American consumer markets. Geoforum 41, 74–83. https://doi.org/10.1016/j.geoforum.2009.02.004

Renton, A., 2009. Suffering the science: Climate change, people, and poverty, Oxfam Briefing Paper. Oxfam International, [Oxford?].

Reynolds, A., 2013. Networks, ethics, and economic values: Faith-based business and the coffee trade in Central America. Lat. Am. Res. Rev. 112–132.

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin III, F.S., Lambin, E.F., Lenton, T.M., Scheffer, M., Folke, C., Schellnhuber, H.J., Nykvist, B., de Wit, C.A., Hughes, T., van der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P.K., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R.W., Fabry, V.J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P., Foley, J.A., 2009. A safe operating space for humanity. Nature 461, 472 EP-. https://doi.org/10.1038/461472a

Ruben, R., Fort, R., 2012. The Impact of Fair Trade Certification for Coffee Farmers in Peru. World Dev. 40, 570–582. https://doi.org/10.1016/j.worlddev.2011.07.030

Rueda, X., Lambin, E.F., 2013. Linking Globalization to Local Land Uses: How Eco-Consumers and Gourmands are Changing the Colombian Coffee Landscapes. World Dev. 41, 286–301. https://doi.org/10.1016/j.worlddev.2012.05.018

Schoon, M., Cox, M., 2018. Collaboration, Adaptation, and Scaling: Perspectives on Environmental Governance for Sustainability. Sustainability 10, 679. https://doi.org/10.3390/su10030679

Seto, K.C., Reenberg, A. (Eds.), 2014. Rethinking Global Land Use in an Urban Era. The MIT Press. https://doi.org/10.7551/mitpress/9780262026901.001.0001

Simms, C., Trott, P., van den Hende, E., Hultink, E.J., 2020. Barriers to the adoption of waste-reducing eco-innovations in the packaged food sector: A study in the UK and the Netherlands. J. Clean. Prod. 244, 118792. https://doi.org/10.1016/j.jclepro.2019.118792

Simon, D., Schiemer, F., 2015. Crossing boundaries: Complex systems, transdisciplinarity and applied impact agendas. Curr. Opin. Environ. Sustain. 12, 6–11. https://doi.org/10.1016/j.cosust.2014.08.007

Stewart, R.B., 1992. Environmental Law in the United States and the European Community: Spillovers, Cooperation, Rivalry, Institutions. Univ. Chic. Leg. Forum 41–80.

Taylor, P.L., 2005. In the Market But Not of It: Fair Trade Coffee and Forest Stewardship Council Certification as Market-Based Social Change. World Dev. 33, 129–147. https://doi.org/10.1016/j.worlddev.2004.07.007

Tellman, B., Gray, L.C., Bacon, C.M., 2011. Not Fair Enough: Historic and Institutional Barriers to Fair Trade Coffee in El Salvador. J. Lat. Am. Geogr. 10, 107–127. https://doi.org/10.1353/lag.2011.0037

Terstappen, V., Hanson, L., McLaughlin, D., 2013. Gender, health, labor, and inequities: A review of the fair and alternative trade literature. Agric. Human Values 30, 21–39. https://doi.org/10.1007/s10460-012-9377-7

Tranfield, D., Denyer, D., Smart, P., 2003. Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. Br. J. Manag. 14, 207–222. https://doi.org/10.1111/1467-8551.00375

Tripathi, L., Mwangi, M., Abele, S., Aritua, V., Tushemereirwe, W.K., Bandyopadhyay, R., 2009. Xanthomonas Wilt: A Threat to Banana Production in East and Central Africa. Plant Dis. 93, 440–451. https://doi.org/10.1094/PDIS-93-5-0440

von Geibler, J., 2013. Market-based governance for sustainability in value chains: Conditions for successful standard setting in the palm oil sector. J. Clean. Prod. 56, 39–53. https://doi.org/10.1016/j.jclepro.2012.08.027

Wahl, A., Bull, G.Q., 2014. Mapping Research Topics and Theories in Private Regulation for Sustainability in Global Value Chains. J. Bus. Ethics 124, 585–608. https://doi.org/10.1007/s10551-013-1889-6

Wiek, A., Lang, D.J., 2016. Transformational Sustainability Research Methodology, in: Heinrichs, H., Martens, P., Michelsen, G., Wiek, A. (Eds.), Sustainability Science: An Introduction. Springer Netherlands, Dordrecht, pp. 31–41. https://doi.org/10.1007/978-94-017-7242-6_3

Wilson, B.R., 2010. Indebted to Fair Trade? Coffee and crisis in Nicaragua. Geoforum 41, 84–92. https://doi.org/10.1016/j.geoforum.2009.06.008

Woroniecki, S., Krüger, R., Rau, A.--L., Preuss, M.S., Baumgartner, N., Raggers, S., Niessen, L., Holländer, L., Beyers, F., Rathgens, J., Wagner, K.C., Habigt, L., Krause, T., Wamsler, C., von Wehrden, H., Abson, D., 2019. The framing of power in climate change adaptation research. Wiley Interdiscip. Rev. Clim. Chang. 10, 1. https://doi.org/10.1002/wcc.617

Wright, C., Madrid, G., 2016. Contesting Ethical Trade in Colombia's Cut-Flower Industry: A Case of Cultural and Economic Injustice. Cult. Sociol. 1, 255–275. https://doi.org/10.1177/1749975507078190

Yu, Y., Feng, K., Hubacek, K., 2013. Tele-connecting local consumption to global land use. Glob. Environ. Chang. 23, 1178–1186. https://doi.org/10.1016/j.gloenvcha.2013.04.006

4.2 Adapting to change: An empirical case study of the social-ecological challenges and adaptive management practices of smallholder coffee-farmers in Uganda

Julius Rathgens, Neha Chauhan, Henrik von Wehrden

Abstract

Fairtrade certifications and other means of ethical trading try to change the exploitative structures of global trade by creating regulations that improve the livelihoods of smallholder farmers in the global south while maintaining the capacity of the ecosystems they rely on. However, the complexity of global trade arrangements often limits the success of such regulation efforts. Climate change is an additional factor that heavily affects smallholder farmers, but current certification programs struggle to respond to them. To generate relevant, context-sensitive policies and standards, there is a need for a better understanding of the actual environmental and social conditions affecting local farmers. This paper uses a participatory, social-ecological network approach, providing a deeper understanding of the challenges farmers are facing, as well as their management strategies. Drawing from 20 focus group discussions with respectively 20-30 smallholder 12. coffee farmers in two districts of Uganda, this paper examines the social and environmental stressors and their interrelationships affecting the livelihoods farmers as well as their current management practices. Our results suggest that pests and diseases (e.g., stem borer and leaf rust), as well as abiotic stressors (e.g. precipitation and temperature changes), are currently already heavily affecting the management practices of smallholder farmers. Furthermore, reliable trade relationships, as well as infrastructural vulnerabilities, are prominent socio-economic stressors. Our findings suggest that a combination of farm-level management practices (e.g., intercropping and contour construction), as well as plant-based management practices (e.g., nature-based repellents) are useful practices to enhance the robustness of the respective farms. Additionally, the formation of democratic co-operatives and governmental support enhances information flow to enhance adaptive management strategies. We then provide projections how climate change as a catalyst for ecological stressors will affect the farmers in the future. our Ecological stress in all its nuances will most likely increase substantially in the near future. We therefore highlight the need to keep in mind the interconnections of social and ecological factors, as a shift in one domain can have strong implications on the other.

1. Introduction

Global trade arrangements have contributed to an emergence of complex value chains that connect geographically distant regions through global markets (Liu et al. 2013, Gereffi et al. 2005). These trade arrangements enable producers from Uganda to sell their products to distant regions via global markets. Thus, they have the potential to increase prosperity in producing regions by satisfying demand in consuming regions. However, these trade arrangements have been framed as being highly exploitative towards producers and ecosystems in countries of product origin and perpetuate global inequality (Dorninger et al. 2021). In particular, issues of justice, information asymmetries as well as ecosystem degradation are related to global trade arrangements (Blackman and Rivera 2011).

Soft commodities, like coffee, tea, and tropical fruits can only be produced in constrained regions and thus are only available worldwide through global markets. Consequently, global demand increasingly influences national markets. These demands with social, as well as ecological impacts in the respective regions. The international coffee price has a direct effect on the livelihood on rural households of coffee farmers worldwide (Bussolo 2007). Additionally,

global trade has a strong impact on resource use in producing regions with detrimental effects on local ecosystems and economies (Dorninger et al. 2021). Apart from global production and consumption, climate change is one of the main drivers for ecological changes, which more often than not increase pressure on ecosystems where coffee is grown. Since most coffee producers are smallholder farmers their social well-being strongly depends on their farming practices (Rice, 2018). Changes in the socio-economic system through the change of global prices or political conflicts can thus effect on the livelihoods of the coffee smallholders. Additionally, changes in the ecosystem due to climate change plays an ever-increasing role.

Bringing global value chains and the associated actors towards more sustainable trajectories remains a "Wicked problem" (Rittel and Webber 1973). The involvement of different actors from different countries and the interdependent factors between socio-economic and ecological domains make straightforward private or public regulations difficult. Moreover, climate change will most likely radically transform landscapes in producing regions and the livelihoods of the depending actors. Understanding the perceptions and challenges of the producing actors in global value chains is thus becoming even more relevant. In the case of coffee, climate change, as well as socio-economic variability have been proposed to create negative effects for the producers (Bacon et al. 2017). Since these producers are usually smallholder farmers with less than two hectares of arable land, the vulnerability of these actors to socio-economic as well as climatic volatilities is very high (Ricciardi et al. 2021).

While there is an increasing number of publications dealing with social issues in producing countries, there is a lack of participatory approaches that explicitly include the perspectives of the producers in global value chains (Rathgens et al. 2020). Participatory approaches are not a panacea to complex sustainability issues but they may produce knowledge that helps to approximate solutions for wicked problems. These approaches on the one hand support researchers to gain validated data through mutual reflection processes with affected stakeholders. Additionally, it clarifies the purpose of the researcher to the stakeholders allowing these stakeholders to steer the processes into meaningful areas. As Miller (2013) states, these research processes should function as a boundary zone, where science and society can engage in a dialectical process to create knowledge that is meaningful for scientists as well as practitioners.

In this article we, therefore, investigate the ecological challenges, coffee producers are facing, the role of climate change, as well as their management practices and social structures, to better understand how they are coping with these challenges. We lay a special focus on the adaptive management practices of the smallholder farmers, as well as their formal and informal organization. Thus, this paper sheds light on the interconnections of social and ecological systems through a participatory network approach. We first lay out the theoretical background drawing from the nested scale framework as proposed by Colding and Barthel (2019). In the case description, we explain why Uganda is a good opportunity to study the interconnections of social and ecological factors. We, therefore, layout our study context and design where we explain why we based our research on participatory focus group discussions together with smallholder coffee communities, using the "NET-MAP"-method of Schiffer and Hauck (2010) and combining it with the social-ecological networks proposed by Bodin et al. (2016, 2017). In the results section we give the reader an overview of the faced social and ecological challenges. In the discussion, we try to assess how climate change might affect the

farmers shortly. With the combination of these two approaches, we want to get a better understanding of the ecological challenges smallholders are facing and their organizational capacities to cope with these challenges. It will also give insights into their risk perception and management strategies. The results play into a broader aim of generating a framework to bridge the gap between scientific and local knowledge production.

2. Theoretical Background

Social and Environmental issues have been proposed as being closely interconnected in scale and domain. Macroscopic properties are the result of the collective action of agglomerative clusters of individual actors (Levin et al. 2012). Additionally, changes in structural patterns, like supply chain laws or strong price fluctuations and variation in precipitation and temperature (climatic factors) will have a direct impact on the farming practices and livelihoods of the producing actors.
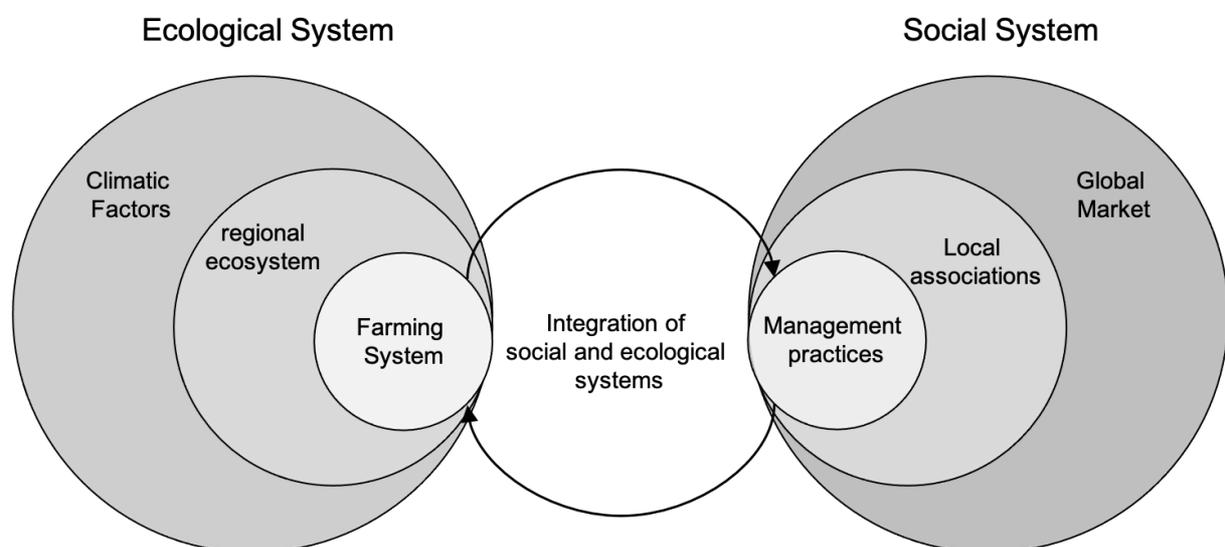
Ecological System   Social System

Climatic Factors   Global Market
regional ecosystem   Local associations
Farming System   Integration of social and ecological systems   Management practices

Fig. 2: Framework for nested scales of the ecological and social system, based on Colding and Barthel (2019)

At farm-level the ecosystem is strongly affected through management practices. Similarly, the well-being of the producers directly depends on soil fertility, pollination and harvesting volatilities. Besides, external ecological factors, like precipitation, temperature and other climatic factors, and external social factors like governmental influence, infrastructure and the organization of the cooperative with the respective communities, also play an important role in the well-being of the social ecological farming system (See Fig. 1). Knowledge about management practices and ecological problems is usually provided through formal workshops within cooperatives. Additionally, informal social networks (e.g., supportive neighborhoods, communities and social interactions with other actors) have been hypothesized to play an important role as they present a low barrier and create meaningful exchange (Bodin and Crona 2007).

These interdependencies make social ecological systems very hard to analyze, let alone plan interventions (Berkes and Folke 2002). Undoubtedly smallholder farmers will need to adapt to climate change in the future, but creating accurate models of these complex, adaptive systems that present simple and reductionist determining factors is hard, if not impossible. But incorporating the multifaceted magnitude of the factors that influence the ecosystem well-being of the producing regions and the livelihood of the producers relying on them requires

interdisciplinary approaches that incorporate the local knowledge of affected actors (Levin et al. 2012, Worm et al. 2006).

Farmers have a direct dependency on climatic factors and their associated changes. Their livelihood and wellbeing are directly impacted by climate change. This dependency has led farmers to have long term perspectives about climate change and allied risks. Perception is the process through which humans apprehend changes and risks of the environment and generate strategies in response (Schlüter et al. 2017). It spans from the cognitive ability, along with available knowledge about impacts, the perceived behavioral choices and hence the ultimate selection of adaptation and mitigation strategies. Literature focused on climate change perception emphasizes that farmer's demography, assets, farm characteristics and institutional support, play a significant role in arbitrating the perception of climate risks. This explains the need for emphasis required on studying and understanding farmer's perceptions, as the individual's perceived notion of risk forms the basis of valuation of climate risk (Li et al. 2017). Although, climate risk perception is the fundamental basis behind climate change adaptation and mitigation strategies, these perceptions are altered by underlying socio-economic, ecological factors, and farm characters. There exists a direct relationship between farmer's perception and farming experience, education and type of irrigation sources (Simelton et al. 2013, Deressa 2007). These findings assert the existence of heterogeneous perceptions of farmers to climate risk, majorly due to differential resource endowment. These perceptions are the baseline for the ability of the coffee producers to create resilient farming systems. In this article we will use the definition of Levin et al. (2012): "Resilience or robustness refers to a system's ability to continue to function when intrinsic and extrinsic disturbances occur." This resilience is used under the notion that the actors within it either try to create a system that resists external stressors, or are able to reorganize after the change occurred (Folke et al. 2010).

A detailed evaluation of the risk perception by heterogeneous farming households is needed to comprehend the differentiated concerns of local communities and to generate a knowledge base for the effective support needed by diverse farmers in decision making for short-term and long-term adaptation strategies against increasing climate risks. There is a growing consensus that farmers have a clear, coherent, and analytical way of perceiving the disparate natural processes transpiring in their farmlands and changes happening in them (Cerdán et al. 2012, Anik & Khan 2012, Kangalawe et al. 2011, Soto-Pinto et al. 2007). However, because of the wide range of local effects of weather variability, local knowledge is has been contested to generate generalizable knowledge beyond a certain level. Despite these limitations, local knowledge consists of varied forms of technical, scientific knowledge and social wisdom, especially relevant to developmental processes. The advancement of local knowledge is required not only with respect to its extraction but also its documentation. The focus of this article is therefore to understand what ecological challenges farmers perceive and what adaptive management practices they are using in order to create resilient farming systems. Additionally, this article lays a focus on the formal and informal organizations farmers recognize to create support structures.

3. Methods

3.1 Case description

Coffee is a major cash crop in Uganda accounting for about 20–30% of foreign exchange earnings, with a dominance of Robusta Coffee. Arabica Coffee on the other hand is a more sensitive

plant, which only grows in specific altitudes and climate conditions. Nevertheless, and also due to its comparatively higher market price Arabica Coffee production has increased and is now one of Uganda's biggest export commodities (Ssebunya 2019). Smallholder farmers, whose average farm sizes range from 0.5 to 2.5 ha, produce 90% of Uganda's coffee (Ssebunya 2019). These smallholders usually live in communities in remote areas and are often disconnected from direct reliable trade relations. Arabica coffee has two harvesting seasons in Uganda, one around September and one around February.

Being a cash crop coffee is an attractive source of income for many producers in remote locations. This remoteness oftentimes however, leads to a lack of information regarding market prices which may lead to the exploitation of farmers through middlemen. One way to tackle this issue for farmers is to organize themselves in cooperatives. These cooperatives usually consist of many different communities working together under one organization to split costs for bigger investments (e.g., drying tools, pulping machines), share responsibilities, and increase information flow about climatic factors, potential buyers, management practices, and governmental funding or restrictions. Even though the organization of individual farmers poses much potential it can also add to the predisposed exploitation through middlemen. Besides, every form of organization creates time constraints which creates opportunity costs for farmers, making the formation of cooperatives not automatically a strong, democratic process, but may instead create additional potential pitfalls, as well as chances of conflicts. The livelihoods of these smallholder coffee farmers are already highly vulnerable. Climate change increases this vulnerability even further (Jassogne et al. 2013). With droughts becoming longer and stronger, unpredictable rainfall patterns, and an increase in pests and diseases, climate change is already hitting Uganda (as the changing climate supports growing reproduction). These adverse impacts of climate change are likely to increase within the next decades (Osbahr 2011).

Climate change affects Arabica coffee production directly and indirectly; directly because the climate affects the flowering of coffee and the bean filling, and indirectly due to the appearance or increasing incidence of certain pests and diseases (while others disappear or decrease) (Jassogne et al. 2013). Farmers are trying to adapt to these changes through different adaptive management practices. These consist of growing shade trees to adapt to increasing droughts and the creation of contours against soil erosion. But even without climate change, they already have a high vulnerability towards yield volatilities, due to insufficient monetary capital. Therefore, every adaptation strategy is unlikely to be adopted unless it brings out short-term economic stability. (Jassogne et al. 2013)

3.2 Study Context
This study was carried out in close collaboration with two coffee cooperatives in the eastern and western parts of Uganda. Both cooperatives are growing coffee in a garden system, where they intercrop Arabica Coffee with Shade Trees (e.g., Banana Trees), food crops (e.g. Matoke, Groundnuts), and other cash crops (e.g. cocoa and vanilla). Both of them are relatively newly established cooperatives and are organized as a democratic cooperative with organic farming practices (e.g., no chemical pesticides and fertilizers). Even though Uganda is known for its Robusta coffee the farmers of these cooperatives produce washed Arabica coffee. The process of washed Arabica consists of pulping, fermenting, and washing the coffee beans. They then dry the beans and peel the parchment. The green beans then are stored in a central storage unit of the cooperative and then checked for quality consistency (See Fig. 2).
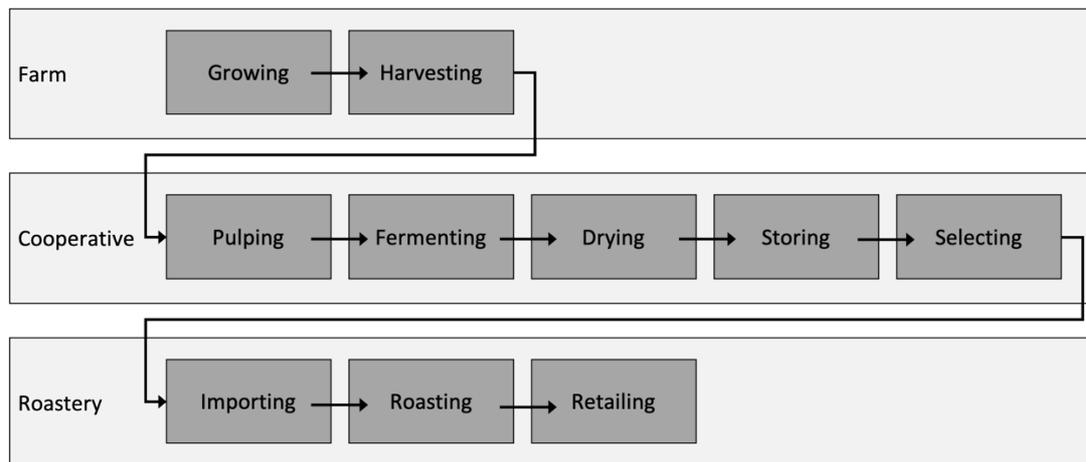
Fig. 3: Schematic Image of the production process of coffee with the main actors connected to the individual steps of the coffee production

The eastern part of the case study was carried out with the cooperative "Mt. Elgon Organic Farmers (MEOFA)" which consists of 1800 smallholder farmers. It is in an area clustered around Mount Elgon close to the city Mbale. MEOFA is a relatively new cooperative, thus they are not yet certified, but work under organic farming practices and are in the application process to become Fairtrade certified. The western part was carried out in close collaboration with the cooperative "Bakonzo Organic Farmers Cooperative Union (BOCU)", which consists of 3000 farmers that are involved in washed arabica coffee. Out of 3000 farmers, 1975 are certified as organic and Fairtrade farmers and 1025 are in the transition to organic certification (2nd year). They are clustered around the area of the Rwenzori Mountains approximately to the city Kasese.

