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Changing behaviours to change the system?
Dairy system transformation in Germany

What is the scope for behaviour change by producers and consumers in unlocking a sustainability transformation of the German dairy system?

Sustainable Food and Natural Resources

Lea Leimann

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Abstract

Current dairy consumption and production practices exceed the planetary boundaries and threaten human and animal health and socio-economic well-being. A radical, transformative and systemwide change in the dairy system is urgently needed, but the pathway is still unknown. With regards to diets, a lot of emphasis is put on demand-based solutions and consumer behaviour change, however, an evaluation of their potential in achieving transformative change is still missing. The role of producers in driving this change is even less examined. Combining behaviour change with systems change is a somewhat novel, but promising approach to bridge this gap. This research study therefore combines these disciplines to research how much leeway consumers and producers have in transforming the German dairy system towards becoming more sustainable.

To deal with this complexity, a two-pronged methodology approach was used, where focus groups provided consumer insights, and semi-structured interviews added the expert views of dairy producers. The COM-B model was used to understand the aspects needed to engage with a new behaviour. The actors' capability, opportunity and motivations were analysed to identify barriers, enablers, major challenges and solutions to move towards a system that acts within socio-ecological boundaries. The transformative potential of behaviour change was assessed through systems mapping and leverage points.

Consumer insights confirmed the intention- and knowledge-action gap, where despite a high level of these factors, behaviour change was hindered by lifestyle issues, the availability of sustainable dairy products and social norms. Placing a high value on food and the connectedness to farmers were identified as potential opportunities. Producers' good intentions were limited by economic and political dependencies and the social norms of growth and individualism, whereas what enabled them was collaboration and the experience that it pays off to produce differently (e.g. organic production or cow bound calf rearing). The systems analysis found that in order to transform the system, changing the growth-orientated goal towards quality differentiation and the underlying mental structures towards collaboration would be most effective, but also most challenging. The results propose that the behaviour change opportunities for consumers and producers in system transformation are limited in terms of direct changes of the overall goal and in people's mental models, but small structural achievements on the level of different actors and their interconnections are possible through collaboration. Successful collaboration, enabled also by openness and awareness, has then the potential to shift paradigms. This highlights that possible solutions address several layers of the system, but also require political support.

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“Food creates trust and identity, promotes social exchange, inspires conversation and thoughts - and makes you happy!” - Ursula Hudson

Chairwoman and visionary pioneer of Slow Food Germany until July 2020

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1. Introduction

This research study combines aspects of behaviour change with food system change to research the scope for transforming the German dairy system by changing consumption and production behaviours towards sustainability.

1.1. Dairy food system transformation

Agriculture, especially livestock farming, puts immense pressure on the world's ecosystems (Costanza, et al., 2017) and is exceeding the planetary boundaries (Rockström, et al., 2009). Dairy husbandry is the second biggest contributor (after beef) to food-related ecosystem challenges (WBAE and WBW, 2016). The beef and dairy sector are also mutually linked, since male dairy calves are fattened in the beef sector (Busch, et al., 2017). The environmental impact of the dairy sector is increasingly observed, but is still somewhat neglected, compared to the impacts of the beef sector (Röös, et al., 2018). This is especially the case in the intensified way in which dairy farming is mainly practiced, it contributes to increased greenhouse gas emissions (GHGs), biodiversity loss and reduced wildlife health, soil and water pollution, nitrogen and phosphorous cycles and land-use change (Steffen et al., 2015, Clay, Garnett and Lorimer, 2019). Clay, Garnett and Lorimer (2019) identify four prominent concerns about this intensified dairy production: its impacts on the environment and on animal welfare, and on the socioeconomic well-being and human health of those who produce the products. A core reason for this intensification is named in the growing worldwide demand for dairy products (Clay, Garnett and Lorimer, 2019). This places the emphasis and pressure on demand-based solutions and consumer behaviour change interventions. The parties involved are quick to shift the responsibility away from themselves and onto the consumer (Boström and Klintman, 2019). Nevertheless, comprehensive assessment to realistically assess the potential of consumption-based approaches in mitigating change is still pending (Creutzig, et al., 2018). In the case of demand-side policies to reduce animal-based foods by combining health and sustainability aspects a wide-scoping and recent review found that there are very few and those that exist focus mainly on informing consumers (Temme, et al., 2020). The influence and success of information-based behaviour change interventions, however, is noted as being limited (Cornish, et al., 2019).