3.3 Research Design

Within our study, we conducted 20 Focus Group Discussions of which 12 were done with farmers from MEOFA and 8 with farmers from BOCU. For our interviews, we were using the NET-MAP Design invented by Schiffer and Hauck (2010). Its basis is a mapping tool that supports stakeholders as well as researchers to understand, discuss and evaluate certain contexts. Through the creation of influence network maps, stakeholders and participants of the focus groups can iterate and clarify their opinions. NET-MAP helps stakeholders define the kinds of influence that exist, the actors that are involved in a given network, how and why different actors are linked the degree to which different actors have influence. Norström et al. (2020) indicate that knowledge co-production with non-academics should gain more importance as it gives on the one hand new empirical insights for academic discourses, on the other hand, it creates knowledge that is meaningful for affected stakeholders. In the light of this argument, we used a participatory network approach that tries to engage with the coffee producers. This network approach is based on two theoretical frameworks. On the one hand, it incorporates the framework of social ecological networks. Bodin (2016) uses a network approach to analyze the interconnections of social actors and ecological systems. Through this framework, it is, therefore, possible to put emphasis on the interdependencies of social actors and to be more specific with their connections to ecological issues. However, since this approach usually cannot detect a qualitative reflection through the interviewees, we used a more participatory approach for gathering the data. Schiffer and Hauck (2010) use focus group discussions to collect data. In this process, interviewees and researchers need to create a mutual understanding. Through the use of symbols and visualizations, actors get a better understanding of the issue at hand, which gives more validity to the data. In addition, it creates a form of agency,

since the researcher is trying to visualize the statements of the actors, which gives space for iteration and correction. This aspect not only supports stakeholders who might be illiterate but also improves the social robustness, as the participants can ask questions and directly change the outcome of the gathered data.

4. Results

Ecological challenges are already a strong threat to coffee producers in sub-Saharan Africa. As most of the producers are smallholder farmers they are especially affected by changes in the surrounding ecosystems. Based on the social-ecological networks of the focus group discussions with 20 smallholder communities we created a Sankey Diagram that presents the ecological challenges, as perceived by the farmers and their respective adaptive management practices (For a more interactive plot see the supplementary material). All statistics and plots have been generated using the software R (R Core Team 2020).

4.1 Ecological Challenges

Based on the focus group discussions the farmers indicated several stressors through a LIKERT Scale from 1-5. Based on this scale we clustered the ecological challenges into three subgroups (1) Abiotic Stressors; (2) Pests and Diseases; and (3) Phenological Stressors (See Figure 2). Certainly, the different ecological challenges affect the individual farm plots differently. Therefore, we used the median to gain an overall ordination of the most pressing challenges and indicated the variance of the respective assessments. Overall, the most pressing challenges can be clustered in the subgroup of pests and diseases. A diversity of pests and diseases exists that does not only decrease the produce quantity but also has the ability to strongly impact the quality of produce and the overall health of coffee plots. The effect of pests and diseases on the product varies depending upon the plant and pest species involved. Many pests and diseases affect the flower, leaves, stem, and other parts of coffee plants, such as the Stem Borer (Median: 5; var. 5-2,75) and Leaf Rust (Median: 4; var. 5-2,75), thus weakening the coffee plant and its produce. This may lead to reduced foliation, decreased nutrient uptake, or imbalance. The Berry Borer, as another major pest of major concern (Median: 2; var. 4-0), directly affects the quantity and quality of the coffee harvest through attacking the coffee berries, as they drill holes into the green berry to lay eggs. This leads to impeded coffee bean qualities or even the dying out of the coffee berries with harvest losses. All these have a direct or indirect impact on the quantity and quality of beans.

The second subgroup of ecological challenges consists of abiotic stressors. The farmers perceived soil erosion (Median: 4; var. 5-2,75) and droughts (Median: 1,25; var. 5-0) as the major threats. Soil erosion is particularly detrimental as it is not only affecting the yield but also the overall structure of the farm. It undermines the root structures of the coffee crops draining them from nutrition and destabilizing the crop itself. Additionally, it negatively affects the farm structure, as the arable land is usually constructed on higher altitudes with slopes. Through the erosion process soil gets washed away, leaving the farmers with less arable cropland. Droughts have been perceived with a high variance. One reason for the variability of the scoring is the different locations of the farm plots, as some of the farmers are on northern-facing slopes with less sun and others are located on different angles with a higher exposition to radiation.
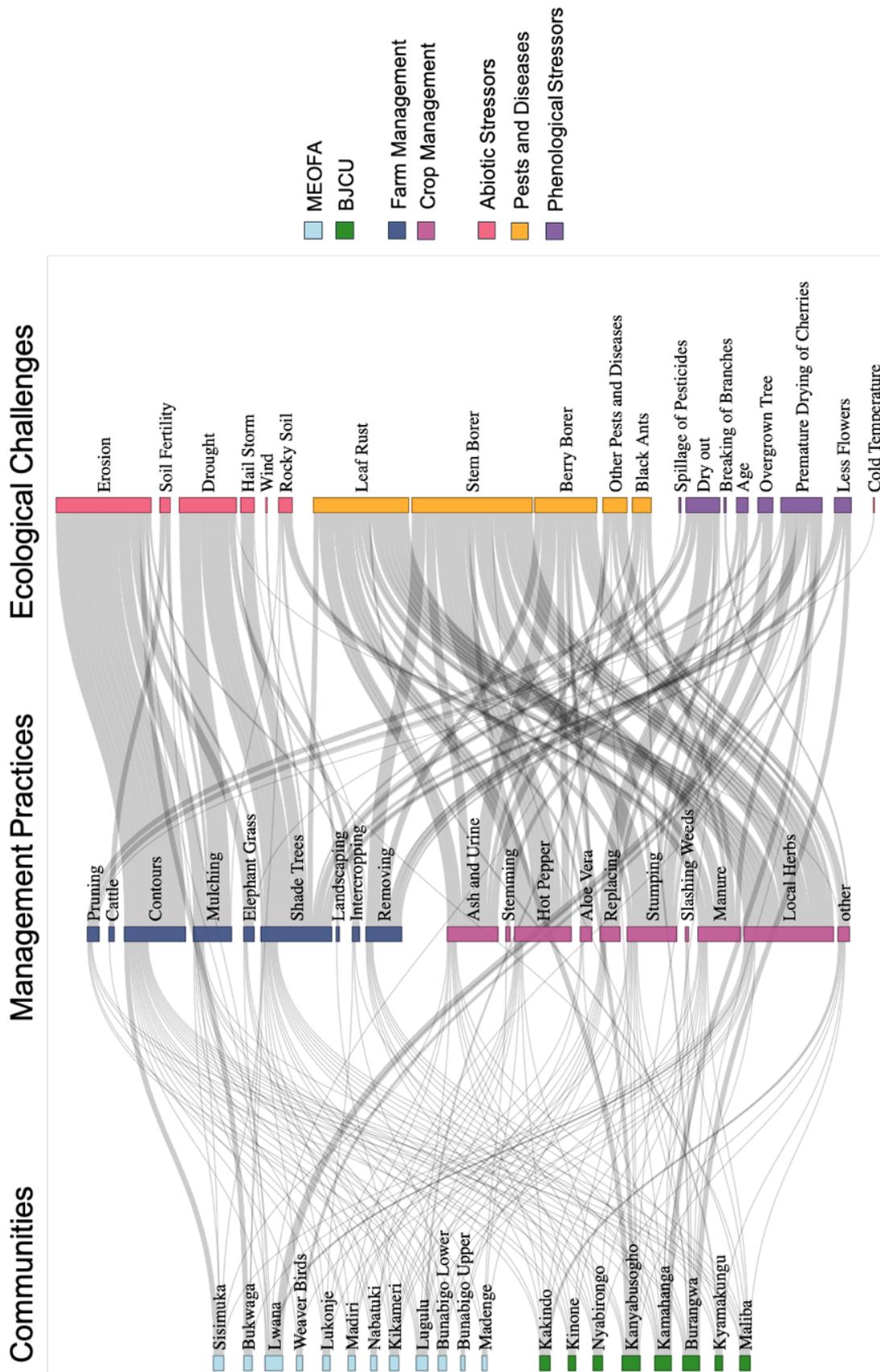
Fig. 4: Sankey diagram of the ecological challenges (right) with the respective management practices (middle) executed by the farming communities (left). Ecological challenges are subdivided into phenological stressors (purple), pests and diseases (orange) and abiotic stressors (pink). Management practices are subdivided into Farm Management (purple) and Crop Management (blue). The links are based on the social ecological network plots of each farming community. The size of the ecological challenges represent the overall rating of the respective communities (LIKERT Scale: 1-5, NA's were counted as 0)

Even though the third subgroup, the phenological stressors are perceived as being less of a threat to the farmers, they are still of importance for a more comprehensive overview of ecological challenges. Premature drying of cherries (Median: 3; var. 5-0), drying out of coffee trees (Median: 0; var. 3-0) and few flowers (Median: 0; var. 0-0,5) have been mentioned but scored comparably low. This low score is usually the result of the farmers being better adapted to these threats. The variation in meteorological trends impacts the phenology of coffee plants and often leads to negative impacts on the yield. Excessive use of chemical fertilizers or altered soil composition affects the concentration of different micro and macronutrients in coffee such as nitrogen, zinc, magnesium, phosphorus, calcium. The changed concentration or excessive accumulation of these nutrients leads to physiological changes, and in turn generating phenological stress. Premature drying of cherries, changing of flowering seasons, defoliation, untimely falling off of berries, and drying out of trees are some of the impacts of phenological stress that farmers have to face and adapt to.

4.2 Management Practices
The abovementioned challenges force the farmers to adapt their management practices. These management practices were clustered into two subgroups: (1) Crop management; and (2) Farm management. As the interviewed farmers of this study are either already organic certified or in the transition towards organic farming, their crop management practices rely on nature-based management practices. Local herbs like aloe vera and hot pepper are frequently used as coping mechanisms against pests and diseases. Most farmers tried to use a combination of different nature-based substances (e.g., a combination of manure, chili, ash and urine). However, the farmers have also stated that these management techniques are oftentimes not sufficient, which is why post hazard coping is frequently used consisting of stemming, pruning, stumping and fully removing infested trees in order to hinder pests and diseases from spreading.

Farm management is the second means by which smallholders can adopt adaptive management practices. These practices consist of the creation of contours, mulching, and intercropping with other plants like shade trees and elephant grass. Low-cost management strategies, such as intercropping plays an important role. Farmers usually intercrop coffee with other cash crops (e.g., cocoa and vanilla) and plants for subsistence farming to absorb price and yield shocks from coffee farming. Additionally, shade trees reduce the temperature and buffer higher temperature conditions and therefore create a microclimate that increases the resilience of the farming plot (Vaast et al. 2006). These practices support the farm to be more resilient against abiotic stressors and pests and diseases as well as phenological stressors. However, the farmers usually connect farm management practices with abiotic stressors like soil erosion and drought.

4.3 Social Networks
Social-Economic challenges are, apart from ecological stressors, the main factors for the vulnerability of smallholder farmers. High price volatilities, unreliable trade relations with buyers, as well as infrastructural challenges and geographical distances create inherent vulnerabilities to smallholder farmers in Uganda. Most of the farmers indicated a lack of infrastructure and tools, as well as missing links to reliable trade relations.
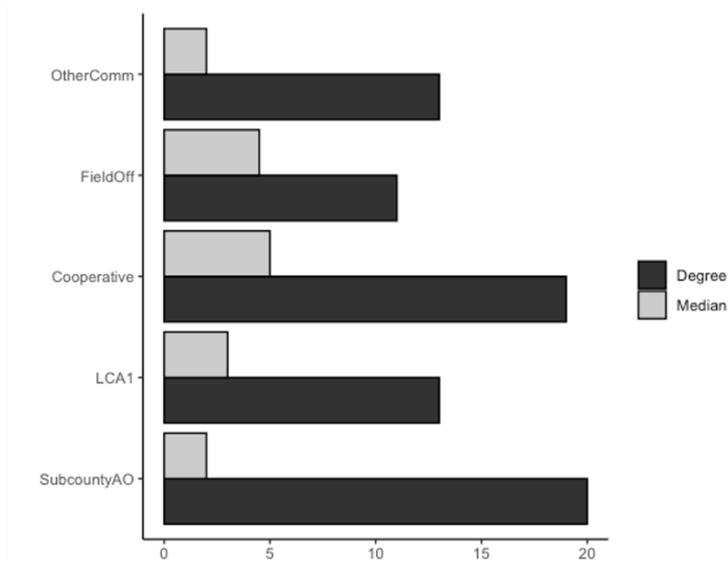
Fig. 5: Comparison of Network Connectivity based on network-node degree and the subjective assessment through the farmers based on a LIKERT Scale from 1-5 (NA's were counted as 0)

Smallholder farmers have different sets of support structures, to adapt to these economic challenges. These support structures consist of formal and informal organizations. Formal organizations, through the structures of farmer cooperatives and governmental representatives, have the goal to enhance the resilience of smallholder farmers through the creation of reliable networks of information flow and financial as well as counseling support. Informal networks in this context are support networks that have not primarily been created for the farming business but are frequently used for conflict management and counseling. Based on the nomination through the focus group, we analyzed the formal and informal organizations of the two cooperatives. Six actors from different fields are central actors based on their connections within the network. (1) The agricultural subcounty office representing the formal local government (degree: 20); (2) The respective cooperatives and their formal organization structures (degree:19); (3) other Communities and their informal exchange (degree: 14) (4) Local Chairman as the political representative for the villages and the informal knowledge broker for farming purposes (LCA1) (degree: 13); (5) Field Officer as the formal manager of the cooperatives (degree: 11); (6) Group Leader as the representative of the respective focus groups (degree: 8). Even though these actors are central to the informal network, we could identify a mismatch between its level of degree and the perceived importance. Even though local government representatives are the most connected actors they are still perceived with a high variance (Median: 2 ± 5; 0) as they are not frequently being present and not taking part in supporting the farming communities. The respective cooperatives (Median: 5 ± 5;0) and its managing field officers (Median: 4,5 ± 5;0) on the contrary, are central and have been perceived as very helpful, as they enforce exchange between farmer communities, manage trade relations and coffee bean quality to enhance revenues. Our results also suggest that the informal exchange with other farming communities (Median: 2 ± 3;0) represents an option for adaptive management on the cooperative level, even though this exchange has been perceived as quite variant depending on the different contexts.

5. Discussion
Increased global demand for coffee has been motivating coffee farmers to expand the cultivar and intensify the production practices (Defries et al. 2010, Jha et al. 2014). The majority of

these farmers are smallholder farmers and account for almost 70% of the global production (Bacon 2005). Economic liberalization and integration have aggravated the exposure of farmers to market risks as they are now more exposed to volatile prices (Daviron and Ponte 2005, Tucker et al. 2010). In addition, increasing temperatures and erratic precipitation patterns most likely will reduce the quality and quantity of coffee yields, increase the pest and disease susceptibility, bringing out nutritional and phenological changes in berry. These factors will result in a strong chance of fitting locations for plantations with detrimental socio-economic effects (Bunn et al., 2015, Imbach et al. 2017, Jezeer et al. 2019). The aforementioned stressors have forced the smallholder farmers already to devise various coping management practices depending on the available resources, assets, and the ecological and social challenge at question (Rodriguez et al. 2014).

Ecological challenges such as pests and diseases, and weather extremes are of increasing importance to producers in the global south (Venancio et al. 2020). These conditions, in which coffee plants grow, have a dominant impact on the quality and quantity of coffee production, incidence of pests, and physiological damages occurring due to them. Surrounding environment forms an integral part of the epidemiology of the diseases. Therefore, understanding the ecological conditions and changes is of great importance to the adaptation and mitigation strategies of coffee producers.

The dynamics of pest and disease occurrences such as coffee leaf rust, stem borer, leaf miner, and berry borer are widely driven by the prevalent climatic conditions, such as, higher temperature, lower altitudes, and moisture. The impacts may vary from physical degradation of quality by producing defective coffee beans, altering the cup size of beans, impaired health of coffee plant and decreased produce quantity or even crop failure. They also might vary from farm to farm as farmers have different settings and adaptive management practices. However, the negative effects are often interdependent and a combination of the sum of factors. Additionally, our results suggest that some ecological and socio-economic challenges are not context dependent. On the contrary, climatic stressors and pests and disease are a negative force that expands the farm level context and presents a challenge for the regional ecosystem. Given the changing climatic conditions, it becomes imperative to understand the negative impacts of climatic conditions, pests, and diseases on coffee, its future projections, and adaptive management practices.

5.1 Climate Change and how it will affect smallholder farmers in the future

Climate change is showing an increasing impact on smallholder coffee farmers in growing regions, with increasing temperatures negatively affecting the resistance of coffee plants (source), reducing the effectiveness of nature-based repellants, and increasing the mobility of major pests and diseases due to niche development (Sharma 2014). These adverse impacts are more severe for smallholder coffee farmers, who in many cases rely majorly on coffee production for their livelihoods (Kutywayo et al. 2013). Coffee plant resistance, use of biopesticides and natural predators are the most common options for organic smallholder farmers due to local availability and low prices. However, the relative efficacy of many of these pest control measures is likely to change as a result of global warming. It is of paramount interest to smallholders as well as sustainability scientists, how perceived ecological stressors (See Fig. 2) most likely will affect smallholder farmers in the near future. In addition to socio-economic factors that can negatively impact smallholder coffee farmers, like national policies, global price volatility, and unreliable trade relationships,

Climatic Factors

Droughts and weather extremes (heavy rains and hailstorms) have been assessed as some of the main abiotic stressors that pose a challenge for the smallholder farmers (See Fig. 2). These climatic conditions have a direct effect on coffee plantation plots (Pham et al. 2020). Droughts can have a detrimental effect on coffee plantations, not only decreasing yield and quality but also being one of the main factors for plant death and forcing the coffee producers to manually irrigate their crops (Venancio et al. 2020). Even though an increase in CO_2 levels can enhance the growth rates of plants, the volatility of precipitation and temperature most likely will decrease the plant growth (Coley 1998). Abiotic stressors will most likely increase within the next decades, heavily influencing producing regions (Pham et al. 2020) While some increased rainfall patterns can have a positive influence on the yield, the soil erosion due to heavy rainfalls makes heavy rainfall events detrimental to the smallholder farmers who usually have their plots at hangs on higher altitudes. Additionally, precipitation has a strong effect on pest-plant interactions. Severe droughts can increase the damage of insects on host species due to a decreased plant resilience (Sharma et al. 2014). Higher humidity levels (e.g. after heavy rainfalls) also showed negative effects, as they positively influenced the detection of plant odors through pests, which led to a higher damage outcome.

Pests and Diseases

Apart from climatic factors, pests and diseases play a major role in the coffee business. Pests and diseases like the Stem- and Berry Borer as well as the Coffee Leaf Rust have been assessed to have the highest negative impact on smallholder farmers, already causing major threats to the coffee plots. The abundance and severity of major coffee pests and diseases are projected to heavily increase within the next decades as climatic variables, like temperature and precipitations allow a higher mobility (Thomas et al. 2001). Macroecological investigations have shown that Coffee Leaf Rust leads to severe damages in South America and also has been the major factor for almost 86% of crop failure in central America (Rice 2018). The Stem Borer caused a 70% loss of crops in Zimbabwe (Kutywayo et al. 2013). Scientific predictions on the coffee berry borer indicate that even a very small increase in temperatures would create a substantial effect on serious consequences for the production of coffee (Jaramillo 2011). Additionally, due to faster generation turnovers, pests and diseases are more adaptive to extreme weather events (Sharma 2014). Higher temperatures can result in heavier abundance of pests and diseases as the temperature boosts the time to reproductive maturity (Kutywayo et al. 2013). Additionally, plant resilience decreased through higher temperatures making the coffee plants more prone to pest infestation.

Phenological Stressors

Phenological stressors were perceived differently in the focus groups and were assessed as being a lesser threat than abiotic stressors, and pests and diseases. However, premature drying of berries and drying out of coffee plants poses a threat to coffee smallholders as they affect their yield and increase their workload and economic productivity. Climate models show that a change of temperatures due to global warming will most likely change the flowering times of plants, making them more susceptible to other pests and diseases and harder to seasonally manage for coffee smallholders (Fitter and Fitter 2002, Parmesan and Yohe 2003, Willis et al. 2008) increasing the adaptive management workload. Especially, droughts and higher temperatures are proposed to have a strong interrelation with fruit and flower abortion (Venancio et al. 2020).

Adaptive management under climatic stress

The increasing ecological challenges coffee farmers are facing force them to invest in their adaptive management practices (Rodriguez et al. 2014). The increasing awareness of coffee smallholders about the negative effects and high costs of synthetic pesticides and fertilizers has led to an increase in the use of natural plant products, biopesticides, fungi, nematodes, and other predators (Sharma 2014). Our results suggest that various adaptive management practices are already being utilized. These can be differentiated into crop management and farm management (See Fig. 2). These practices are of vital importance as they ensure productivity and sustain the livelihoods of the producers in the future. However, due to increasing climate stress, crop production and farm management tasks will increase significantly in the near future, directly resulting in higher agricultural costs, lower yields, and thus lower financial revenues.

5.2 Social Organization and Resilience

Regional ecosystem stressors (e.g. spread of pests and diseases) and climatic factors (e.g. changes in precipitation and temperatures) require adaptation processes on multiple levels The increasing ecological as well as socio-economic challenges force smallholder farmers not only to invest in their on-farm management practices but also to form strong alliances and rely on other support mechanisms. Our results show that smallholders are already part of formal, as well as informal support structures. However, these support structures are mostly on the farm level, through informal exchange with other farmers and communities and through the formation of local associations like formal democratic farmer cooperatives. Our results suggest that formal and informal institutions, like the farmer cooperatives and the support from local political representatives, like the local chairman are perceived as valuable. However, our results also suggest that there is a lack of support structures on a broader scale (e.g. actors from the national government and actors from the global market like coffee traders). Long term trade relations, like they are proposed in the constitutions of Fairtrade labeling organization are of vital importance to the smallholders but rarely in place. Moreover, institutional structures that try to support smallholder farmers need to take ecological, as well as socio-economic stressors into account, as they are closely interrelated. The national states actors are a good starting point but not sufficient in order to deal with the dynamic complexity of smallholders who are embedded in global value chains (Lenschow et al. 2015). Moreover, there is a need for multi-level governance consisting of local actors and global players in order to understand the social-ecological challenges and shift global value chains towards more sustainable trajectories.

5.3 The nexus of social and ecological on multiple levels

In order to understand the interrelations between social and ecological challenges of smallholders in global value chains, it is imperative to understand the bidirectional nature of processes occurring between social and ecological systems (Berkes et al. 1998). A better understanding of the complex interactions of components of social and ecological systems is often regarded as an imperative benchmark for accomplishing the goal of sustainable development. The absence of this consideration given to the complexity of nature of socio-ecological systems, has often led to a series of problems extending to both social and ecological systems such as increased pest infections, land degradation and crumbling institutional capacity (Folke et al. 2016, Epstein et al. 2015, Ostrom 2009).

While smallholder farmers are already using a variety of adaptive management practices in order to cope with social-ecological challenges, their choice of adaptive management and their overall resilience is heavily influenced through a variety of social-ecological factors (Bacon 2017).

In order to shift global value chains towards sustainable trajectories there is therefore a need to act on multiple levels in the socio-economic spectrum. There is a need for a stronger informal exchange between different coffee farmers, in order to create an information flow about challenges and coping mechanisms, as well as best practices in farm level management. There is a need for formal institutional support through democratic cooperatives and meaningful exchange with local governmental actors. And lastly, there is a need of private governance through global coffee traders and their commitment to long term trade relations, as well as minimum prices and the willingness to create settings of mutual exchange and understanding.

6. Conclusion

For the past decades, humans have become the dominant force affecting the functionality, structure, resilience and interconnections of all the systems (Crutzen 2002). Global value chains are now one of the dominant systems that supply consumption demand and connect producers from the global south with consumers from the global north. We have done a case study using collaborative network mapping together with coffee smallholders from Uganda to find out about social-ecological challenges they are facing, the prevalent management practices and their interrelations. With a collaborative network approach, we were able to show the individual interrelations of different communities between the perceived ecological challenges and their respective management practices (See Fig. 3).

Farmers perceive the spread of pests and diseases (above all the stem borer, berry borer and leaf rust), and climatic factors (e.g., droughts, heavy rainfalls) as major threats to their farming practices, whereas phenological stressors such as drying and overgrowing of trees and changes in coffee flowering are perceived as less harmful. Farmers responds to these stressors by applying crop level and farm level adaptive management practices. Crop management consists of monitoring and coping ecological challenges, such as nature-based repellents, whereas, farm management is focused on farm resilience enhancement by making infrastructural changes such as contours, landscaping, intercropping etc. Formal and informal social networks appear as important factors for smallholder farmers by providing them with supporting structures. These networks consists of informal exchanges between the communities, as well as formal networks with different stakeholders from the cooperatives, government, local community leaders, and neighbors. Drawing from the scientific literature, a deeper knowledge of behavior and expected shift due to changing climate was gathered. These projections play an important role in better understanding of the management practices with regard to the upcoming challenges.

These projections show that individual farm management is not sufficient to deal with the already existing and exacerbating challenges the farmers are facing. Enhanced support from the informal and formal networks is needed. Global actors have the capability to uplift the support provided by the regional and local support groups, but presently, we find the lack of interaction of global actors with the smallholder farmers. Based on our understanding we propose the following four aspects, that need to be taken into consideration to support smallholder farmers in global value chains and shift these value chains towards more sustainable

trajectories, (1) The need to understand ecological challenges in the face of climate change as which can translate into detrimental effects for smallholder farmers in global value chains; (2) Smallholder farmers need better local and regional support structures, building on mutual exchange with stakeholders from multiple levels to face upcoming ecological and socio-economic shocks; (3) The social-ecological challenges at local level should be better understood in the face of climate change as they are a strong driving force and will have detrimental effects at global value chains; (4) There is immediate need to combine the broader recognition of global teleconnections with knowledge based on a local scale.

References

Anik, Sawon Istiak, and Mohammed Abu Sayed Arfin Khan. 2012. 'Climate Change Adaptation through Local Knowledge in the North Eastern Region of Bangladesh'. *Mitigation and Adaptation Strategies for Global Change* 17(8):879–96. doi: 10.1007/s11027-011-9350-6.

Bacon, Christopher. 2005. 'Confronting the Coffee Crisis: Can Fair Trade, Organic, and Specialty Coffees Reduce Small-Scale Farmer Vulnerability in Northern Nicaragua?' *World Development* 33(3):497–511. doi: 10.1016/j.worlddev.2004.10.002.

Bacon, Christopher M., William A. Sundstrom, Iris T. Stewart, and David Beezer. 2017. 'Vulnerability to Cumulative Hazards: Coping with the Coffee Leaf Rust Outbreak, Drought, and Food Insecurity in Nicaragua'. *World Development* 93:136–52. doi: 10.1016/j.worlddev.2016.12.025.

Berkes, Fikret, and Carl Folke, eds. 2002. *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*. Transferred to digital printing. Cambridge: Cambridge Univ. Press.

Berkes, Fikret, Carl Folke, and Johan Colding, eds. 1998. *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*. Cambridge, U.K. ; New York, NY, USA: Cambridge University Press.

Blackman, Allen, and Jorge Rivera. 2011. 'Producer-Level Benefits of Sustainability Certification: Benefits of Sustainability Certification'. *Conservation Biology* 25(6):1176–85. doi: 10.1111/j.1523-1739.2011.01774.x.

Bodin, Örjan. 2017. 'Collaborative Environmental Governance: Achieving Collective Action in Social-Ecological Systems'. *Science* 357(6352):eaan1114. doi: 10.1126/science.aan1114.

Bodin, Örjan, and Beatrice I. Crona. 2009. 'The Role of Social Networks in Natural Resource Governance: What Relational Patterns Make a Difference?' *Global Environmental Change* 19(3):366–74. doi: 10.1016/j.gloenvcha.2009.05.002.

Bodin, Örjan, Garry Robins, Ryan R. J. McAllister, Angela M. Guerrero, Beatrice Crona, Maria Tengö, and Mark Lubell. 2016. 'Theorizing Benefits and Constraints in Collaborative Environmental Governance: A Transdisciplinary Social-Ecological Network Approach for Empirical Investigations'. *Ecology and Society* 21(1):art40. doi: 10.5751/ES-08368-210140.

Bunn, Christian, Peter Läderach, Oriana Ovalle Rivera, and Dieter Kirschke. 2015. 'A Bitter Cup: Climate Change Profile of Global Production of Arabica and Robusta Coffee'. *Climatic Change* 129(1–2):89–101. doi: 10.1007/s10584-014-1306-x.

Bussolo, Maurizio, Olivier Godart, Jann Lay, and Rainer Thiele. 2007. 'The Impact of Coffee Price Changes on Rural Households in Uganda'. *Agricultural Economics* 37(2–3):293–303. doi: 10.1111/j.1574-0862.2007.00275.x.

Cerdán, C. R., M. C. Rebolledo, G. Soto, B. Rapidel, and F. L. Sinclair. 2012. 'Local Knowledge of Impacts of Tree Cover on Ecosystem Services in Smallholder Coffee Production Systems'. *Agricultural Systems* 110:119–30. doi: 10.1016/j.agsy.2012.03.014.

Colding, Johan, and Stephan Barthel. 2019. 'Exploring the Social-Ecological Systems Discourse 20 Years Later'. *Ecology and Society* 24(1):art2. doi: 10.5751/ES-10598-240102.

Coley, Phyllis D. 1998. 'Possible Effects of Climate Change on Plant/Herbivore Interactions in Moist Tropical Forests'. *Climatic Change* 39(2/3):455–72. doi: 10.1023/A:1005307620024.

Daviron, Benoit, and Stefano Ponte. 2005. *The Coffee Paradox: Global Markets, Commodity Trade and the Elusive Promise of Development*. Zed Books Ltd.

DeFries, Ruth S., Thomas Rudel, Maria Uriarte, and Matthew Hansen. 2010. 'Deforestation Driven by Urban Population Growth and Agricultural Trade in the Twenty-First Century'. *Nature Geoscience* 3(3):178–81. doi: 10.1038/ngeo756.

Deressa, Temesgen Tadesse. 2007. 'Measuring the Economic Impact of Climate Change on Ethiopian Agriculture: Ricardian Approach.' *World Bank*.

Dorninger, Christian, Alf Hornborg, David J. Abson, Henrik von Wehrden, Anke Schaffartzik, Stefan Giljum, John-Oliver Engler, Robert L. Feller, Klaus Hubacek, and Hanspeter Wieland. 2021. 'Global Patterns of Ecologically Unequal Exchange: Implications for Sustainability in the 21st Century'. *Ecological Economics* 179:106824. doi: 10.1016/j.ecolecon.2020.106824.

Epstein, Graham, Jeremy Pittman, Steven M. Alexander, Samantha Berdej, Thomas Dyck, Ursula Kreitmair, Kaitlyn J. Rathwell, Sergio Villamayor-Tomas, Jessica Vogt, and Derek Armitage. 2015. 'Institutional Fit and the Sustainability of Social–Ecological Systems'. *Current Opinion in Environmental Sustainability* 14:34–40. doi: 10.1016/j.cosust.2015.03.005.

Fitter, A. H. 2002. 'Rapid Changes in Flowering Time in British Plants'. *Science* 296(5573):1689–91. doi: 10.1126/science.1071617.

Folke, Carl, Reinette Biggs, Albert V. Norström, Belinda Reyers, and Johan Rockström. 2016. 'Social-Ecological Resilience and Biosphere-Based Sustainability Science'. *Ecology and Society* 21(3):art41. doi: 10.5751/ES-08748-210341.

Folke, Carl, Stephen R. Carpenter, Brian Walker, Marten Scheffer, Terry Chapin, and Johan Rockström. 2010. 'Resilience Thinking: Integrating Resilience, Adaptability and Transformability'. *Ecology and Society* 15(4):20.

Gereffi, Gary, John Humphrey, and Timothy Sturgeon. 2005. 'The Governance of Global Value Chains'. *Review of International Political Economy* 12(1):78–104. doi: 10.1080/09692290500049805.

Imbach, Pablo, Emily Fung, Lee Hannah, Carlos E. Navarro-Racines, David W. Roubik, Taylor H. Ricketts, Celia A. Harvey, Camila I. Donatti, Peter Läderach, Bruno Locatelli, and Patrick R. Roehrdanz. 2017. 'Coupling of Pollination Services and Coffee Suitability under Climate Change'. *Proceedings of the National Academy of Sciences* 114(39):10438–42. doi: 10.1073/pnas.1617940114.

Jaramillo, Juliana, Eric Muchugu, Fernando E. Vega, Aaron Davis, Christian Borgemeister, and Adenirin Chabi-Olaye. 2011. 'Some Like It Hot: The Influence and Implications of Climate Change on Coffee Berry Borer (Hypothenemus Hampei) and Coffee Production in East Africa' edited by S. Thrush. *PLoS ONE* 6(9):e24528. doi: 10.1371/journal.pone.0024528.

Jassogne, Laurence, Piet J. A. van Asten, Ibrahim Wanyama, and Philippe V. Baret. 2013. 'Perceptions and Outlook on Intercropping Coffee with Banana as an Opportunity for Smallholder Coffee Farmers in Uganda'. *International Journal of Agricultural Sustainability* 11(2):144–58. doi: 10.1080/14735903.2012.714576.

Jezeer, Rosalien E., Maria J. Santos, Pita A. Verweij, René G. A. Boot, and Yann Clough. 2019. 'Benefits for Multiple Ecosystem Services in Peruvian Coffee Agroforestry Systems without Reducing Yield'. *Ecosystem Services* 40:101033. doi: 10.1016/j.ecoser.2019.101033.

Jha, Shalene, Christopher M. Bacon, Stacy M. Philpott, V. Ernesto Méndez, Peter Läderach, and Robert A. Rice. 2014. 'Shade Coffee: Update on a Disappearing Refuge for Biodiversity'. *BioScience* 64(5):416–28. doi: 10.1093/biosci/biu038.

Kangalawe, Richard, Shadrack Mwakalila, and Petro Masolwa. 2011. 'Climate Change Impacts, Local Knowledge and Coping Strategies in the Great Ruaha River Catchment Area, Tanzania'. *Natural Resources* 02(04):212–23. doi: 10.4236/nr.2011.24027.

Korelitz, B. I., and S. C. Sommers. 1975. 'Responses to Drug Therapy in Ulcerative Colitis. Evaluation by Rectal Biopsy and Histopathological Changes'. *The American Journal of Gastroenterology* 64(5):365–70.

Kutywayo, Dumisani, Abel Chemura, Winmore Kusena, Pardon Chidoko, and Caleb Mahoya. 2013. 'The Impact of Climate Change on the Potential Distribution of Agricultural Pests: The Case of the Coffee White Stem Borer (Monochamus Leuconotus P.) in Zimbabwe' edited by D. Doucet. *PLoS ONE* 8(8):e73432. doi: 10.1371/journal.pone.0073432.

Lenschow, Andrea, Jens Newig, and Edward Challies. 2016. 'Globalization's Limits to the Environmental State? Integrating Telecoupling into Global Environmental Governance'. *Environmental Politics* 25(1):136–59. doi: 10.1080/09644016.2015.1074384.

Levin, Kelly, Benjamin Cashore, Steven Bernstein, and Graeme Auld. 2012. 'Overcoming the Tragedy of Super Wicked Problems: Constraining Our Future Selves to Ameliorate Global Climate Change'. *Policy Sciences* 45(2):123–52. doi: 10.1007/s11077-012-9151-0.

Li, Mengping, Xuexi Huo, Changhui Peng, Huanguang Qiu, Zhouping Shangguan, Cheng Chang, and Jianjun Huai. 2017. 'Complementary Livelihood Capital as a Means to Enhance Adaptive Capacity: A Case of the Loess Plateau, China'. *Global Environmental Change* 47:143–52. doi: 10.1016/j.gloenvcha.2017.10.004.

Liu, Jianguo, Vanessa Hull, Mateus Batistella, Ruth DeFries, Thomas Dietz, Feng Fu, Thomas W. Hertel, R. Cesar Izaurralde, Eric F. Lambin, Shuxin Li, Luiz A. Martinelli, William J. McConnell, Emilio F. Moran, Rosamond Naylor, Zhiyun Ouyang, Karen R. Polenske, Anette Reenberg, Gilberto de Miranda Rocha, Cynthia S. Simmons, Peter H. Verburg, Peter M. Vitousek, Fusuo Zhang, and Chunquan Zhu. 2013. 'Framing Sustainability in a Telecoupled World'. *Ecology and Society* 18(2):art26. doi: 10.5751/ES-05873-180226.

Miller, Thaddeus R. 2013. 'Constructing Sustainability Science: Emerging Perspectives and Research Trajectories'. *Sustainability Science* 8(2):279–93. doi: 10.1007/s11625-012-0180-6.

Norström, Albert V., Christopher Cvitanovic, Marie F. Löf, Simon West, Carina Wyborn, Patricia Balvanera, Angela T. Bednarek, Elena M. Bennett, Reinette Biggs, Ariane de Bremond, Bruce M. Campbell, Josep G. Canadell, Stephen R. Carpenter, Carl Folke, Elizabeth A. Fulton, Owen Gaffney, Stefan Gelcich, Jean-Baptiste Jouffray, Melissa Leach, Martin Le Tissier, Berta Martín-López, Elena Louder, Marie-France Loutre, Alison M. Meadow, Harini Nagendra, Davnah Payne, Garry D. Peterson, Belinda Reyers, Robert Scholes, Chinwe Ifejika Speranza, Marja Spierenburg, Mark Stafford-Smith, Maria Tengö, Sandra van der Hel, Ingrid van Putten, and Henrik Österblom. 2020. 'Principles

for Knowledge Co-Production in Sustainability Research'. *Nature Sustainability* 3(3):182–90. doi: [10.1038/s41893-019-0448-2](10.1038/s41893-019-0448-2).

Osbahr, Henny, Peter Dorward, Roger Stern, and Sarah Cooper. 2011. 'SUPPORTING AGRI-CULTURAL INNOVATION IN UGANDA TO RESPOND TO CLIMATE RISK: LINKING CLIMATE CHANGE AND VARIABILITY WITH FARMER PERCEPTIONS'. *Experimental Agriculture* 47(2):293–316. doi: [10.1017/S0014479710000785](10.1017/S0014479710000785).

Ostrom, Elinor. 2009. 'A General Framework for Analyzing Sustainability of Social-Ecological Systems'. *Science* 325(5939):419–22. doi: 10.1126/science.1172133.

Parmesan, Camille, and Gary Yohe. 2003. 'A Globally Coherent Fingerprint of Climate Change Impacts across Natural Systems'. *Nature* 421(6918):37–42. doi: 10.1038/nature01286.

Pham, Yen, Kathryn Reardon-Smith, Shahbaz Mushtaq, and Ravinesh C. Deo. 2020. 'Feed-back Modelling of the Impacts of Drought: A Case Study in Coffee Production Systems in Viet Nam'. *Climate Risk Management* 30:100255. doi: [10.1016/j.crm.2020.100255](10.1016/j.crm.2020.100255).

Rathgens, Julius, Stefan Gröschner, and Henrik von Wehrden. 2020. 'Going beyond Certifi-cates: A Systematic Review of Alternative Trade Arrangements in the Global Food Sec-tor'. *Journal of Cleaner Production* 276:123208. doi: 10.1016/j.jclepro.2020.123208.

Ricciardi, Vincent, Zia Mehrabi, Hannah Wittman, Dana James, and Navin Ramankutty. 2021. 'Higher Yields and More Biodiversity on Smaller Farms'. *Nature Sustainability*. doi: [10.1038/s41893-021-00699-2](10.1038/s41893-021-00699-2).

Rice, Robert A. 2018. 'Coffee in the Crosshairs of Climate Change: Agroforestry as Abatis'. *Agroecology and Sustainable Food Systems* 42(9):1058–76. doi: [10.1080/21683565.2018.1476428](10.1080/21683565.2018.1476428).

Rittel, Horst W. J., and Melvin M. Webber. 1973. 'Dilemmas in a General Theory of Planning'. *Policy Sciences* 4(2):155–69. doi: [10.1007/BF01405730](10.1007/BF01405730).

Rodriguez, Daniel, Howard Cox, Peter deVoil, and Brendan Power. 2014. 'A Participatory Whole Farm Modelling Approach to Understand Impacts and Increase Preparedness to Climate Change in Australia'. *Agricultural Systems* 126:50–61. doi: 10.1016/j.agsy.2013.04.003.

Schiffer, Eva, and Jennifer Hauck. 2010. 'Net-Map: Collecting Social Network Data and Facili-tating Network Learning through Participatory Influence Network Mapping'. *Field Me-thods* 22(3):231–49. doi: [10.1177/1525822X10374798](10.1177/1525822X10374798).

Schlüter, Maja, Andres Baeza, Gunnar Dressler, Karin Frank, Jürgen Groeneveld, Wander Ja-ger, Marco A. Janssen, Ryan R. J. McAllister, Birgit Müller, Kirill Orach, Nina Schwarz, and Nanda Wijermans. 2017. 'A Framework for Mapping and Comparing Behavioural Theories in Models of Social-Ecological Systems'. *Ecological Economics* 131:21–35. doi: 10.1016/j.ecolecon.2016.08.008.

Sharma, Hari C. 2014. 'Climate Change Effects on Insects: Implications for Crop Protection and Food Security'. *Journal of Crop Improvement* 28(2):229–59. doi: [10.1080/15427528.2014.881205](10.1080/15427528.2014.881205).

Simelton, Elisabeth, Claire H. Quinn, Nnyaladzi Batisani, Andrew J. Dougill, Jen C. Dyer, Evan D. G. Fraser, David Mkwambisi, Susannah Sallu, and Lindsay C. Stringer. 2013. 'Is Rainfall Really Changing? Farmers' Perceptions, Meteorological Data, and Policy Implications'. *Climate and Development* 5(2):123–38. doi: [10.1080/17565529.2012.751893](10.1080/17565529.2012.751893).

Soto-Pinto, Lorena, Víctor Villalvazo-López, Guillermo Jiménez-Ferrer, Neptalí Ramírez-Mar-cial, Guillermo Montoya, and Fergus L. Sinclair. 2007. 'The Role of Local Knowledge in Determining Shade Composition of Multistrata Coffee Systems in Chiapas, Mexico'. *Bio-diversity and Conservation* 16(2):419–36. doi: [10.1007/s10531-005-5436-3](10.1007/s10531-005-5436-3).

Ssebunya, Brian Robert, Christian Schader, Lukas Baumgart, Jan Landert, Christine Al-tenbuchner, Erwin Schmid, and Matthias Stolze. 2019. 'Sustainability Performance of Certified and Non-Certified Smallholder Coffee Farms in Uganda'. *Ecological Economics* 156:35–47. doi: 10.1016/j.ecolecon.2018.09.004.

Thomas, C. D., E. J. Bodsworth, R. J. Wilson, A. D. Simmons, Z. G. Davies, M. Musche, and L. Conradt. 2001. 'Ecological and Evolutionary Processes at Expanding Range Margins'. *Nature* 411(6837):577–81. doi: 10.1038/35079066.

Tucker, Catherine M., Hallie Eakin, and Edwin J. Castellanos. 2010. 'Perceptions of Risk and Adaptation: Coffee Producers, Market Shocks, and Extreme Weather in Central America and Mexico'. *Global Environmental Change* 20(1):23–32. doi: 10.1016/j.gloen-vcha.2009.07.006.