The direction of where this change in consumption would have to lead, can be found in paper of the EAT-Lancet Commission (2019), which is widely discussed and cited, for example by Carrington (2019). Therein, the authors connect healthy with sustainable diets for humans and the planet. With regards to milk and dairy, they propose a diet change towards 50% less of these products (Willett, et al., 2019). Based on the current high milk and dairy consumption figures in Germany, and the diets milk and dairy consumption would have to be reduced to a quarter of the current consumption amounts to follow these dietary recommendations (BMEL, 2020; FAO, 2019). Furthermore, the remaining volume of dairy consumption would have to be produced within the socio-ecological boundaries of the planet (Willett, et al., 2019; FAO, 2019). As this is currently not the case, a change in production methods would also have to be achieved, but there is no consensus as to how. Arguments are made, and have political support, for further intensification and mechanisation in order to optimise processes, e.g. to new findings on feeding algae to cattle to reduce methane emissions (EC, 2020; VDM, 2020), while others make claims for traditional methods based on the natural consumption habits of cows, where the cow is 100% grass-fed rather than consuming pulses and other dietary supplements. It is thus not in competition with crops

grown for human consumption and is seen as natural enhancers of biodiversity (Fink-Kessler and Lenkert-Hörrmann, 2019).

Another area that needs considerable research to identify potential solutions, is how increased socioeconomic wellbeing and human health of dairy farmers can be improved (Knierim, et al., 2020). More and more farms in Germany are giving up dairy farming and this structural change affects the cultural landscape and is difficult to reverse (Glauben, Tietje and Weiss, 2006; Milestad, Ahnström, and Björklund, 2011). Farmers' dissatisfaction with the policy framework and the loss of social acceptance of the resulting agricultural practices resulted in an unprecedented level of tractor demonstrations in autumn 2019 (Schulz, Schmitz and Jasper, 2020), highlighting a will and need for change.

To summarize, the change needed would be two-fold: A reduced level of dairy consumption, and that which is consumed being of a higher quality, and with improvements in production, from an environmental, animal welfare, socio-economic and human health perspective (Willet et al., 2019; Fink-Kessler and Lenkert-Hörrmann, 2019; Clay, Garnett and Lorimer, 2019). This is no small change to be achieved, but requires a radical, transformational shift of the goals of the entire dairy system towards this aim. This dissertation therefore acknowledges the need for a systemic transformation, when looking into behaviour change of consumers and dairy system actors to achieve this, which as described above is a novel approach.

Transformations require an understanding of the whole system, of the relationships between a system's elements, the present feedback-loops and the underlying mental models and assumptions (Meadows, 2008). Systems thinking is the discipline dealing with these issues and supporting systems transformation by identifying leverage points and the degree of their potential for systemwide transformation (Meadows, 1999). As stated above, it is assumed that consumption and production behaviours will have to change in order to move towards a more sustainable dairy system. The role of behaviour change in achieving a systemic transformation in the food system has been rarely investigated (Creutzig, et al., 2018). Poore and Nemecek (2018) holistically reviewed the potential of producers and consumers to reduce environmental impacts. The authors state that dietary change can deliver environmental benefits on a scale not achievable by producers. However, this is based on input and output data and neglects the behavioural ability of these actors to implement and practice the changes. Only one comparable study combining behaviour and system change was identified, which dealt with the system of low carbon communities (Moloney, et al., 2010) and no study could be found which specifically addressed the dairy system. This makes it an interesting and important topic for investigation.

1.2. Change in consumption behaviour

Evidence from behaviour change literature has widely shown that willingness and intention alone, do not lead to more sustainable purchases and that there is a gap between an intention and the actual purchase (OECD, 2017; Kollmuss and Agyeman, 2002). There are many factors shaping consumption decisions, some internal to the individual, but most of them influenced by the social and external sphere (Cornish, et al., 2019). This explains why people fail to purchase more sustainable food, even if they intend to. Reasons for this can be a prevalence of other priorities, such as economic constrains or health concerns, or their inability to process the increasing number of criteria and labels that indicate such product performance (Joshi and Rahman, 2015; Langer, Eisend and Ku, 2007, Cornish et al., 2019).

Michie, Van Stralen and West (2011) acknowledge that three main components shape and are essential to behaviour change, namely physical and psychological capability (C), physical and social opportunity (O) and automatic and reflective motivation (M). Their COM-B model provides a simple framework for understanding behaviours. An intervention would have to consider all of the components to increase the likelihood of the successful action being taken, because behaviours occur as a result of these three necessary and interlinked conditions. Cornish et al. (2019) recently successfully used this model to encourage higher welfare food choices, but did not include systems thinking in their approach.