Venancio, Luan Peroni, Roberto Filgueiras, Everardo Chartuni Mantovani, Cibele Hummel do Amaral, Fernando França da Cunha, Francisco Charles dos Santos Silva, Daniel Althoff, Robson Argolo dos Santos, and Paulo Cezar Cavatte. 2020. 'Impact of Drought Associated with High Temperatures on Coffea Canephora Plantations: A Case Study in Espírito Santo State, Brazil'. *Scientific Reports* 10(1):19719. doi: 10.1038/s41598-020-76713-y.

Willis, C. G., B. Ruhfel, R. B. Primack, A. J. Miller-Rushing, and C. C. Davis. 2008. 'Phylogenetic Patterns of Species Loss in Thoreau's Woods Are Driven by Climate Change'. *Proceedings of the National Academy of Sciences* 105(44):17029–33. doi: 10.1073/pnas.0806446105.

Worm, B., E. B. Barbier, N. Beaumont, J. E. Duffy, C. Folke, B. S. Halpern, J. B. C. Jackson, H. K. Lotze, F. Micheli, S. R. Palumbi, E. Sala, K. A. Selkoe, J. J. Stachowicz, and R. Watson. 2006. 'Impacts of Biodiversity Loss on Ocean Ecosystem Services'. *Science* 314(5800):787–90. doi: 10.1126/science.1132294.

4.3 Broadening the perspective on the Knowledge-Doing-Gap: Analyzing a German consumer survey

Julius Rathgens, John-Oliver Engler, Henrik von Wehrden

Abstract

Understanding and changing consumption patterns for sustainability has been a long-lasting effort of scholars from different disciplines. However, despite sufficient information and a rising recognition of sustainability issues, there is often still a gap between mental attitudes and actual buying behavior: the Knowledge-Doing-Gap. Here, we investigate this gap through an empirical model with a particular focus on the situational constraints consumers are facing who intend to act upon pro-sustainable attitudes. Using data from an online-survey among N = 475 consumers, we use a structural equation model to model the Knowledge-Doing-Gap. Our results suggest that sustainable consumption is a topic of interest across diverse demographic groups rather than a small elite, and in particular to women. Factors like convenience, price and budget restrictions, self-efficacy and social norm form barriers towards sustainable consumption that are conceptually and empirically relevant. The discourse on sustainable consumption needs to shift towards an interdisciplinary exchange incorporating the inherent complexity of relevant factors without losing the parsimony of existing empirical models.

1. Introduction

Human demands on Earth's natural resources have widely outpaced what can be produced. The increasing production and consumption of commodities are among the main drivers why humanity is exceeding planetary boundaries (Rockström et al., 2009). While many efforts are made to influence the way goods and resources are produced and distributed, 72% of all greenhouse gas emissions are related to household consumption (Hertwich and Peters, 2009). Household demand is increasingly supplied through global value chains, where commodities are consumed in a spatially decoupled place from its place of origin (Liu et al., 2013). These global consumption patterns have a strong influence on the producing regions (Lenschow et al. 2015) and are considered an important driving force for land use change (Eakin et al. 2014). A key challenge is to understand and change consumption patterns towards more sustainable trajectories in the context of global supply chains.

Understanding individual consumption patterns, its underlying attitudes and choice preferences has been a long-lasting goal of social psychology and behavioral economics (Stern, 2000). Many frameworks exist that try to investigate the relations between attitudes, intentions and behavior. Policy proposals often rely on models of neoclassical economic theory, which assume that consumers base their decisions on rational deliberation and principles of utility maximization (Ostrom, 2000). As Rathgens et al. (2020) pointed out, the majority of case studies that focus on sustainable consumption in the context of global trade arrangements emerge around knowledge, information and attitudes towards consumption behavior. While these aspects may help to disentangle attitudes towards sustainable consumption, they may help little to understand consumers' actual buying behavior. In-vivo studies of actual buying behavior tried to close this gap through behavioral analyses of consumers. However, by solely focusing on behavior, studies fail to describe the attitudes that stand behind the buying behavior, leaving out an important lever to understand change processes and how these processes can be facilitated (Andorfer and Liebe, 2015). This leads to a gap between the actual behavior and the underlying factors that might cause this behavior. There is growing evidence

51

that even though the awareness of individuals towards sustainability issues is increasing, this does not directly translate into changed behavior (Gatersleben, 2002; Jensen, 2002). Our paper aims to investigate links between mental attitudes and actual behavior. Particularly we are interested in the perceived barriers that create a misalignment between attitudes and behavior.

We explore these barriers using data from a self-developed online questionnaire about globally traded food items (e.g. coffee, tea, tropical fruits), which represent global supply chains. We analyze our data using a structural equation modeling (SEM) approach. SEMs are able to test a suite of hypotheses within just one model. In particular, it is possible to compare the strengths of different factors in determining actual buying behavior. Thus, here we quantify the role of perceived situational constraints, attitudes towards global food products and self-reported buying behavior. In this article we therefore first give a theoretical overview of the issues at hand when doing research on sustainable consumption, showing that there is a blind spot in the literature concerning the barriers individuals are facing between attitudes and actual behavior (Section 2). We then develop an adapted Attitude-Behavior-Model based on our review that includes habits and situational constraints to productively address the blind spot identified in the literature available (Section 3). We test our model with data from N = 475 German consumers that were asked to critically reflect on their alignment between attitudes and behavior, explicitly naming situational constraints that form a barrier between attitudes and behavior (Section 4). We thus investigate the situational constraints that are empirically meaningful and give further insights into the gap between attitudes and behavior. Based on the results we highlight that external factors need to be investigated to better understand and change consumption behavior towards more sustainable trajectories (Section 5).

2. Theoretical Background

Sustainability challenges, such as increasing greenhouse gas emissions, ecosystem degradation and the prevalence of global injustices can be linked to consumption patterns (Hertwich and Peters, 2009). More and more of the food products found on supermarket shelves is available because of global markets. As these products are usually part of complex value chains it is often unclear for consumers where their product originates from and under what circumstances the product of interest has been produced. (Aertsens et al., 2011). To tackle this issue, scholars as well as policy makers tried to provide consumers with more information, be it on packages, through information campaigns or certificates (de Pelsmacker and Janssens, 2007). These actions are usually undertaken under the assumption of behavioral economists that people base their behavior – be it consumption or any other individual choice – on rational deliberation. Individuals are therefore described as "rational agents" or as Ostrom (2000) states "rational egoists". The baseline assumptions are in particular that (1) the individual self-centered interest is the key to understand human behavior; (2) the respective behavior is the result of a cognitive, "rational" deliberation process; (3) consumer preferences are taken as a given without further explanation (Jackson, 2005).

While this assumption has been undoubtedly helpful to generate useful and empirically validated models to predict transactions in stock markets, it is rather unspecific in situations of social dilemmas and does not sufficiently explain sustainable consumption behavior of individuals (Ostrom, 2000). These models certainly reach their limitations in explaining the gap between attitudes and behavior. One prevailing problem for sustainability science is that an

increased awareness for sustainability related issues does not directly translate into more sustainable behavior (Gifford, 2011; Terlau and Hirsch, 2015). While many consumers prefer products from companies that take ethical responsibility (e.g., with fair trading principles or carbon offsetting), the market share of these companies is still marginal. This issue is often referred to as "Knowledge-Doing-Gap", "Value-Behavior-Gap, "Value-Action-Gap" or "Eco-Action-Gap" (Blake, 1999; Agyemann and Kollmuss, 2002; Kennedy, 2009). Since early models of economics were limited in explaining this gap, social psychologists intended to obtain a more nuanced understanding of factors relevant for the individual deliberation processes causing consumption. The Theory of Planned Behavior is one of the more prominent frameworks that addresses how people plan and execute their consumption behavior (Andorfer and Liebe, 2013), stating that before any consumer behavior there is a kind of argumentation and planning that influences the intention to carry out the behavior. The theory focusses on subjective norms and the perceived control over the action of individuals (Ajzen, 1985). While this model has been helpful to get a better understanding of the antecedents of behavior and has been supported through empirical investigations, it still lacks empirical evidence to explain the gap between pro-sustainable attitudes and its respective behavior.

Scholars have tried to give insights into why an increasing awareness does not necessarily lead to the respective behavior (Gifford, 2011). Conceptual investigations into this topic proposed different barriers that may explain the gap between attitudes and behavior. These are usually clustered around internal factors (e.g. knowledge, attitudes and self-efficacy) and external factors (e.g. socio-cultural and economic disparities) (Kollmuss and Agyemann, 2002; Stern, 2000; Gifford, 2011).Undoubtedly attitudes, and knowledge have a strong influence on sustainable consumption. Scholars of behavioral economics and social psychology have used these factors as predictors for consumption behavior (Jackson, 2005). However, as sustainable consumption is a complex phenomenon with different contextual settings, using attitudes and knowledge as the only predictors that influence consumption generated poor models (de Pelsmacker et al., 2005). Due to the fact that models of Knowledge to Action and Theory of Planned Behavior show mixed results in describing sustainable consumption, a growing body of literature started suggesting additional internal, as well as external factors to increase the predictive quality of the models. Triandis (1977) explicitly tried to incorporate habits, emotions and situational constraints into models of sustainable consumption. Although the ideas have not gained as much prominence, they might still be meaningful for gaining deeper insights into sustainable consumption. However, empirical testing of these aspects has been quite rare, but investigations of pro-sustainable behavior in settings of car use and land use change support the suggestion that habits and situational constraints have a strong relation towards behavior (Bamberg and Schmidt, 2003; Okumah et al. 2020).

3. Methods

3.1 Hypotheses

Our model is based on Hines (1987) who suggests that attitudes and intentions are an artifact of the combination of antecedent factors like values, knowledge and group identity. Inspired by the parsimony of the Theory of Planned Behavior proposed by Ajzen and Fishbein (Ajzen, 1985) and the Theory of Interpersonal Behavior (Triandis, 1977) we incorporated questions of Group Identity and subjective norm, self-concept and Values (See Appendix I for the different items of). Additionally, we propose that demographic factors play an important role in explaining and predicting sustainable consumption (Yamoah, 2019). We therefore model attitudes as a latent construct that draws on the three constructs (1) Knowledge; (2) Values and (3) Group

Identity. We then use this latent construct to investigate into different demographic charac-teristics (Gender, Age, Education, Income) (See Fig. 1).

Table 3: Overview of proposed Hypotheses

| Hypothesis	Source
Factors affecting Attitudes	
H1: Cognitive and affective aspects (knowledge) have a positive effect on Attitudes	De Pelsmacker et al., 2007
H2: Values have a positive effect on Attitudes	Leiserowitz et al. 2008
H3: Group ID has a positive effect on Attitudes	Yan and Li, 2009
H4: Demographics (Gender, Age, Education, Income) have a positive effect on Attitudes	Yamoah, 2019
H5: Women have a stronger Attitude towards sutainable consumption	Kollmuss and Agye-mann, 2002
H6: Gender, Age and Education are mediated through Income	Lam, 1997
Factors affecting Behavior	
H7: Attitude has a positive effect on behavior	Ajzen, 2002
H8: Habits have a negative effect on behavior	Mazar et al., 2020
H9: Social Norm has a negative effect on behavior	Bamberg and Möser, 2007
H10: Price/Budget has a negative effect on behavior	Hainmueller et al., 2015
H11: Quality has a negative effect on behavior	Gleim and Lawson, 2013
H12: PBC has a negative effect on behavior	Okumah, 2020
H13: Convenience has a negative effect on behavior	Bernstad, 2014

3.2 Model
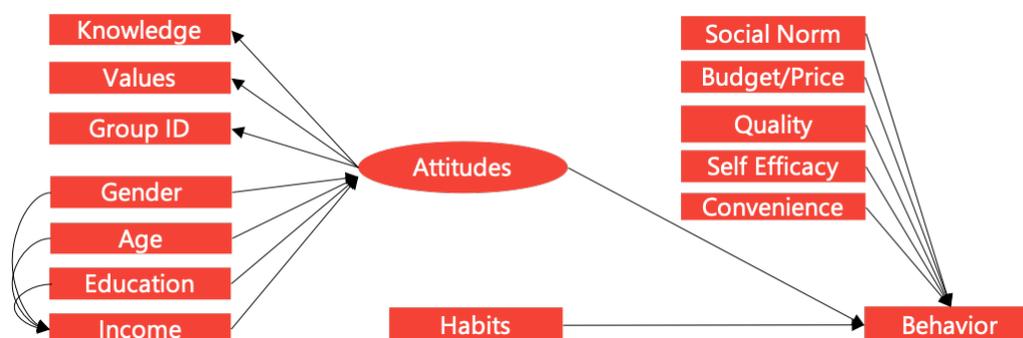
Fig. 6:Proposed Flow Model including internal factors (Knowledge, Values, Group ID), demographic factors (Gender, Age, Education, Income), situational constraints (Social Norm, Budget/Price, Quality, Self Efficacy, Convenience) and Habits

Based on the conceptual literature, we incorporate constructs that explicitly function as situational constraints, impeding sustainable consumption (Social Norm, Budget/Price, Quality,

PBC, Convenience) to get insights into the gap between attitudes and behavior. These constructs do not represent an exhaustive list, but are rather a starting point to test and compare the predictability of certain barriers towards sustainable consumption. Using the elaborated constructs, we formulated hypotheses that make the conceptual assumptions explicit (See Table 1). We then test these hypotheses in order to analyze the role and interactions of factors that influence sustainable consumption. In the following, we will describe the relevance of these constructs, highlighting proposals of other literature.

Knowledge

Knowledge and the communication of knowledge in the form of providing information such as brochures, posters and newspaper articles have been suggested to be the most relevant factor for inducing pro-sustainable behavior (de Pelsmacker et al., 2007). It is assumed that unsustainable behavior simply follows lacking information, or awareness. Thus, the provision of information may be used to induce change (Shaw and Shiu, 2003, Pérez and García de los Salmones, 2017). To this end, De Pelsmacker and Janssens (2007) show that knowledge about Fairtrade practices and products has a direct and indirect influence on buying behavior. However, the correlation between knowledge as a direct predictor of intention and behavior is ambiguously discussed in the literature. Aertsens et al. (2011) argue that lack of knowledge about organic food is the main impeding factor that slows down the growth of the organic food markets. However, providing information as a sole solution towards sustainable consumption overlooks the descriptive power of other factors. Okumah et al. (2020) show, that knowledge and environmental concern among other factors effect pro-sustainable behavior. They argue that information needs to be directed towards a specific behavior, so that knowledge can be used as a predictor of behavior. Jensen (2002) proposes that the knowledge of Fairtrade benefits for producers leads to an increase of consumption of Fairtrade products. In this study, we therefore used items that are directed towards globally traded goods and its benefits for producers.

Values

Values and concerns for people and the environment are important factors in the everyday life of individuals. Consumers of globally traded goods show affections towards issues in other countries (Bucic, Harris, Arli, 2012). Values, as abstract principles that give insight into individual's self-concept, have been successfully used as an important factor to understand pro-sustainable behavior, particularly in the absence of knowledge about concrete environmental issues (Agyemann and Kollmuss, 2002, Pelsmacker et al. 2005). Kempton et al. (1995) show in groups of strong environmentalists and anti-environmentalists that although knowledge about environmental problems is not significantly different, certain behavior differs. In addition, socially responsible attitudes and attitudes towards human rights show a strong connection on Fairtrade purchasing intentions (Kim et al., 1999; Hertel et al., 2009). Therefore, scholars have shifted their attention to values as another factor influencing attitudes and behavior. The Schwartz-Value-Framework has been used in this case as an attempt to measure individuals underlying norms and "abstract willingness to act". Schwartz hypothesized that abstract values are the basis of concrete situational action and proposed ten different aspects to measure these abstract values (Schwartz, 1977). Of these ten aspects, some show a direct positive relation with environmental behavior, for instance are altruistic concerns a good predictor for individual recycling behavior (Hopper and Nielsen, 1991).

Group ID

Issues of group norms and identifying with a peer group are hypothesized to have an influence on decisions of individuals (Jackson, 2005). Scholars are concerned with the question if attitudes are influenced by other people and peer groups. Group identity and belonging to a group has been shown to have an influence on individual behavior. Water and energy consumption within households (Kurz et al., 2005), being silent in libraries (Aarts and Dijksterhuis, 2003) and towel use in hotels (Goldstein et al., 2008) have been used as cases to show a direct effect of social groups on individual behavior. The strength of these effects is based on cultural contexts and individual mindsets. Whereas a very individualistic person in western countries might be unaffected by the opinions and mindsets of their peers, a case study of Chinese citizens has shown that consumers tend to be more on the collectivist spectrum making them more open to the opinions and mindsets of their peers (Yen, 2017).

Demographics

The role of demographic variables as predictive factors is an issue that is often overlooked in pro-sustainable behavior (Yamoah, 2019). Empirical investigations using the "theory of planned behavior", try to address them indirectly through the factors of subjective norm and perceived behavioral control. However, they play an important role in explaining sustainable consumption. Particular aspects of demographics have shown to be strongly linked to consumption patterns. Botetzagias et al. (2014) show a link between demographics and energy saving while Chowdhury and Ceder (2013) highlight a connection between demographics and transportation choices. Kollmuss and Agyemann (2002) argue that gender and years of education show a strong link towards pro-sustainable behavior, where women usually show more concern and seem to be more willing to change their consumption behaviour. It is assumed that the educational or training years have a positive correlation with pro environmental behavior. However, whether the level of education directly effects the attitudes remains unclear. Hines (1987) concludes that individuals with higher incomes and higher education appeared to be more likely to engage in pro- environmental behavior. An increase in age however seemed to have a weak but negative effect on pro-sustainable behavior (ebd.). Thus, this paper includes gender, age, level of education and income to gain insights into the explanatory value of demographics. It is fair to say that demographic differences are usually strongly related to income (Lam, 1997). We therefore hypothesize that income can play a mediating role between attitudes and other demographic variables.

Social Norm

Individuals influence and are influenced by their social group (Biel and Thogersen, 2007). This process of deliberation between individuals and their surroundings results in guidelines for behavior, which is referred to as social norms (Kollmuss and Agyemann, 2002). The individual usually is credited for conforming to a desirable behavior and gets disapproval for deviating from conformity (Schultz et al., 2008). It is fair to say that these social norms influence the buying behavior of individuals. Abrahamse and Steg (2012) provide a meta-analysis to show that social influence is effective at encouraging pro-sustainable behavior. Kim et al. (2012) show a strong link between social norms and purchase intention of eco-friendly apparel. Klöckner and Ohms (2009) conclude that the price difference between organic and conventional milk are less important constraints for consumers living in groups with high ecological norms. These social norms can also be a barrier for sustainable consumption as the individual might feel obliged to obey to the rules of certain reference groups (Bamberg and Möser, 2007).

Budget/Price

Products with sustainable claims, like Fairtrade coffee or organic chocolate tend to be more expensive than conventional products. Participants of empirical studies suggest that their main impeding factor is a limit of budget and/or the higher price of the product. Van Doorn and Verhoef (2015) identified price consciousness as a barrier towards the purchase of organic products. Increased prices are connected to a decline of coffee sales (Hainmueller et al., 2015) and consumers of Belgian chocolate demand Fairtrade products to be cheaper (de Pelsmacker et al., 2006).

Quality

Quality concerns are of high interest to consumers. Especially globally traded products like chocolate and coffee are consumed for their taste and some consumer groups tend to purchase products for their quality aspects (Poelmans and Rousseau, 2016). Van Doorn and Verhoef (2015) identified quality consciousness as the preference to buy products that have specific taste or health aspects. Organic food has been shown to have some positive annotations in the perceptions of consumers (Paul and Rana, 2012). Additionally, Fairtrade chocolate has been perceived as tasting better and having less calories in consumer perceptions, even if factually untrue (Schuldt et al. 2012). On the other hand, some food products also have some bad reputations and are perceived as having a bad visual appearance, smaller size and have a shorter minimum shelf life (Lopes Souza Soares et al., 2008). Additionally, consumers stated that poor product quality was one of the main barriers to purchase green products more often (Gleim et al., 2013). We therefore included the factor perceived quality as a possible barrier towards pro-sustainable consumption.

Self-Efficacy

Perceived Self Efficacy refers to the belief in personal capabilities to execute a certain action. This factor is closely linked to a concept called perceived behavioral control (Okumah, 2020). In its intended form, it is not concerned with the outcomes of certain actions, but the action itself. However, it has been used to describe the change of the perceived ability to perform actions under different conditions (Ajzen, 2002). Self-efficacy of individuals to foster sustainable development turned out to be a strong predictor of sustainable consumption behavior (Hanss and Böhm, 2010). Okumah (2020) show that self-efficacy factors have a strong link to recycling, land management and general ecological behavior. Bamberg and Möser (2007) propose that self-efficacy (or perceived behavioral control) is not mediated through intentions, but instead has a direct effect on the respective behavior. We therefore use the notion of self-efficacy as a barrier to describe the perceived lack of agency to produce a given outcome.

Convenience

Convenience has been identified as an important factor impeding sustainable consumption (Boulstridge and Carrigan, 2000). Especially in the context of everyday consumption, which consists of products with low financial involvement that are usually easily available, convenience is argued to be an important factor. Aspects like the distance to the supermarket, product availability and access to certain products or facilities forms situational constraints for sustainable consumption (Jackson, 2005). Bernstad et al. (2014) show that contextual factors, like poor recycling facilities, have a strong impact on environmental behavior.

Habits

Our everyday consumption patterns are not always the result of internal, rational deliberation processes. Indeed, in many circumstances people have certain heuristics and rules of thumbs that are not based on a systematic, objective review of all possible options (Jackson, 2005). Habits have been proposed as a construct that is independent of internal deliberation processes. It is hypothesized to be the result of repeated past behavior, which shifts the future activity away from conscious activities towards an automated behavior, like paying bills or everyday grocery shopping (Yamoah, 2019). Smith et al. (2007) show in a natural field experiment a strong correlation between past behavior and future intention to buy and also give evidence that past behavior is independent of attitudes and intentions. Dean et al. (2012) show that past behavior is a good predictor of buying intention in the organic food sector.

3.3 Questionnaire

We conducted a survey using an online questionnaire of German consumers. The questionnaire was distributed online to a total of N= 575 persons that were living in Germany at the time of the conduction of the survey, or that had lived for at least 10 years in Germany in the past. Germany lends itself as a prime subject of investigation because it is one of the countries with a high consumption of globally traded food items like coffee, tea and cocoa products (Carrington et al., 2010) and also because the problem awareness around issues of sustainability is comparably high in the general population (Young et al., 2010). The questionnaire was carried out in German language, from February to May 2020 and consisted of 28 focused questions which are based on the hypotheses derived from the literature (See Table 1). Each construct is tested through three items which are measured using a LIKERT scale (See Appendix 1). Additionally, we surveyed the participants about their general buying behavior of globally traded food items and their demographics.

Our sample consists of N=575 participants out of which all were included for all statistical analyses, that have completely filled out the questionnaire (N=475). We could indicate a slight bias towards female participants (61%). However, income, formal education and age distributions were more diverse. Income and age distributions are quite similar to the German population (See Table 1). To check for internal consistency, we calculated Cronbach's α for the set of constructs evaluated in our questionnaire. Initially the construct "Habits" scored at $\alpha = 0.22$ indicating unacceptable construct consistency. After checking the correlation matrix of the three items of this construct, we manually removed the one item, which did not correlate with the others as proposed by Wieland et al. (2017). Following this "scale purification" (ibid: 321), the construct attained $\alpha = 0.56$. Even though Schmitt (1996) argues that a relatively low level ($\alpha < 0.5$) for Cronbach's alpha can be used if the measure has other desirable properties, Yamoah et al (2014) refer to $\alpha = {\sim}0.6$ as the threshold for a construct to be kept for further analysis. According to this criterion, we had to drop the constructs, 'habits' and 'quality' from all subsequent analyses (Table 4). However, due to its meaningful content coverage we kept 'knowledge' as part of our model, since it is conceptually relevant and demanding to operationalize (Schmitt 1996). All statistical analyses were carried out in R using the "lavaan"-package (R Core Team, 2020).

4. Results

4.1 Descriptive Statistics

Of the 475 participants ~31% state that their consumption behavior is mostly in line with their values and attitudes (LIKERT-Score: 4-5). ~57% were unsure (LIKERT-Score: 3) and ~11% expressed that there is a gap between their intention and the respective behavior (LIKERT-Score: 1-2).

Table 4: Overview table of the descriptive analysis of demographics

	n	%		n	%
Gender			**Income**		
Female	292	61.5	no income	30	6.3
Male	153	32.2	<500€	46	9.7
Other	1	0.2	500-1000	86	18.1
No answer	29	6.1	1000-1500	61	12.8
Age			1500-2000	51	10.7
<21	32	6.7	2000-2500	56	11.8
21-30	190	40	2500-3000	25	5.3
31-40	112	23.6	3000-3500	25	5.3
41-50	44	9.3	3500-4000	18	3.8
51-60	33	6.9	>4000	28	5.9
>60	22	4.6	No answer	49	10.3
No answer	42	8.8			
Formal Education			**Profession**		
< Bachelor degree	204	42.9	Undergraduate	1	0.2
>= Bachelor degree	212	44.6	Apprentice	3	0.6
other	18	3.8	Student	151	31.8
No answer	41	8.6	Employee	205	43.2
			Self-employed	41	8.6
			Unemployed	4	0.8
			other	29	6.1
			No answer	41	8.6

Our descriptive results suggest that the construct "Values" has the highest subjective score (mean= 16,84) in comparison with the other constructs. A Welch's T-Test suggest that the scoring of "Values" does not significantly differ between female and male participants (p-value = 0.17).

The highest ranking, perceived barriers are Price/Budget and Convenience (See Fig. 2). These two constructs are significantly different from the other constructs (Tukey-Test: p-value<0.01); our model suggests that there are no significant differences between female and male participants (Welch's t-test: p= 0.08).

4.2 Structural Equation Model

To get a deeper understanding of the different factors and their interplay we test our model using a Structural Equation Modelling approach.
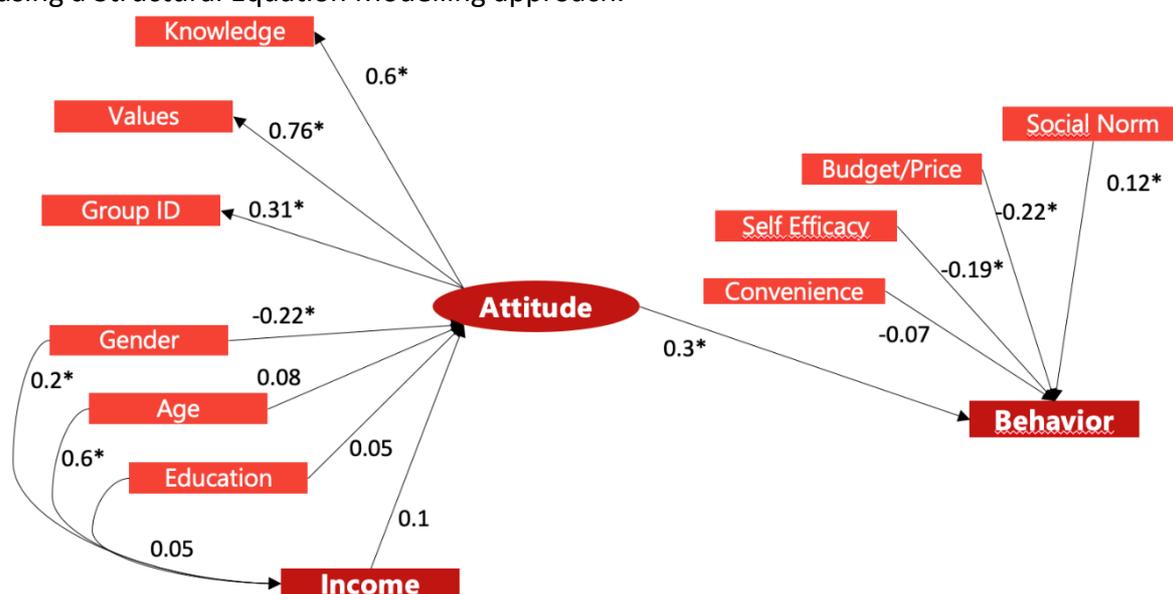
Fig. 7: Path analysis results of the hypothesized model from Fig. 1. Model Fit Indices: $\chi^2(98.001)/df(34) = 2.88$, GFI = 0.924, CFI = 0.878, RMSEA = 0.068, SRMR = 0.048 (*=p-value<0.05).

The proposed structural model (Fig. 2) defines Attitude as a latent construct which loads onto the construct's Knowledge, Values and Group Identity. The factors show a significant relationship with attitudes (p-value < 0.01) and a strong path coefficient (r>0.3). The strongest path coefficient exists between values and attitudes (r=0.76), suggesting that this construct is of high importance to the participants (See Appendix I for the detailed items).

Attitude is then regressed on demographic factors. The results show that income, age, and education had no significant relationship with Attitudes. Gender however had a negative effect on the attitudes (r=-0.22) meaning that female respondents had a more positive attitude towards pro-sustainable consumption than male respondents.

As income is usually strongly connected to other demographic factors, we used it as a mediator for age, gender and education. There was a positive path coefficient (r=0.6) between age and income. The older the respondents, the higher the likelihood of generating a higher income. They also suggest that gender shows a significant relation with income, meaning that male participants have a higher income than female participants. However, education shows no significant relation to income.

Behavior is measured through the question how people perceive their alignment between certain values and their respective behavior. This factor is then regressed on attitudes and the

hypothesized barriers. The results suggest a positive path coefficient between Attitudes and Behavior (r=0.3). It therefore functions as a mediator between the antecedents of Attitudes (Knowledge, Values, Group ID) and its respective behavior. At last, the results suggest a positive path coefficient between situational constraints and the respective behavior. Convenience however, also shows an effect on behavior, but we cannot rule out that the effect could have been zero as well. Overall, the results suggest that barriers have explanatory value to affect behavior. In line with other research, Budget/Price shows the highest path coefficient (r=0.22).

Table 4: Overview Table of the hypotheses and the empirical results based on the structural equation model

Hypothesis	Coefficient	Decision
Factors affecting attitudes		
H1: Cognitive and affective aspects (Knowledge) have a positive effect on Attitudes	0.6*	Accepted
H2: Values have a positive effect on Attitudes	0.76*	Accepted
H3: Group ID has a positive effect on Attitudes	0.31*	Accepted
H4: Demographics (Age, Education, Income) have a direct effect on Attitude	Age: 0.08	Rejected
	Ed.: 0.2*	Accepted
	Income: 0.1	Rejected
H5: Women are more inclined towards sustainable consumption	Gender: -0.22*	Accepted
H6: Gender, Age and Education are mediated through Income	Gender: 0.2*	Accepted
	Age: 0.6*	Accepted
	Education: 0.05	Rejected
Factors affecting Behavior		
H7: Attitude has a positive effect on Behavior	0.3*	Accepted
H8: Habits have a negative effect on Behavior	Poor internal consistency	Inconclusive
H9-H13: Barriers (Social Norm, Budget/Price, Quality, Self Efficacy, Convenience) have a negative effect on Behavior	Social Norm: 0.12*	Rejected
	Budget/Price: -0.22*	Accepted
	Quality: poor i. consistency	Inconclusive
	Self Efficacy: -0.19*	Accepted
	Convenience: -0.07	Rejected

Based on our empirical findings we give suggestions about the research hypotheses formulated in Table 1. Our results support the hypothesis that consumers in the German market base their purchase intentions on certain attitudes (See Table 4). These attitudes show a

strong relation towards the participants' values, cognitive aspects and their social surroundings (H1, H2, H3). Our study suggests that female participants show a stronger attitude towards sustainable consumption (H5). We also show that formal education is positively correlated with attitudes, suggesting that participants with a higher educational status tend to be more aware of issues connected to globally traded food and show a stronger attitude towards sustainable consumption. However, income and age showed no significant path coefficient, suggesting that the phenomenon of sustainable consumption is not only connected to younger generations and people with higher income (H4). Participants base their purchase intentions on their attitudes toward specific products (H7). Our empirical results show that attitudes play an important role in the consumption choices of German consumers. While we had to drop habits from our empirical analysis due to poor internal consistency, our results suggest that situational constraints have a negative path coefficient towards pro-sustainable buying behavior (H9) with Budget/Price and Self Efficacy (PBC) functioning as the strongest barriers between the alignment of attitudes and the respective behavior.

5. Discussion

The results of our analysis suggest that the gap between pro-sustainable mental attitudes and actual buying behavior are influenced through a multitude of different factors from internal deliberation processes to situational constraints. While it is clear that there exists no holistic framework that is still empirically testable, we want to highlight different aspects in order to bring the discussion towards a more solution-oriented interdisciplinary exchange.

5.1 Attitude-behavior gap awareness

One key assumption in the literature is that consumers are aware of the gap between their attitudes and behavior (Kennedy et al., 2009). However, we find mixed results in our survey, as most of the participants assume that their consumption patterns match their values and attitudes. One reason could be that our sample consisted of participants with a higher-than-average formal education level. This is in line with Kollmuss and Agyemann (2002), who suggest that sustainable awareness increases through years of education and therefore the gap between attitudes and behavior gets smaller. However, our results challenge Hines (1987) since in our data education show no clear relation towards attitudes (See Fig. 2), questioning whether formal education is a good proxy for pro-sustainable consumption. Information about sustainably produced products is still incoherent. While some participants are aware of the gap between their attitudes and their everyday consumption patterns, many participants indicate a strong alignment between their attitudes and their behavior. Our results might indicate a social desirability bias, where participants present themselves in a more socially desirable manner. We could show that the majority of participants show a high scoring based on the construct values, yet they might feel obliged to state that they usually align their consumption towards their attitudes. However, these results could also show that there is still a lack of coherent information about sustainable products.

5.2 The role of internal factors for pro-sustainable attitudes

Another key assumption from behavioral economics and social psychology, is that internal factors are the causal antecedents of pro-sustainable attitudes (Ajzen, 2002; Jensen, 2002; Yamoah et al., 2014), which our results confirm by the factors of internal deliberation (Values, Group Identity, Knowledge) that are empirically meaningful to describe attitudes. However, the question remains, which factors are meaningful to describe attitudes and how these interplay with the respective behavior. As Jackson (2005) proposes the long-lasting tradition of

neoclassical economics, building on rational deliberation, have been ill-fitted to describe the complexities of individual buying behavior. Based on our results most of the participants buy their products in supermarkets. Since globally traded food items are therefore just part of a daily shopping routine of many participants, the internal deliberation processes about sustainable consumption do not sufficiently explain consumption behavior. This is in line with the argument from Terlau and Hirsch (2015) who suggest that especially everyday consumption patterns are low-involvement behaviors, where automatic and sub-conscious decisions are taking place without a rational process. Therefore, the findings of this study suggest that the models that put a focus on internal factors should ideally be complemented through external factors, like group norms, habits and structural aspects.

5.3 The role of demography

Demographic variables are suggested to be meaningful factors to give insights on sustainable consumption. In particular gender plays an important role, where female participants tend to have stronger attitudes towards sustainable consumption (Meier and Christen, 2012). Our results show that the highest-ranking factors, influencing attitudes and forming situational constraints showed no differences between female and male participants. However, the results from the structural equation model suggests that the combination of the factors constituting attitudes is in line with the proclaimed hypothesis that female participants have a stronger attitude towards sustainable consumption. This is in line with Kollmuss and Agyemann (2002), who finds that women tend to have stronger environmental concerns and a higher willingness to act pro-sustainable.

5.4 The role of situational constraints

Finally, this study tested if it is meaningful to include external factors, like situational constraints. Our empirical results support the finding of van Doorn and Verhoef (2015) that situational constraints give insights into the gap between attitudes and behavior. The highest-ranking barriers are factors concerning the perceived price of the product and/or budget restrictions, as well as factors of self-efficacy. In line with Hainmueller et al. (2015) and de Pelsmacker et al. (2006), our results suggest that concerns of price and budgets are meaningful barriers to describe the gap between attitudes and behavior. In addition, our results support the argument of Bamberg and Möser (2007) that self-efficacy is not a factor that is mediated through attitudes and intentions but instead directly forms a situational barrier. Even though, these factors do not sufficiently cover all potential barriers that individuals are facing, they provide a first step towards a more integrated framework to understand the different factors that play a role in sustainable consumption.

5.5 Moving forward

There is still no broad consensus about the factors that influence sustainable consumption, despite continuous research that is even increasing over the last decades. We suggest that this is a problem of parsimony. On the one hand does social-psychological and economic research often build on simplistic but empirically robust models. On the other hand, conceptual models are proposed which attempt to include a comprehensive overview of all possible aspects. While the former fail to underpin or generate meaningful theoretical considerations for understanding sustainable consumption the latter use models which are empirically very demanding and certainly not parsimonious. Based on our results we suggest that there needs to be a stronger interdisciplinary exchange between these two approaches in order to advance our understanding of the causal factors for sustainable consumption and create robust models

that are empirically testable. We show that the Theory of Planned Behavior has still concep-
tual meaning to describe sustainable consumption and its causal factors. However, our results
also suggest that this approach needs to be complimented by external factors, such as situa-
tional constraints. Therefore, the focus of investigation needs to shift from focusing only on
the individual and his or her internal deliberations towards conceptualizations that include
external factors and everyday heuristics. While participants show a strong affection towards
sustainable consumption based on our results, they still face barriers in their everyday life
decisions. In addition, research has mainly focused on what Stern (2000) calls Private-Sphere
Environmentalism, i.e. individual, private behavior concerned with buying, using and disposing
goods and services for private households (e.g. buying organic products, reusing jars and sep-
arating trash). However, this leaves out research on other environmentally significant behav-
ior such as environmental activism, which consists of individuals partaking in demonstrations
or environmental organizations and non-activist behaviors in the public sphere, which mainly
consists of active citizenships (e.g. signing petitions, picking up litter, donating), which is con-
cerned with buying, using and disposing goods and services for private households (e.g. buying
organic products, reusing jars and separating trash, cf. Stern 2000).
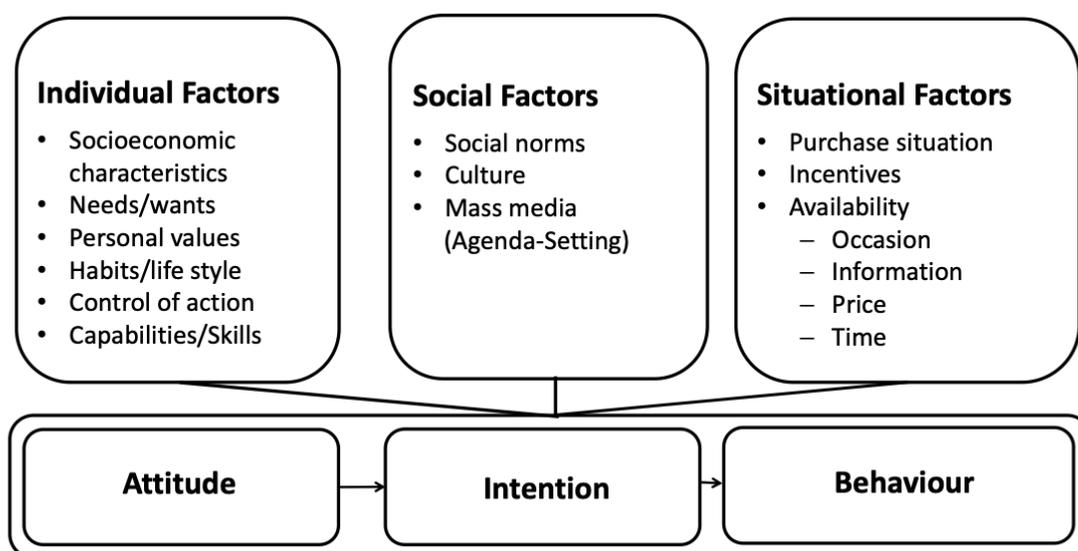
Fig. 8: Conceptual model of the influencing factors for pro-sustainable behavior. (Terlau and Hirsch, 2015)

As globally traded commodities usually get produced through complex global value chains,
information about social and environmental aspects is to date not coherently communicated,
which is why consumers cannot adjust their consumption behavior based on the provided
information. A communication flow based on the model of linear progressions that provides
consumers with coherent communication about sustainable products might be able to at least
partly overcome this hurdle. Additionally, our model suggests that values, knowledge and
group identity are meaningful constructs to measure attitudes towards sustainable consump-
tion. It also suggests that attitudes have an empirical relation to behavior and therefore func-
tion as meaningful causal factors explaining behavior. However, we could also show that atti-
tudes alone cannot explain the respective behavior and therefore need to be complemented
through other aspects. In our empirical investigation situational constraints can function as
barriers between the alignment of attitudes and its respective behavior. Although we cannot
say that the barriers evaluated in our empirical study function as an exhaustive list, we were

still able to show the meaningfulness of including external barriers into the context of sustainable consumption. This has far reaching implications, as it questions the conceptual rationale of certain models, as our results suggest that behavior is not the result of just the cognitive deliberation process of self-centered individuals. On the contrary sustainable consumption is a process that spans from the internal deliberations over the immediate peers that influence our decisions up to structural imbalances such as gender, income and education. In order to shift the research about sustainable consumption into a more complete, solution-orientated direction it is important to create an interdisciplinary discourse. However, due to the different disciplines that are involved in this process methodological barriers need to be overcome. A first step towards an interdisciplinary discourse has been brought forward by Terlau and Hirsch (2015) who try to give a simplistic but comprehensive overview of perspectives on individual consumption behavior (See Fig. 3). Sustainable consumption does not only include barriers on an individual scale. On the contrary, researchers who want to better understand sustainable consumption need to put a stronger emphasis on social and situational factors that can form barriers towards the alignment between attitudes and its respective behavior.

6. Conclusion

Sustainable consumption is one of the key drivers to move societies towards more sustainable trajectories. It therefore becomes evident that understanding the most important factors behind sustainable consumption remains a tricky science puzzle. In the present study, we were able to highlight epistemological gaps stemming from a missing interdisciplinary exchange. While sustainable consumption is an inherently complex issue encompassing many aspects, we show a mismatch between conceptual ideas and empirical approaches, which is rooted in empirical research engaging in parts of the theoretical concepts and conceptual ideas trying to grasp every aspect that sustainable consumption revolves around. To address this mismatch, we propose three aspects that function as a bridge towards more comprehensive and empirically meaningful models to understand sustainable consumption. (1) Attitude-Behavior-Gap awareness. Consumers are usually aware of the gap between their attitudes and the respective behavior. Explicitly including this awareness into future models might help increasing the explanatory value. (2) Demographic factors. While our results show some differences based on demographic variables, we were able to show that women have a stronger attitude towards sustainable consumption. (3) Situational constraints. As shown by other work and supported by our empirical results, situational constraints are conceptually relevant and empirically meaningful to include in order to shift the discourse towards an interdisciplinary exchange to understand sustainable consumption. With this article we hope to propose some conceptually relevant and empirically meaningful puzzle pieces to broaden the perspectives on towards more sustainable trajectories.

References

Aarts, Henk, and Ap Dijksterhuis. 2003. 'The Silence of the Library: Environment, Situational Norm, and Social Behavior.' *Journal of Personality and Social Psychology* 84(1):18–28. doi: 10.1037/0022-3514.84.1.18.

Abrahamse, Wokje, and Linda Steg. 2011. 'Factors Related to Household Energy Use and Intention to Reduce It: The Role of Psychological and Socio-Demographic Variables'. *Human Ecology Review* 30–40.

Aertsens, Joris, Koen Mondelaers, Wim Verbeke, Jeroen Buysse, and Guido Van Huylen-broeck. 2011. 'The Influence of Subjective and Objective Knowledge on Attitude, Motivations and Consumption of Organic Food'. *British Food Journal* 113(11):1353–78. doi: 10.1108/00070701111179988.

Ajzen, Icek. 1985. 'From Intentions to Actions: A Theory of Planned Behavior'. Pp. 11–39 in *Action Control*, edited by J. Kuhl and J. Beckmann. Berlin, Heidelberg: Springer Berlin Heidelberg.

Ajzen, Icek. 2002. 'Perceived Behavioral Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behavior [1]'. *Journal of Applied Social Psychology* 32(4):665–83. doi: 10.1111/j.1559-1816.2002.tb00236.x.

Andorfer, Veronika A., and Ulf Liebe. 2013. 'Consumer Behavior in Moral Markets. On the Relevance of Identity, Justice Beliefs, Social Norms, Status, and Trust in Ethical Consumption'. *European Sociological Review* 29(6):1251–65. doi: 10.1093/esr/jct014.

Andorfer, Veronika A., and Ulf Liebe. 2015. 'Do Information, Price, or Morals Influence Ethical Consumption? A Natural Field Experiment and Customer Survey on the Purchase of Fair Trade Coffee'. *Social Science Research* 52:330–50. doi: 10.1016/j.ssresearch.2015.02.007.

Anon. n.d. 'A Safe and Just Space for Humanity'.

Bamberg, Sebastian, and Guido Möser. 2007a. 'Twenty Years after Hines, Hungerford, and Tomera: A New Meta-Analysis of Psycho-Social Determinants of pro-Environmental Behaviour'. *Journal of Environmental Psychology* 27(1):14–25. doi: 10.1016/j.jenvp.2006.12.002.

Bamberg, Sebastian, and Guido Möser. 2007b. 'Twenty Years after Hines, Hungerford, and Tomera: A New Meta-Analysis of Psycho-Social Determinants of pro-Environmental Behaviour'. *Journal of Environmental Psychology* 27(1):14–25. doi: 10.1016/j.jenvp.2006.12.002.

Bamberg, Sebastian, and Peter Schmidt. 2003. 'Incentives, Morality, Or Habit? Predicting Students' Car Use for University Routes With the Models of Ajzen, Schwartz, and Triandis'. *Environment and Behavior* 35(2):264–85. doi: 10.1177/0013916502250134.

Bernstad, Anna. 2014. 'Household Food Waste Separation Behavior and the Importance of Convenience'. *Waste Management* 34(7):1317–23. doi: 10.1016/j.wasman.2014.03.013.

Biel, Anders, and John Thøgersen. 2007. 'Activation of Social Norms in Social Dilemmas: A Review of the Evidence and Reflections on the Implications for Environmental Behaviour'. *Journal of Economic Psychology* 28(1):93–112. doi: 10.1016/j.joep.2006.03.003.

Blake, James. 1999. 'Overcoming the "Value-action Gap" in Environmental Policy: Tensions between National Policy and Local Experience'. *Local Environment* 4(3):257–78. doi: 10.1080/13549839908725599.

Botetzagias, Iosif, Chrisovaladis Malesios, and Dimitra Poulou. 2014. 'Electricity Curtailment Behaviors in Greek Households: Different Behaviors, Different Predictors'. *Energy Policy* 69:415–24. doi: 10.1016/j.enpol.2014.03.005.

Boulstridge, Emma, and Marylyn Carrigan. 2000. 'Do Consumers Really Care about Corporate Responsibility? Highlighting the Attitude—Behaviour Gap'. *Journal of Communication Management* 4(4):355–68. doi: 10.1108/eb023532.

Bucic, Tania, Jennifer Harris, and Denni Arli. 2012. 'Ethical Consumers Among the Millennials: A Cross-National Study'. *Journal of Business Ethics* 110(1):113–31. doi: 10.1007/s10551-011-1151-z.

Butzer, K. W. 2012. 'Collapse, Environment, and Society'. *Proceedings of the National Academy of Sciences* 109(10):3632–39. doi: 10.1073/pnas.1114845109.

Carrington, Michal J., Benjamin A. Neville, and Gregory J. Whitwell. 2010. 'Why Ethical Consumers Don't Walk Their Talk: Towards a Framework for Understanding the Gap Between the Ethical Purchase Intentions and Actual Buying Behaviour of Ethically Minded Consumers'. *Journal of Business Ethics* 97(1):139–58. doi: 10.1007/s10551-010-0501-6.

Chen, Yan, and Sherry Xin Li. 2009. 'Group Identity and Social Preferences'. *American Economic Review* 99(1):431–57. doi: 10.1257/aer.99.1.431.

Chowdhury, Subeh, and Avishai (Avi) Ceder. 2016. 'Users' Willingness to Ride an Integrated Public-Transport Service: A Literature Review'. *Transport Policy* 48:183–95. doi: 10.1016/j.tranpol.2016.03.007.

De Pelsmacker, Patrick, Liesbeth Driesen, and Glenn Rayp. 2005. 'Do Consumers Care about Ethics? Willingness to Pay for Fair-Trade Coffee'. *Journal of Consumer Affairs* 39(2):363–85. doi: 10.1111/j.1745-6606.2005.00019.x.

De Pelsmacker, Patrick, and Wim Janssens. 2007. 'A Model for Fair Trade Buying Behaviour: The Role of Perceived Quantity and Quality of Information and of Product-Specific Attitudes'. *Journal of Business Ethics* 75(4):361–80. doi: 10.1007/s10551-006-9259-2.

Dean, Moira, Monique M. Raats, and Richard Shepherd. 2012. 'The Role of Self-Identity, Past Behavior, and Their Interaction in Predicting Intention to Purchase Fresh and Processed Organic Food1: INTENTION TO PURCHASE ORGANIC FOOD'. *Journal of Applied Social Psychology* 42(3):669–88. doi: 10.1111/j.1559-1816.2011.00796.x.

Eakin, Hallie, Ximena Rueda, and Ashwina Mahanti. 2017. 'Transforming Governance in Telecoupled Food Systems'. *Ecology and Society* 22(4):art32. doi: 10.5751/ES-09831-220432.

Folke, Carl, Stephen R. Carpenter, Brian Walker, Marten Scheffer, Terry Chapin, and Johan Rockström. 2010. 'Resilience Thinking: Integrating Resilience, Adaptability and Transformability'. *Ecology and Society* 15(4):art20. doi: 10.5751/ES-03610-150420.

Gatersleben, Birgitta, Linda Steg, and Charles Vlek. 2002. 'Measurement and Determinants of Environmentally Significant Consumer Behavior'. *Environment and Behavior* 34(3):335–62. doi: 10.1177/0013916502034003004.

Gifford, Robert. 2011. 'The Dragons of Inaction: Psychological Barriers That Limit Climate Change Mitigation and Adaptation.' *American Psychologist* 66(4):290–302. doi: 10.1037/a0023566.

Gleim, Mark, and Stephanie J. Lawson. 2014. 'Spanning the Gap: An Examination of the Factors Leading to the Green Gap'. *Journal of Consumer Marketing* 31(6/7):503–14. doi: 10.1108/JCM-05-2014-0988.

Goldstein, Noah J., Robert B. Cialdini, and Vladas Griskevicius. 2008. 'A Room with a Viewpoint: Using Social Norms to Motivate Environmental Conservation in Hotels'. *Journal of Consumer Research* 35(3):472–82. doi: 10.1086/586910.

Hainmueller, Jens, Michael J. Hiscox, and Sandra Sequeira. 2015. 'Consumer Demand for Fair Trade: Evidence from a Multistore Field Experiment'. *Review of Economics and Statistics* 97(2):242–56. doi: 10.1162/REST_a_00467.

Hanss, Daniel, and Gisela Böhm. 2010. 'Can I Make a Difference? The Role of General and Domain-Specific Self-Efficacy in Sustainable Consumption Decisions'. *Umweltpsychologie* 14(2):46–74.

Hertel, Shareen, Lyle Scruggs, and C. Patrick Heidkamp. 2009. 'Human Rights and Public Opinion: From Attitudes to Action'. *Political Science Quarterly* 124(3):443–59. doi: 10.1002/j.1538-165X.2009.tb00655.x.

Hertwich, Edgar G., and Glen P. Peters. 2009. 'Carbon Footprint of Nations: A Global, Trade-Linked Analysis'. *Environmental Science & Technology* 43(16):6414–20. doi: 10.1021/es803496a.

Hines, Jody M., Harold R. Hungerford, and Audrey N. Tomera. 1987. 'Analysis and Synthesis of Research on Responsible Environmental Behavior: A Meta-Analysis'. *The Journal of Environmental Education* 18(2):1–8. doi: 10.1080/00958964.1987.9943482.

Hopper, Joseph R., and Joyce McCarl Nielsen. 1991. 'Recycling as Altruistic Behavior: Normative and Behavioral Strategies to Expand Participation in a Community Recycling Program'. *Environment and Behavior* 23(2):195–220. doi: 10.1177/0013916591232004.

Jackson, Tim. 2005. 'Motivating Sustainable Consumption: A Review of Evidence on Consumer Behaviour and Behavioural Change'.

Jensen, Bjarne Bruun. 2002. 'Knowledge, Action and Pro-Environmental Behaviour'. *Environmental Education Research* 8(3):325–34. doi: 10.1080/13504620220145474.

Kempton, Willett, James S. Boster, and Jennifer A. Hartley. 1995. *Environmental Values in American Culture*. Cambridge, Mass: MIT Press.

Kim, Gwang-Suk, Grace Y. Lee, and Kiwan Park. 2010. 'A Cross-National Investigation on How Ethical Consumers Build Loyalty Toward Fair Trade Brands'. *Journal of Business Ethics* 96(4):589–611. doi: 10.1007/s10551-010-0486-1.

Klöckner, Christian A., and Silvia Ohms. 2009. 'The Importance of Personal Norms for Purchasing Organic Milk'. *British Food Journal* 111(11):1173–87. doi: 10.1108/00070700911001013.

Kollmuss, Anja, and Julian Agyeman. 2002. 'Mind the Gap: Why Do People Act Environmentally and What Are the Barriers to pro-Environmental Behavior?' *Environmental Education Research* 8(3):239–60. doi: 10.1080/13504620220145401.

Kurz, Tim, Ngaire Donaghue, and Iain Walker. 2005. 'Utilizing a Social-Ecological Framework to Promote Water and Energy Conservation: A Field Experiment1'. *Journal of Applied Social Psychology* 35(6):1281–1300. doi: 10.1111/j.1559-1816.2005.tb02171.x.

Lam, David. 1997. 'Chapter 18 Demographic Variables and Income Inequality'. Pp. 1015–59 in *Handbook of Population and Family Economics*. Vol. 1. Elsevier.

Leiserowitz, Anthony A., Robert W. Kates, and Thomas M. Parris. 2006. 'Sustainability Values, Attitudes, and Behaviors: A Review of Multinational and Global Trends'. *Annual Review of Environment and Resources* 31(1):413–44. doi: 10.1146/annurev.energy.31.102505.133552.

Lenschow, Andrea, Jens Newig, and Edward Challies. 2016. 'Globalization's Limits to the Environmental State? Integrating Telecoupling into Global Environmental Governance'. *Environmental Politics* 25(1):136–59. doi: 10.1080/09644016.2015.1074384.

Liu, Jianguo, Vanessa Hull, Mateus Batistella, Ruth DeFries, Thomas Dietz, Feng Fu, Thomas W. Hertel, R. Cesar Izaurralde, Eric F. Lambin, Shuxin Li, Luiz A. Martinelli, William J. McConnell, Emilio F. Moran, Rosamond Naylor, Zhiyun Ouyang, Karen R. Polenske, Anette Reenberg, Gilberto de Miranda Rocha, Cynthia S. Simmons, Peter H. Verburg, Peter M. Vitousek, Fusuo Zhang, and Chunquan Zhu. 2013. 'Framing Sustainability in a Telecoupled World'. *Ecology and Society* 18(2):art26. doi: 10.5751/ES-05873-180226.

Mazar, Asaf, Geoffrey Tomaino, Ziv Carmon, and Wendy Wood. 2020. *Sustaining Sustainability: Lessons from the Psychology of Habits*. preprint. PsyArXiv.

Meier, Toni, and Olaf Christen. 2012. 'Gender as a Factor in an Environmental Assessment of the Consumption of Animal and Plant-Based Foods in Germany'. *The International Journal of Life Cycle Assessment* 17(5):550–64. doi: 10.1007/s11367-012-0387-x.

Okumah, Murat, Julia Martin-Ortega, Paula Novo, and Pippa J. Chapman. 2020. 'Revisiting the Determinants of Pro-Environmental Behaviour to Inform Land Management Policy: A Meta-Analytic Structural Equation Model Application'. *Land* 9(5):135. doi: 10.3390/land9050135.

Ostrom, Elinor. 2000. 'Collective Action and the Evolution of Social Norms'. *Journal of Economic Perspectives* 14(3):137–58. doi: 10.1257/jep.14.3.137.

Pelsmacker, Patrick De, Wim Janssens, Ellen Sterckx, and Caroline Mielants. 2006. 'Fair-Trade Beliefs, Attitudes and Buying Behaviour of Belgian Consumers'. *International Journal of Nonprofit and Voluntary Sector Marketing* 11(2):125–38. doi: 10.1002/nvsm.47.

Pérez, Andrea, and María del Mar García de los Salmones. 2018. 'How Do Consumers Face the Decision to Buy Fair Trade Products? A Marketing Approach'. *Nonprofit and Voluntary Sector Quarterly* 47(5):1057–80. doi: 10.1177/0899764018776370.

Poelmans, Eline, and Sandra Rousseau. 2016. 'How Do Chocolate Lovers Balance Taste and Ethical Considerations?' *British Food Journal* 118(2):343–61. doi: 10.1108/BFJ-06-2015-0208.

R Core Team. 2020. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing.

Rathgens, Julius, Stefan Gröschner, and Henrik von Wehrden. 2020. 'Going beyond Certificates: A Systematic Review of Alternative Trade Arrangements in the Global Food Sector'. *Journal of Cleaner Production* 276:123208. doi: 10.1016/j.jclepro.2020.123208.

Rockström, Johan, Will Steffen, Kevin Noone, Åsa Persson, F. Stuart Chapin, Eric F. Lambin, Timothy M. Lenton, Marten Scheffer, Carl Folke, Hans Joachim Schellnhuber, Björn Nykvist, Cynthia A. de Wit, Terry Hughes, Sander van der Leeuw, Henning Rodhe, Sverker Sörlin, Peter K. Snyder, Robert Costanza, Uno Svedin, Malin Falkenmark, Louise Karlberg, Robert W. Corell, Victoria J. Fabry, James Hansen, Brian Walker, Diana Liverman, Katherine Richardson, Paul Crutzen, and Jonathan A. Foley. 2009. 'A Safe Operating Space for Humanity'. *Nature* 461(7263):472–75. doi: 10.1038/461472a.

Schmitt, Neal. 1996. 'Uses and Abuses of Coefficient Alpha.' *Psychological Assessment* 8(4):350–53. doi: 10.1037/1040-3590.8.4.350.

Schuldt, Jonathon P., Dominique Muller, and Norbert Schwarz. 2012. 'The "Fair Trade" Effect: Health Halos From Social Ethics Claims'. *Social Psychological and Personality Science* 3(5):581–89. doi: 10.1177/1948550611431643.

Schultz, Wesley P., Azar M. Khazian, and Adam C. Zaleski. 2008. 'Using Normative Social Influence to Promote Conservation among Hotel Guests'. *Social Influence* 3(1):4–23. doi: 10.1080/15534510701755614.

Schwartz, Shalom H. 1977. 'Normative Influences on Altruism'. Pp. 221–79 in *Advances in Experimental Social Psychology*. Vol. 10. Elsevier.

Shaw, Deirdre, and Edward Shiu. 2003. 'Ethics in Consumer Choice: A Multivariate Modelling Approach'. *European Journal of Marketing* 37(10):1485–98. doi: 10.1108/03090560310487202.

Smith, Joanne R., Deborah J. Terry, Antony S. R. Manstead, Winnifred R. Louis, Diana Kotterman, and Jacqueline Wolfs. 2007. 'Interaction Effects in the Theory of Planned Behavior: The Interplay of Self-Identity and Past Behavior'. *Journal of Applied Social Psychology* 37(11):2726–50. doi: 10.1111/j.1559-1816.2007.00278.x.

Soares, Luciana Lopes Souza, Rosires Deliza, and Silvana Pedroso Oliveira. 2008. 'The Brazilian Consumer's Understanding and Perceptions of Organic Vegetables: A Focus Group Approach'. *Ciência e Tecnologia de Alimentos* 28(1):241–46. doi: 10.1590/S0101-20612008000100034.

Stern, Paul C. 2000. 'New Environmental Theories: Toward a Coherent Theory of Environmentally Significant Behavior'. *Journal of Social Issues* 56(3):407–24. doi: 10.1111/0022-4537.00175.

Terlau, Wiltrud, and Darya Hirsch. 2015. 'Sustainable Consumption and the Attitude-Behaviour-Gap Phenomenon - Causes and Measurements towards a Sustainable Development'. *Int J Food System Dynamics.Vol 6* No 3 (2015). doi: 10.18461/1869-6945-14.

Triandis, Harry. 1977. *Interpesonal Behavior*. Monterey: Brooks/Cole Pub Co.

Van Doorn, Jenny, and Peter C. Verhoef. 2015. 'Drivers of and Barriers to Organic Purchase Behavior'. *Journal of Retailing* 91(3):436–50. doi: 10.1016/j.jretai.2015.02.003.

Wieland, Andreas, Christian F. Durach, Joakim Kembro, and Horst Treiblmaier. 2017. 'Statistical and Judgmental Criteria for Scale Purification'. *Supply Chain Management: An International Journal* 22(4):321–28. doi: 10.1108/SCM-07-2016-0230.

Yamoah, Fred A., and Adolf Acquaye. 2019. 'Unravelling the Attitude-Behaviour Gap Paradox for Sustainable Food Consumption: Insight from the UK Apple Market'. *Journal of Cleaner Production* 217:172–84. doi: 10.1016/j.jclepro.2019.01.094.

Yamoah, Fred Amofa, Rachel Duffy, Dan Petrovici, and Andrew Fearne. 2016. 'Towards a Framework for Understanding Fairtrade Purchase Intention in the Mainstream Environment of Supermarkets'. *Journal of Business Ethics* 136(1):181–97. doi: 10.1007/s10551-014-2509-9.

Yen, Ghi-Feng, Ru-Yu Wang, and Hsin-Ti Yang. 2017. 'How Consumer Mindsets in Ethnic Chinese Societies Affect the Intention to Buy Fair Trade Products: The Mediating and Moderating Roles of Moral Identity'. *Asia Pacific Journal of Marketing and Logistics* 29(3):553–68. doi: 10.1108/APJML-06-2016-0107.

Young, William, Kumju Hwang, Seonaidh McDonald, and Caroline J. Oates. 2009. 'Sustainable Consumption: Green Consumer Behaviour When Purchasing Products'. *Sustainable Development* n/a-n/a. doi: 10.1002/sd.394.

Appendix

Appendix I: Overview of the factors that influence attitudes and factors that form barriers (bullet points are questions that were raised in the questionnaire). The factors are subdivided into three consecutive items which are later analyzed via Cronbach's alpha for internal consistency. The right column shows the scale on which the items were measured.

Construct Names	Items	Scale
Factors that influence intention		
Knowledge	1. Certain product features assure me that producers are paid fairly 2. My conscious purchase helps to reduce global poverty 3. Because I pay more for a product, producers get more money	1-7
Values	1. Buying fair food helps me to get a good conscience 2. I see it as my duty to buy Fairtrade products 3. I am willing to pay more money to work for global justice	1-7
Group Identity	1. I often have similar views to people who are close to me 2. People close to me often buy products with similar characteristics (e.g. Fairtrade label)	1-7

	3. When making purchasing decisions, I let myself be influenced by people who are close to me	
Habits	1. I buy almost exclusively Fairtrade products 2. I buy globally traded food from a retailer I trust 3. I often buy To-Go products	1-7
Factors that form barriers		
Social Norm	1. I was in a social group that normally does not buy my products 2. I bought a product for a person who normally does not buy my products. 3. I had the feeling that my normal buying decision was a disruptive factor in the situation.	1-7
Budget/Price	1. I did not have enough money to buy products that match my values. 2. The product was too expensive. 3. I had the choice and decided to buy a cheaper alternative.	1-7
Quality	1. In comparison the product did not taste so good 2. I was worried that the product would not stay fresh for so long 3. The composition of the product did not meet my expectations (e.g. too much sugar, not vegan)	1-7
Self Efficacy	1. I had the feeling that my purchase decision makes no difference. 2. I had the feeling that the global injustice should not be handed over to the responsibility of the consumers. 3. I was frustrated that my values restrict my buying behavior in everyday life.	1-7
Convenience	1. The place where I do my other shopping does not carry the product 2. I was in a hurry and had no other option in the situation. 3. I could not find the product that matches my values and therefore decided to buy another one.	1-7
Perception of Alignment of Attitudes and Purchasing Behavior		
Behavior	My shopping matches my values and attitudes towards globally traded food	1-5

5. Synthesis

Tackling the wickedness of transforming global value chains towards sustainability requires the identification of drivers and barriers. Therefore, this dissertation provides answers to the overarching research question:

What are the drivers and barriers towards a sustainable transformation of the coffee sector?

I used three perspectives to provide empirical nuance to the proposed framework of transformation proposed by Sygna and O'Brien (2013). Within their framework, they put a special emphasis on barriers that happen on the nexus between the three spheres of transformation.
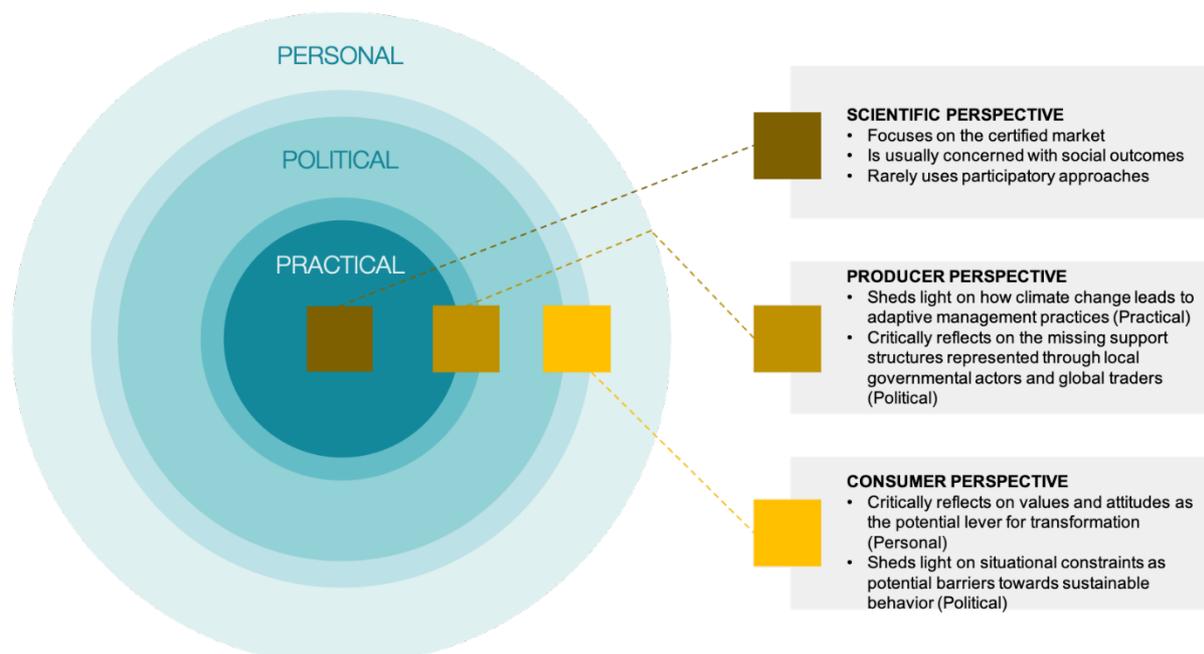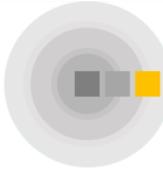

Fig. 9: Overview of the main results of the three articles focusing on the interplay between the three spheres of transformation based on O'Brien and Sygna (2013)

The results of this dissertation suggest that from the scientific perspective most of the research is still focusing on the practical sphere (5.1.1). From the producer perspective, our results suggest that smallholder coffee farmers are already facing strong ecological challenges they are forced to adapt to (practical sphere) and are lacking the social support structures to create resilient communities (political sphere) (5.1.2). From the consumer perspective, we were able to show that German consumers are having the necessary attitudes towards pro-sustainable behavior (personal sphere) but are facing situational constraints that form barriers in their respective behavior (political sphere) (5.1.3). Based on these results and their implications for a transformation of the coffee sector I propose to include the notion of a forced transformation through the incorporation of a fourth sphere called "planetary force" (5.2).

Finally, I reflect on the term transformation and give an outlook on how certain methodological approaches can facilitate interdisciplinary discourses that can create the needed contextual debates about certain qualities of the notion of transformation (5.3).

5.1 Drivers and barriers for a transformation of the coffee sector

The results of the articles in this dissertation reflect on the underlying factors that form drivers and barriers within the three spheres of transformation. In this chapter, I, therefore, give a short overview of the main findings of the three perspectives the articles represent and elaborate on the empirical nuances they provide for a transformation of the coffee sector (See Table).

Table 5: Overview of the different perspectives, represented by the different articles in this dissertation

	1. Scientific perspective	2. Producer perspective	3. Consumer perspective
Sphere of Transformation			
Main findings	Scientific literature focuses on certification schemes, participatory approaches are rare, three clusters could be identified that focus on certification in combination with either consumers' perceptions or producer support	Pests, diseases and abiotic stressors heavily influence the farming practices, the majority of adaptive management practices are either on the crop or farm level, support structures are insufficient to create climate-resilient communities	Sustainable consumption is a concept of interest across diverse demographic groups, women tend to have stronger attitudes towards sustainable consumption, situational constraints are empirically meaningful in describing the Knowledge-Doing-Gap
Nuance for Transformation	The literature is biased towards the practical sphere of transformation, focuses on certification schemes but is lacking focus on the political and personal sphere	Forced transformation through climate change leads to adaptive management practices, sufficient support structures to create resilient coffee producing communities is missing	Reflects on values and attitudes as the potential lever for transformation, sheds light on situational constraints as barriers towards sustainable behavior

5.1.1 Scientific perspective

Our results from the systematic literature review suggest that the scientific literature focusing on alternative trade arrangements is **fragmented with little interdisciplinary exchange**. The research approaches are **predominantly dealing with certification schemes** and their effects on sustainability issues, focusing on producers or consumers. Our analysis suggests that on the producer side research is dominated through econometric investigations that cluster around the question if certification schemes have a positive impact on the producers or the ecosystems they rely on. On the consumer side, it is concerned with how certificates are perceived and if they induce a higher willingness to pay. However, to this day it is still inconclusive if certification processes can be framed as a causal factor to any form of empowerment or the maintenance of healthy ecosystems on the producer side. Oftentimes research on certification schemes is **missing the contextual properties of the producers** and **fails to recognize the interplay between social and ecological domains**. **Participatory approaches**, that try to consequently include the producer perspectives, are rare. On the consumer side, controlled experiments show that consumers are willing to pay more for products with ethical properties like Fairtrade or organic labels. However, these experiments do not automatically translate into actual changed buying behavior.

Due to these results, it is fair to say that the majority of research is dealing with the **practical sphere**, concerned with technical responses to unfair trade arrangements and biodiversity loss

and the measurement of its effectiveness. However, as discussed earlier and suggested by O'Brien and Sygna (2013), solely focusing on the practical sphere bares **the lowest transformational potential**. In the case of the global coffee market, this becomes evident as an increasing number of scholars are indicating a co-optation of the certified market through incumbent actors. This leads to a shift of the intent of Fairtrade from "raising the bar" of smallholder farmers to "keeping minimum standards" (Raynolds et al., 2007).

In order to identify levers for a transformation towards sustainability research should, therefore, go beyond certification processes and investigate factors that create these unfair trade arrangements. O'Brien (2021) reminds that after nearly a decade since the proposition of her framework, research is still strongly focusing on technical responses to sustainability issues. She calls out interdisciplinary efforts to investigate underlying structures and root causes and impeding paradigms. In the case of research on global value chains aspects like **information asymmetries**, **organizational structures** and social-ecological challenges of farmer cooperatives as well as structural and **personal factors that influence the behavior of consumers** are promising ways to investigate the proclaimed root causes and paradigms. In this way, research on global value chains needs to shed more light on the interplay of the practical both with the political and the personal sphere.

5.1.2 Producer perspective

In our case study with Ugandan coffee farmers, we show that environmental challenges such as pests and diseases, as well as droughts and heavy rains, are perceived as major challenges by farmers. They cope with these challenges through the use of adaptive management practices on the crop and farm level. These management practices usually consist of infrastructural adaptation practices (e.g. mulching, intercropping and creation of contours) or crop-level coping mechanisms (e.g. local herbs as repellents, cropping and stumping of infested plants). Using formal and informal social networks, smallholder farmers try to connect themselves to different actors (e.g. local governmental representatives roasters and importers) and try to create reliable social structures for shared meaning-making and resilience. However, our results show that **formalized support** structures through local governmental actors or roasters and importers are present, but **assessed as not being supportive** in order to create resilient farming communities. Overarching **certification schemes**, such as Fairtrade, are a helpful means towards supporting smallholder farmers but **are not sufficient** in mitigating and adapting to the pressing social-ecological challenges farmers are facing.

However, climate change as a strong factor for a forced transformation is already heavily affecting the farming communities and will most likely increase its negative impact in the near future. Up to this point, adaptive management practices and resilience building, therefore, are predominantly played out in the practical sphere. While the ecological challenges farmers from Uganda are facing might be transferable to other contexts, especially the spread and severeness of pests and diseases might look substantially different for producers in other cases. This puts a stronger emphasis on the factors that influence the resilience of farming communities. While our study shows that smallholder farmers mainly rely on the informal exchange they need stronger support systems from the political sphere like increased interaction with governmental representatives to have a mutual understanding of their socio-ecological challenges. Future research should therefore put a **stronger emphasis** on the **social side** of the nexus of social-ecological systems focusing on how resilient communities can be designed through reliable and long-term trade arrangements. An important focus should be

laid on the **role of intermediaries** in different levels, spanning from managing local cooperatives to global trade relations. Borrella et al. (2015) show that these intermediaries play an important role to connect farmers with governmental representatives and global traders. Additionally, research on and exchange about the differences in the organization, communication and collaborative meaning-making of actors in cooperatives could be a relevant leverage for producer communities to enhance their climate resilience. In addition, **participatory approaches** could be a crucial lever to find out about **different perceptions** as the main factor of social support systems. Hochachka (2021) for example uses a photo-voice method to find out about shared meaning of different actor groups in the face of climate change to understand drivers and barriers of a shared problem-understanding as one of the founding pillars in the design of resilient farming communities. In order to create these resilient communities and design flourishing global trade arrangements, global actors, like importers, roasters with the financial help from end-consumers need to support local smallholder cooperatives through a thorough understanding of the challenges and form **trustworthy, long-term trade arrangements**.

5.1.3 Consumer perspective

While consumption consists of many different actors and aspects, the end-consumer has been framed as a driving force that affects production patterns at spatially distal regions. The results of our consumer survey suggest that consumers show increasing pro-sustainable attitudes. However, this increase does not automatically translate into changed buying behavior, as these products still have a marginal share in national markets. Understanding this Knowledge-Doing-Gap to bring consumption towards more sustainable trajectories remains one of the tricky puzzles that require **interdisciplinary exchange**. We, therefore, combined factors from prominent models of social-psychology, behavioral-economics and sociology. Using these factors, we were able to show that **consumers are aware of the gap** between their values and their respective behavior.

Moreover, our results suggest that consumers are facing **situational constraints** as one external factor that impedes their behavior from being in line with their attitudes. Our model suggests that **demographics** (consisting of a difference in values between men and women) and different situational factors (e.g. convenience, price, self-efficacy) play an important role in explaining the gap between the consumers' attitudes and their respective behavior.
Our results underline the **friction** that is happening at the nexus **between the personal and the political sphere** that creates the gap between attitudes and behavior.

While we only investigated into globally traded food items this was helpful in finding out about factors that create this friction at the nexus between the personal and political spheres. However, as the results might differ for other products and cultural backgrounds, more research is needed in different cultural contexts and for other commodities. While we base our findings on self-reported data, we are aware that this might be prone to a bias of social desirability. Future research approaches should therefore also emphasize the **combination of self-reported data and actual behavior**. Using a combination of these approaches would generate insights that can create further nuance about the nexus of attitudes and their respective behavior. Bamberg et al. (2007) for example suggest different methodological set-ups that use a combination of self-reported data and the respective behavior in order to find out about environmental consciousness and willingness to act. While I focused in our study on situational constraints and its meaningfulness in explaining the gap between attitudes and behavior, I am

aware that other factors might also play a role in explaining this gap. Terlau and Hirsch (2015) for example propose social norms, institutional constraints and demographics as other factors that influence the Knowledge-Doing-Gap and that need to be considered in future analyses.

Finally, while we only investigated into the individual role of end-consumers, it is fair to say, that not all consumers are only bound to this role. My results are meaningful in explaining the gap between attitudes and behavior. However, it is still debatable if these factors have the same explanatory value in different settings. Fischer et al. (2021), for example, elaborate on the risk of "consumer scapegoatism", where a narrow focus on changing behaviors is only thought of under the lens of individual consumers (Akenji, 2014). The authors propose that **models need to go beyond the individual household**, towards a focus of individuals as active members of communities, referring to them as citizens with an intrinsic motivation to transform global value chains apart from their buying behavior (Bamberg et al. 2021). Schulte et al. (2021) propose that social-psychology should emphasize the role of the individual as a member of social groups with frequent voluntary collaborations with others.

5.2 Four spheres of transformation: The role of planetary force

The framework of the three spheres of transformation, proposed by Sygna and O'Brien (2013) brings forward the discussion on how to deliberately achieve a transformation towards sustainability, as well as where to locate approaches to transformation. This framework can be used to highlight that solely focusing on technical responses, management practices or measurable practices (practical sphere) bears the risk of creating unintended side-effects or even exacerbating the issues they tried to solve. In addition, solely focusing on the personal sphere addresses so-called "deep" leverage points, but might generate outcomes that are too idealistic and abstract to be actionable. The interaction between the different spheres is proposed to have the highest potential for a transformation.

Folke et al. (2010) suggest differentiating between deliberative and forced transformations. Undoubtedly, the desired fundamental shift of societies towards sustainable trajectories is ideally realized deliberatively. It is of utmost importance that the transformation of societies does not jeopardize the founding pillars of a free, democratic society (Butzer, 2012). At the moment, however, the three spheres of transformation are not accounting for the forced transformations that are already happening. Our results from the case study with coffee farmers from Uganda suggest that ecological challenges, in the form of increasing occurrences of pests and diseases and temperature and precipitation patterns, are already forcing the producers to adapt. O'Brien and Sygna (2013) argue that changes in natural systems are part of the political or personal sphere because they can be managed through social systems and reflect past paradigms. However, climate change, manifesting into forced transformation, is intensifying the need for strong support structures (political sphere). Additionally climate change is also one of the driving forces that induces a change in the personal sphere, forcing coffee farmers to consider their adaptability and resilience (personal sphere) and a fundamental change in their management practices (practical sphere).
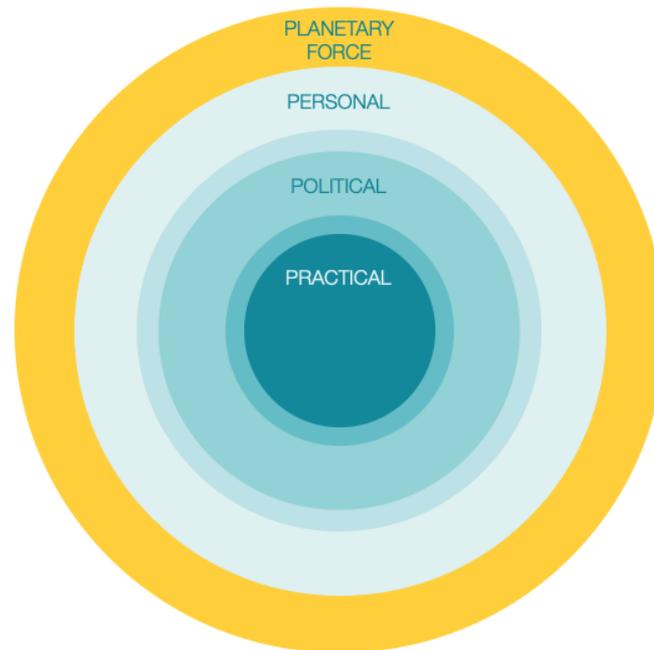
Figure 1: Three spheres of transformation proposed by Brian and Sygna (2013) with an added fourth sphere called the planetary force

As it is the main intention under the forced pressure of climate change to avoid "the collapse of large segments of the human population or of globalized contemporary society as a whole (Steffen et al., 2011)", I, therefore, propose a fourth sphere called the "planetary force". This fourth sphere strongly affects deliberative transformations. Although it is not desirable, climate change, as one of the major driving forces of fundamental ecosystem change, needs to consequently be accounted for and creates a temporal urgency to act.

Using the internal logic of the embeddedness of the different spheres I argue that this fourth sphere needs to be considered when trying to create intentional shifts towards more sustainable trajectories, as it is change that happens in this sphere that forces societies to fundamentally change.

5.3 Methodological approaches for a transformation

Complex global value chains, as wicked problems, exacerbated through climate change, emphasize the need of finding potential levers to induce a deliberate fundamental change of the globalized society. In this dissertation, the concept of transformation by O'Brien and Sygna (2013) is used to understand the fundamental changes taking place in the different spheres and the barriers that arise at the interface between them. The premise of intentional semantic shifts in research – in this case by using the word transformation instead of change – can be seen as an indicator for a discursive trend, shaping new forms of research and real-world policies. Even though the term transformation is gaining more and more attention in the scientific field the risk becomes evident that the concept of transformation might become a victim of "moral minimalism" so that it encourages wide agreement, but apart from theoretical considerations lacks the translational capacity to inform real-world transformations (Walzer, 1994).

While it is undoubtedly helpful to generate fitting frameworks to induce research about deliberate transformations, Blythe et al. (2018) remark that the explicit deliberation about "[…] what exactly needs to be transformed and why, how, in whose interest […]" remains unclear.

If the term transformation should not become another buzzword. It needs conceptual underpinning that is empirically testable and open for contextual debate. For transformation to become a "thick" concept, it needs discussions about its "qualification, compromises, complexity and disagreement" (Walzer, 1994).

The complex dynamics of social-ecological systems in global settings create problems that transcend scientific disciplines. Therefore, I propose that a broad methodological approach can be the starting point to better understand these parameters. While many methodological approaches are strongly tied to certain disciplines, it becomes evident that singular approaches can only deliver pieces of the puzzle. Methods often thrive within a disciplinary sphere and function as a vehicle for the soundness and rigor of disciplinary research paradigms. They function as boundary objects that create transparency about the data gathering and analysis by using comparable criteria and streamlining the communication of scientific results. While there is no doubt about the importance of specific methods in certain disciplines, some methods and concepts are more suitable than others to facilitate discourse in interdisciplinary settings. Above that, they themselves can function as interdisciplinary boundary objects, and thus create meaningful exchange between different research domains.

In this dissertation, I recognized that many interdisciplinary discourses only bring puzzle pieces due to narrow disciplinary lenses and methodologies. Therefore, this dissertation reflects on my pursuit to facilitate an interdisciplinary discourse by using different methodological approaches: (1) systematic literature review that highlights the different strands of research, their methodological approaches and blind spots; (2) social-ecological network approaches to highlight the interconnections between the human and natural systems where change in one domain may have positive spillovers or unintended side-effects in the other; (3) structural equation models to incorporate and compare theories from different disciplines side by side and make assumptions in one discipline visible to scholars from other disciplines. This dissertation, therefore, highlights that certain methodological approaches can be meaningfully used to make disciplinary paradigms visible and connect different world views. They, therefore, deliver a founding pillar to contribute to a solution-orientated agenda that tries to address the wicked problem of transforming the coffee sector and beyond.

6. Conclusion

The increasing production and consumption of globally traded commodities, like coffee, are among the main drivers why societies are exceeding planetary boundaries (Rockström et al., 2009). Global trade arrangements have contributed to the emergence of complex value chains, which connect geographically distant regions through global markets. These value chains are associated with exploitative structures towards producers and the ecosystems they rely on. However, due to its complex, dynamic nature, global value chains inhibit classical interventions to induce change. Scholars, as well as civil society actors, indicate that incremental changes are not sufficient to change the exploitative structures and sustainability issues associated with global value chains. Moreover, increasing voices are calling for a fundamental transformation towards sustainability of global value chains. Due to this call, theoretical frameworks have been created to inform research on transformations, as well as to inform real-world interventions. Among others, O'Brien and Sygna (2013) proposed the three spheres

of transformation (practical sphere, political sphere, personal sphere) as a framework to understand different intervention points to induce a transformation towards sustainability. However, real-world changes have to overcome barriers in order to fundamentally transform societies towards sustainability. Identifying drivers and barriers is one of the necessary steps to induce a transformation towards sustainability. Using the proposed framework, I elaborate on the interplay of the different spheres of transformation, highlighting drivers and barriers.

In this dissertation I used three perspectives to bring empirical nuance: (1) the scientific perspective through a systematic review; (2) the producer perspective through a social-ecological network analysis; (3) the consumer perspective through a structural equation model. Through the use of a systematic review of the scientific perspective, we are able to show that most of the research is focusing on the certified market and if and how it makes a difference (practical sphere). Although this is an important field of research, solely focusing on the practical sphere has been proposed to have the lowest transformative effect. Our results of the producer perspective suggest that coffee farmers are using adaptive management practices to adapt to the increasing threats of the effects of climate change above all to pests and diseases, as well as droughts and heavy rainfall patterns (practical sphere). They are missing the support structures of local governmental actors as well as actors from the global market in order to generate the needed resilience against increasing stress from the effects of climate change. From the consumer perspective, our results suggest that even though there is a shift in values and attitudes towards pro-sustainable behavior (personal sphere), situational constraints like convenience, price and budget restrictions and demographics create barriers (political sphere) to act in the alignment of these values and attitudes. Although this is an important field of research, solely focusing on the practical sphere has been proposed to have the lowest transformative effect. This dissertation therefore uses a combination of different research methodologies to generate empirical nuance, to underline the framework proposed by O'Brien and Sygna (2013), that especially the interspaces of the different spheres should be more researched and promoted in practice.

Moreover, I suggest that the conceptual design of the three spheres of transformation is missing the notion of a forced transformation proposed by Folke et al. (2010). Although it is of utmost importance that processes of transformation need to happen in a deliberate manner, transformations in the ecosystems are already creating a temporal urgency to the notion of a deliberate transformation to actors in global value chains. I, therefore, propose a fourth sphere – the planetary force – that needs to consequently be integrated into the pursuit to transform societies towards sustainability.

Transformation as a concept is gaining attention and the provision of different frameworks to inform research is meaningful and timely. However, in this dissertation, I want to remind that conceptualizations of the term transformation are prone to fall into the category of moral minimalism, where wide agreements around a concept exist but miss the translational capacity to be applicable to different concepts to inform real-world changes. I remark that frameworks of transformation need conceptual underpinning that are empirically testable and open for discussions about its contextual meaningfulness. I, therefore, propose that certain methods can function as a boundary object to facilitate interdisciplinary discussions about the drivers and barriers towards a transformation of the coffee sector and beyond

References

Aarts, Henk, and Ap Dijksterhuis. 2003. 'The Silence of the Library: Environment, Situational Norm, and Social Behavior.' *Journal of Personality and Social Psychology* 84(1):18–28. doi: 10.1037/0022-3514.84.1.18.

Abrahamse, Wokje, and Linda Steg. 2011. 'Factors Related to Household Energy Use and Intention to Reduce It: The Role of Psychological and Socio-Demographic Variables'. *Human Ecology Review* 30–40.

Aertsens, Joris, Koen Mondelaers, Wim Verbeke, Jeroen Buysse, and Guido Van Huylenbroeck. 2011. 'The Influence of Subjective and Objective Knowledge on Attitude, Motivations and Consumption of Organic Food'. *British Food Journal* 113(11):1353–78. doi: 10.1108/00070701111179988.

Ajzen, Icek. 1985. 'From Intentions to Actions: A Theory of Planned Behavior'. Pp. 11–39 in *Action Control*, edited by J. Kuhl and J. Beckmann. Berlin, Heidelberg: Springer Berlin Heidelberg.

Ajzen, Icek. 2002. 'Perceived Behavioral Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behavior [1]'. *Journal of Applied Social Psychology* 32(4):665–83. doi: 10.1111/j.1559-1816.2002.tb00236.x.

Andorfer, Veronika A., and Ulf Liebe. 2013. 'Consumer Behavior in Moral Markets. On the Relevance of Identity, Justice Beliefs, Social Norms, Status, and Trust in Ethical Consumption'. *European Sociological Review* 29(6):1251–65. doi: 10.1093/esr/jct014.

Andorfer, Veronika A., and Ulf Liebe. 2015. 'Do Information, Price, or Morals Influence Ethical Consumption? A Natural Field Experiment and Customer Survey on the Purchase of Fair Trade Coffee'. *Social Science Research* 52:330–50. doi: 10.1016/j.ssresearch.2015.02.007.

Anon. n.d. 'A Safe and Just Space for Humanity'.

Bamberg, Sebastian, and Guido Möser. 2007a. 'Twenty Years after Hines, Hungerford, and Tomera: A New Meta-Analysis of Psycho-Social Determinants of pro-Environmental Behaviour'. *Journal of Environmental Psychology* 27(1):14–25. doi: 10.1016/j.jenvp.2006.12.002.

Bamberg, Sebastian, and Guido Möser. 2007b. 'Twenty Years after Hines, Hungerford, and Tomera: A New Meta-Analysis of Psycho-Social Determinants of pro-Environmental Behaviour'. *Journal of Environmental Psychology* 27(1):14–25. doi: 10.1016/j.jenvp.2006.12.002.

Bamberg, Sebastian, and Peter Schmidt. 2003. 'Incentives, Morality, Or Habit? Predicting Students' Car Use for University Routes With the Models of Ajzen, Schwartz, and Triandis'. *Environment and Behavior* 35(2):264–85. doi: 10.1177/0013916502250134.

Bernstad, Anna. 2014. 'Household Food Waste Separation Behavior and the Importance of Convenience'. *Waste Management* 34(7):1317–23. doi: 10.1016/j.wasman.2014.03.013.

Biel, Anders, and John Thøgersen. 2007. 'Activation of Social Norms in Social Dilemmas: A Review of the Evidence and Reflections on the Implications for Environmental Behaviour'. *Journal of Economic Psychology* 28(1):93–112. doi: 10.1016/j.joep.2006.03.003.

Blake, James. 1999. 'Overcoming the "Value-action Gap" in Environmental Policy: Tensions between National Policy and Local Experience'. *Local Environment* 4(3):257–78. doi: 10.1080/13549839908725599.

Botetzagias, Iosif, Chrisovaladis Malesios, and Dimitra Poulou. 2014. 'Electricity Curtailment Behaviors in Greek Households: Different Behaviors, Different Predictors'. *Energy Policy* 69:415–24. doi: 10.1016/j.enpol.2014.03.005.

Boulstridge, Emma, and Marylyn Carrigan. 2000. 'Do Consumers Really Care about Corporate Responsibility? Highlighting the Attitude—Behaviour Gap'. *Journal of Communication Management* 4(4):355–68. doi: 10.1108/eb023532.

Bucic, Tania, Jennifer Harris, and Denni Arli. 2012. 'Ethical Consumers Among the Millennials: A Cross-National Study'. *Journal of Business Ethics* 110(1):113–31. doi: 10.1007/s10551-011-1151-z.

Butzer, K. W. 2012. 'Collapse, Environment, and Society'. *Proceedings of the National Academy of Sciences* 109(10):3632–39. doi: 10.1073/pnas.1114845109.

Carrington, Michal J., Benjamin A. Neville, and Gregory J. Whitwell. 2010. 'Why Ethical Consumers Don't Walk Their Talk: Towards a Framework for Understanding the Gap Between the Ethical Purchase Intentions and Actual Buying Behaviour of Ethically Minded Consumers'. *Journal of Business Ethics* 97(1):139–58. doi: 10.1007/s10551-010-0501-6.

Chen, Yan, and Sherry Xin Li. 2009. 'Group Identity and Social Preferences'. *American Economic Review* 99(1):431–57. doi: 10.1257/aer.99.1.431.

Chowdhury, Subeh, and Avishai (Avi) Ceder. 2016. 'Users' Willingness to Ride an Integrated Public-Transport Service: A Literature Review'. *Transport Policy* 48:183–95. doi: 10.1016/j.tranpol.2016.03.007.

De Pelsmacker, Patrick, Liesbeth Driesen, and Glenn Rayp. 2005. 'Do Consumers Care about Ethics? Willingness to Pay for Fair-Trade Coffee'. *Journal of Consumer Affairs* 39(2):363–85. doi: 10.1111/j.1745-6606.2005.00019.x.

De Pelsmacker, Patrick, and Wim Janssens. 2007. 'A Model for Fair Trade Buying Behaviour: The Role of Perceived Quantity and Quality of Information and of Product-Specific Attitudes'. *Journal of Business Ethics* 75(4):361–80. doi: 10.1007/s10551-006-9259-2.

Dean, Moira, Monique M. Raats, and Richard Shepherd. 2012. 'The Role of Self-Identity, Past Behavior, and Their Interaction in Predicting Intention to Purchase Fresh and Processed Organic Food1: INTENTION TO PURCHASE ORGANIC FOOD'. *Journal of Applied Social Psychology* 42(3):669–88. doi: 10.1111/j.1559-1816.2011.00796.x.

Eakin, Hallie, Ximena Rueda, and Ashwina Mahanti. 2017. 'Transforming Governance in Telecoupled Food Systems'. *Ecology and Society* 22(4):art32. doi: 10.5751/ES-09831-220432.

Folke, Carl, Stephen R. Carpenter, Brian Walker, Marten Scheffer, Terry Chapin, and Johan Rockström. 2010. 'Resilience Thinking: Integrating Resilience, Adaptability and Transformability'. *Ecology and Society* 15(4):art20. doi: 10.5751/ES-03610-150420.

Gatersleben, Birgitta, Linda Steg, and Charles Vlek. 2002. 'Measurement and Determinants of Environmentally Significant Consumer Behavior'. *Environment and Behavior* 34(3):335–62. doi: 10.1177/0013916502034003004.

Gifford, Robert. 2011. 'The Dragons of Inaction: Psychological Barriers That Limit Climate Change Mitigation and Adaptation.' *American Psychologist* 66(4):290–302. doi: 10.1037/a0023566.

Gleim, Mark, and Stephanie J. Lawson. 2014. 'Spanning the Gap: An Examination of the Factors Leading to the Green Gap'. *Journal of Consumer Marketing* 31(6/7):503–14. doi: 10.1108/JCM-05-2014-0988.

Goldstein, Noah J., Robert B. Cialdini, and Vladas Griskevicius. 2008. 'A Room with a Viewpoint: Using Social Norms to Motivate Environmental Conservation in Hotels'. *Journal of Consumer Research* 35(3):472–82. doi: 10.1086/586910.

Hainmueller, Jens, Michael J. Hiscox, and Sandra Sequeira. 2015. 'Consumer Demand for Fair Trade: Evidence from a Multistore Field Experiment'. *Review of Economics and Statistics* 97(2):242–56. doi: 10.1162/REST_a_00467.

Hanss, Daniel, and Gisela Böhm. 2010. 'Can I Make a Difference? The Role of General and Domain-Specific Self-Efficacy in Sustainable Consumption Decisions'. *Umweltpsychologie* 14(2):46–74.

Hertel, Shareen, Lyle Scruggs, and C. Patrick Heidkamp. 2009. 'Human Rights and Public Opinion: From Attitudes to Action'. *Political Science Quarterly* 124(3):443–59. doi: 10.1002/j.1538-165X.2009.tb00655.x.

Hertwich, Edgar G., and Glen P. Peters. 2009. 'Carbon Footprint of Nations: A Global, Trade-Linked Analysis'. *Environmental Science & Technology* 43(16):6414–20. doi: 10.1021/es803496a.

Hines, Jody M., Harold R. Hungerford, and Audrey N. Tomera. 1987. 'Analysis and Synthesis of Research on Responsible Environmental Behavior: A Meta-Analysis'. *The Journal of Environmental Education* 18(2):1–8. doi: 10.1080/00958964.1987.9943482.

Hopper, Joseph R., and Joyce McCarl Nielsen. 1991. 'Recycling as Altruistic Behavior: Normative and Behavioral Strategies to Expand Participation in a Community Recycling Program'. *Environment and Behavior* 23(2):195–220. doi: 10.1177/0013916591232004.

Jackson, Tim. 2005. 'Motivating Sustainable Consumption: A Review of Evidence on Consumer Behaviour and Behavioural Change'.

Jensen, Bjarne Bruun. 2002. 'Knowledge, Action and Pro-Environmental Behaviour'. *Environmental Education Research* 8(3):325–34. doi: 10.1080/13504620220145474.

Kempton, Willett, James S. Boster, and Jennifer A. Hartley. 1995. *Environmental Values in American Culture*. Cambridge, Mass: MIT Press.

Kim, Gwang-Suk, Grace Y. Lee, and Kiwan Park. 2010. 'A Cross-National Investigation on How Ethical Consumers Build Loyalty Toward Fair Trade Brands'. *Journal of Business Ethics* 96(4):589–611. doi: 10.1007/s10551-010-0486-1.

Klöckner, Christian A., and Silvia Ohms. 2009. 'The Importance of Personal Norms for Purchasing Organic Milk'. *British Food Journal* 111(11):1173–87. doi: 10.1108/00070700911001013.

Kollmuss, Anja, and Julian Agyeman. 2002. 'Mind the Gap: Why Do People Act Environmentally and What Are the Barriers to pro-Environmental Behavior?' *Environmental Education Research* 8(3):239–60. doi: 10.1080/13504620220145401.

Kurz, Tim, Ngaire Donaghue, and Iain Walker. 2005. 'Utilizing a Social-Ecological Framework to Promote Water and Energy Conservation: A Field Experiment1'. *Journal of Applied Social Psychology* 35(6):1281–1300. doi: 10.1111/j.1559-1816.2005.tb02171.x.

Lam, David. 1997. 'Chapter 18 Demographic Variables and Income Inequality'. Pp. 1015–59 in *Handbook of Population and Family Economics*. Vol. 1. Elsevier.

Leiserowitz, Anthony A., Robert W. Kates, and Thomas M. Parris. 2006. 'Sustainability Values, Attitudes, and Behaviors: A Review of Multinational and Global Trends'. *Annual Review of Environment and Resources* 31(1):413–44. doi: 10.1146/annurev.energy.31.102505.133552.

Lenschow, Andrea, Jens Newig, and Edward Challies. 2016. 'Globalization's Limits to the Environmental State? Integrating Telecoupling into Global Environmental Governance'. *Environmental Politics* 25(1):136–59. doi: 10.1080/09644016.2015.1074384.

Liu, Jianguo, Vanessa Hull, Mateus Batistella, Ruth DeFries, Thomas Dietz, Feng Fu, Thomas W. Hertel, R. Cesar Izaurralde, Eric F. Lambin, Shuxin Li, Luiz A. Martinelli, William J.

McConnell, Emilio F. Moran, Rosamond Naylor, Zhiyun Ouyang, Karen R. Polenske, Anette Reenberg, Gilberto de Miranda Rocha, Cynthia S. Simmons, Peter H. Verburg, Peter M. Vitousek, Fusuo Zhang, and Chunquan Zhu. 2013. 'Framing Sustainability in a Tele-coupled World'. *Ecology and Society* 18(2):art26. doi: [10.5751/ES-05873-180226](10.5751/ES-05873-180226).

Mazar, Asaf, Geoffrey Tomaino, Ziv Carmon, and Wendy Wood. 2020. *Sustaining Sustainability: Lessons from the Psychology of Habits*. preprint. PsyArXiv.

Meier, Toni, and Olaf Christen. 2012. 'Gender as a Factor in an Environmental Assessment of the Consumption of Animal and Plant-Based Foods in Germany'. *The International Journal of Life Cycle Assessment* 17(5):550–64. doi: [10.1007/s11367-012-0387-x](10.1007/s11367-012-0387-x).

Okumah, Murat, Julia Martin-Ortega, Paula Novo, and Pippa J. Chapman. 2020. 'Revisiting the Determinants of Pro-Environmental Behaviour to Inform Land Management Policy: A Meta-Analytic Structural Equation Model Application'. *Land* 9(5):135. doi: 10.3390/land9050135.

Ostrom, Elinor. 2000. 'Collective Action and the Evolution of Social Norms'. *Journal of Economic Perspectives* 14(3):137–58. doi: [10.1257/jep.14.3.137](10.1257/jep.14.3.137).

Pelsmacker, Patrick De, Wim Janssens, Ellen Sterckx, and Caroline Mielants. 2006. 'Fair-Trade Beliefs, Attitudes and Buying Behaviour of Belgian Consumers'. *International Journal of Nonprofit and Voluntary Sector Marketing* 11(2):125–38. doi: 10.1002/nvsm.47.

Pérez, Andrea, and María del Mar García de los Salmones. 2018. 'How Do Consumers Face the Decision to Buy Fair Trade Products? A Marketing Approach'. *Nonprofit and Voluntary Sector Quarterly* 47(5):1057–80. doi: [10.1177/0899764018776370](10.1177/0899764018776370).

Poelmans, Eline, and Sandra Rousseau. 2016. 'How Do Chocolate Lovers Balance Taste and Ethical Considerations?' *British Food Journal* 118(2):343–61. doi: [10.1108/BFJ-06-2015-0208](10.1108/BFJ-06-2015-0208).

R Core Team. 2020. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing.

Rathgens, Julius, Stefan Gröschner, and Henrik von Wehrden. 2020. 'Going beyond Certificates: A Systematic Review of Alternative Trade Arrangements in the Global Food Sector'. *Journal of Cleaner Production* 276:123208. doi: 10.1016/j.jclepro.2020.123208.

Rockström, Johan, Will Steffen, Kevin Noone, Åsa Persson, F. Stuart Chapin, Eric F. Lambin, Timothy M. Lenton, Marten Scheffer, Carl Folke, Hans Joachim Schellnhuber, Björn Nykvist, Cynthia A. de Wit, Terry Hughes, Sander van der Leeuw, Henning Rodhe, Sverker Sörlin, Peter K. Snyder, Robert Costanza, Uno Svedin, Malin Falkenmark, Louise Karlberg, Robert W. Corell, Victoria J. Fabry, James Hansen, Brian Walker, Diana Liverman, Katherine Richardson, Paul Crutzen, and Jonathan A. Foley. 2009. 'A Safe Operating Space for Humanity'. *Nature* 461(7263):472–75. doi: [10.1038/461472a](10.1038/461472a).

Schmitt, Neal. 1996. 'Uses and Abuses of Coefficient Alpha.' *Psychological Assessment* 8(4):350–53. doi: [10.1037/1040-3590.8.4.350](10.1037/1040-3590.8.4.350).

Schuldt, Jonathon P., Dominique Muller, and Norbert Schwarz. 2012. 'The "Fair Trade" Effect: Health Halos From Social Ethics Claims'. *Social Psychological and Personality Science* 3(5):581–89. doi: [10.1177/1948550611431643](10.1177/1948550611431643).

Schultz, Wesley P., Azar M. Khazian, and Adam C. Zaleski. 2008. 'Using Normative Social Influence to Promote Conservation among Hotel Guests'. *Social Influence* 3(1):4–23. doi: [10.1080/15534510701755614](10.1080/15534510701755614).

Schwartz, Shalom H. 1977. 'Normative Influences on Altruism'. Pp. 221–79 in *Advances in Experimental Social Psychology*. Vol. 10. Elsevier.

Shaw, Deirdre, and Edward Shiu. 2003. 'Ethics in Consumer Choice: A Multivariate Modelling Approach'. *European Journal of Marketing* 37(10):1485–98. doi: 10.1108/03090560310487202.

Smith, Joanne R., Deborah J. Terry, Antony S. R. Manstead, Winnifred R. Louis, Diana Kotterman, and Jacqueline Wolfs. 2007. 'Interaction Effects in the Theory of Planned Behavior: The Interplay of Self-Identity and Past Behavior'. *Journal of Applied Social Psychology* 37(11):2726–50. doi: 10.1111/j.1559-1816.2007.00278.x.

Soares, Luciana Lopes Souza, Rosires Deliza, and Silvana Pedroso Oliveira. 2008. 'The Brazilian Consumer's Understanding and Perceptions of Organic Vegetables: A Focus Group Approach'. *Ciência e Tecnologia de Alimentos* 28(1):241–46. doi: 10.1590/S0101-20612008000100034.

Stern, Paul C. 2000. 'New Environmental Theories: Toward a Coherent Theory of Environmentally Significant Behavior'. *Journal of Social Issues* 56(3):407–24. doi: 10.1111/0022-4537.00175.

Terlau, Wiltrud, and Darya Hirsch. 2015. 'Sustainable Consumption and the Attitude-Behaviour-Gap Phenomenon - Causes and Measurements towards a Sustainable Development'. *Int J Food System Dynamics.Vol 6* No 3 (2015). doi: 10.18461/1869-6945-14.

Triandis, Harry. 1977. *Interpesonal Behavior*. Monterey: Brooks/Cole Pub Co.

Van Doorn, Jenny, and Peter C. Verhoef. 2015. 'Drivers of and Barriers to Organic Purchase Behavior'. *Journal of Retailing* 91(3):436–50. doi: 10.1016/j.jretai.2015.02.003.

Wieland, Andreas, Christian F. Durach, Joakim Kembro, and Horst Treiblmaier. 2017. 'Statistical and Judgmental Criteria for Scale Purification'. *Supply Chain Management: An International Journal* 22(4):321–28. doi: 10.1108/SCM-07-2016-0230.

Yamoah, Fred A., and Adolf Acquaye. 2019. 'Unravelling the Attitude-Behaviour Gap Paradox for Sustainable Food Consumption: Insight from the UK Apple Market'. *Journal of Cleaner Production* 217:172–84. doi: 10.1016/j.jclepro.2019.01.094.

Yamoah, Fred Amofa, Rachel Duffy, Dan Petrovici, and Andrew Fearne. 2016. 'Towards a Framework for Understanding Fairtrade Purchase Intention in the Mainstream Environment of Supermarkets'. *Journal of Business Ethics* 136(1):181–97. doi: 10.1007/s10551-014-2509-9.

Yen, Ghi-Feng, Ru-Yu Wang, and Hsin-Ti Yang. 2017. 'How Consumer Mindsets in Ethnic Chinese Societies Affect the Intention to Buy Fair Trade Products: The Mediating and Moderating Roles of Moral Identity'. *Asia Pacific Journal of Marketing and Logistics* 29(3):553–68. doi: 10.1108/APJML-06-2016-0107.

Young, William, Kumju Hwang, Seonaidh McDonald, and Caroline J. Oates. 2009. 'Sustainable Consumption: Green Consumer Behaviour When Purchasing Products'. *Sustainable Development* n/a-n/a. doi: 10.1002/sd.394.

Declaration of authorship

PhD candidate: Julius Rathgens

Title: Fairtrade: Going Beyond Certificates: Empirical Nuance of Drivers and Barriers to Transform the Global Coffee Sector

Declaration of authorship

According to §16 of the guideline of cumulative dissertations, the following section details my own individual contribution in preparing the three research articles. This entails specifying the individual scientific contributions of all co-authors, including me (author´s contributions), and the relative importance of my own contribution in relation to the contributions of other co-authors (decleration of authorship) together with a weighting factor.

Overview of articles included in the doctoral thesis
(in accordance with the Guideline for cumulative dissertations enacted at the Faculty of Sustainability in January 2012)

Article No.	Bibliography	Publication Status	Specific contribution	Weighing Factor
1	Rathgens, J.; Gröschner, S.; von Wehrden, H. (2020). Going beyond certificates: A systematic review of alternative trade arrangements in the global food sector *Journal of Cleaner Production*, *276*, 123208. Doi: 10.1016/j.jclepro.2020.123208	Published 2020 in *Journal of Cleaner Production*	Julius Rathgens together with Henrik von Wehrden conceptualized the article. Julius Rathgens and Stefan Gröschner applied the methodology and formal analysis for the research. Julius Rathgens was responsible for data curation and writing. Henrik von Wehrden provided supervision, guided the conceptualization and writing, and reviewed drafts.	1
2	Rathgens, J.; Chauhan, N.; von Wehrden, H. (forthcoming). Adapting to change: An empirical case study of the social-ecological challenges and adaptive management practices of smallholder coffee-farmers in Uganda	Under internal review	Julius Rathgens conducted the data gathering and analysis and conceptualized the article. Julius Rathgens applied the methodology, software and formal analysis. Neha Chauhan and Julius Rathgens wrote the original draft. Henrik von Wehrdeen supervised the conception and methodology and reviewed drafts.	1
3	Rathgens, J.; Engler, J.; von Wehrden, H. (forthcoming). Broadening the perspective on the Knowledge-Doing Gap: Analyzing a German con-sumer survey *Ecological Economics. Under review*.	Under review since July 2021 in *Ecological Economics*	Julius Rathgens conceptualized the article, applied methodology, software. John-Oliver Engler and Julius Rathgens conducted the formal analysis, and writing to create the original draft. Henrik von Wehrden and John-Oliver Engler supervised the work on the conceptualization, and review of the article.	1

Declaration: (according to § 16 of the guideline for cumulative dissertations)
I avouch that all information given in this appendix is true in each instance and overall.
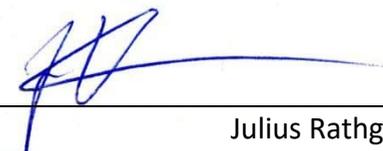
Julius Rathgens

Explanatory Notes

Articles included in a cumulative doctoral thesis can also be conference contributions or book chapters besides papers published in journals.

Bibliography: Author(s) – Title – Journal / Book / Conference contribution – Date of publication – DOI (if available)

Specific contribution of PhD candidate submitting the doctoral thesis / Author status according to § 12 of the guideline for cumulative dissertations

Single author = own contribution amounts to 100%.

Co-author with predominant contribution = own contribution is greater than the individual share of all other co-authors and is at least 35%.

Co-author with equal contribution = (1) own contribution is as high as the share of other co-authors, (2) no other co-author has a contribution higher than the own contribution, and (3) the own contribution is at least 25%.

Co-author with important contribution = own contribution is at least 25%, but is insufficient to qualify as single authorship, predominant or equal contribution.

Co-author with small contribution = own contribution is less than 20%.

Weighing Factor according to § 14 of the guideline for cumulative dissertations

Single author	1.0
Co-author with predominant contribution	1.0
Co-author with equal contribution	1.0
Co-author with important contribution	0.5
Co-author with small contribution	0

Declaration of Originality

Julius Rathgens
Bardowicker Straße 27
21335 Lüneburg
+4915752812555
rathgens@leuphana.de

I hereby declare that I have neither undertaken nor applied to undertake any other docrotal assessment.

I hereby declare that the thesis entitled "Fairtrade: Going Beyond Certificates: Empirical Nuance of Drivers and Barriers to Transform the Global Coffee Sector" has not been submitted to any other academic, that I have submitted the thesis only as part of this and of no other doctoral assessment, and that I have not previously failed any other doctoral assessments.

I hereby declare that the thesis submitted "Fairtrade: Going Beyond Certificates: Empirical Nuance of Drivers and Barriers to Transform the Global Coffee Sector" is my own work and has been produced without any unauthorized assistance. I have not used any aids or material other than that specified. I have referenced all sources used.

Lüneburg, August 7, 2021

_____
                                    Julius Rathgens