1.3. Change in production behaviour

The role of behaviour change in informing and changing farmers' behaviours and practices has not been widely examined (Leimann, 2019), however, farmers' land management practices are important factors to consider, because farmers are the ones with considerable influence over our food systems because of their everyday work (Zhang, et al., 2007). Lamarque et al. (2014) explain, that an interplay of knowledge and values, which are influenced by personal attitudes and socio-demographic factors, influences the decision-making practice and leads to farm-management behaviour. Attitudes and cognition themselves do not necessarily correspond to behaviours, because environmental factors (climate, altitude, topography and pest outbreaks) and political and socio-economic contextual factors (the design of the political and economic measures or the farm structure) also feed back into this process (Lastra-Bravo, et al., 2015).This highlights the factors that shape farmers' behaviours and it becomes apparent, that decisions are not individualistic, but are rather taken with a socially, politically and economically driven system within which farmers act. Consequently, to approach this topic of the dairy system actors' capacity for behaviour change systemically means taking into account that there is a complex system of interconnected elements framing the decision-making process and producing certain behaviours (Meadows, 2008).

1.4. The focus on dairy products in Germany

When discussing sustainable diets within sustainable systems, it is not adequate to solely consider meat or beef consumption. The dairy system is highly inter-connected, since male dairy calves as well as dairy cows that have reached the end of their milk-production are used in the industrial meat system (Fink-Kessler and Lenkert-Hörrmann, 2019; Knierim et al., 2020). The focus on dairy has been chosen for this dissertation to build upon the widely discussed need to reduce meat consumption and to add insights to the body of research on dairy consumption, as the second most promising diet shift after meat reduction with regards to remaining within planetary boundaries (Clay, Garnett and Lorimer, 2019; Poore and Nemecek, 2018).
The geographical scope of this study, which focusses on Germany, has both, a long tradition of ecological consumption and production behaviour on the one hand (Moewius, Röhrig and Barbian, 2020), and a highly industrialized dairy system on the other (OECD/FAO, 2018; Fink-Kessler and Lenkert-Hörrmann, 2019). In Germany, there is a high willingness to pay more for environmentally and animal friendly products, however this does not represent actual purchase decisions to a great extent (Nutritionreport, 2019; Enneking, et al., 2019).

1.5. Aims and objective

The aims of this research project are firstly to provide a foundation for discussion of the scope for consumer and producer behaviour change in unlocking systemic change, secondly it aims to provide insights for creating transformative interventions in the dairy food system that support sustainable dairy consumption choices, as well as more sustainable dairy production systems, and thirdly to provide data for policy decisions.

The results are structured according to the 4 objectives of the study to:
1. identify barriers and enablers of more sustainable dairy consumption and production;
2. map a vision of a future, sustainable dairy system;
3. identify major challenges for dairy system transformation, and;
4. identify the actors' scope for change towards this future system.

1.6. Research methodology

This research aims to answer the following research question:

> *What is the scope for behaviour change by producers and consumers in unlocking a sustainability transformation of the German dairy system?*

A literature review was carried out focussing on theories and approaches to systems thinking, systems transformation and leverage points, the impact and the boundaries of the German dairy system, its elements or actors and on theories of behaviour change. To address the objectives and answer the research question, a two-pronged methodology approach was used, where focus groups provided consumer insights, and semi-structured interviews added the expert views of dairy farmers and other dairy system actors. Thematic analysis (Bryman, 2016) was used to code the rich amount of data based on the objectives to provide insights on the barriers and enablers of more sustainable production and consumption behaviours, a vision of a future system and major challenges that might emerge. The behavioural aspects were clustered with the aid of the COM-B-model to understand behaviours. It assumes that three factors, capability (C), opportunity (O) and motivation (M) are required and mutually interact when actors engage with a new behaviour. The factors and their connections were displayed in a systems map (see figures 9 to 14). To identify the scope for behaviour change in system transformation, key challenges and possible solutions were presented against the background of Meadows' (1999) leverage points on where intervening in a system has the major impact.

1.7. Boundaries and limitations

This research focuses on the German dairy system, which is diverse in its natural geographical conditions and regional structures and in its farm management and production methods (Glauben, Tietje and Weiss, 2006). Purpose sampling (Bryman, 2016) was used to represent this diversity while focusing on those dairy system experts already producing differently or aiming for a change in the system, but the number of interviewees was restricted due to time constraints and it is therefore likely that potentially relevant voices were not represented. Phone interviews were chosen, because bringing together national actors for a workshop was beyond the scope of this study. Whether dairy consumption and production can be sustainable at all is outside the scope of this research. In terms of

discussing how dairy farming could become more sustainable, an assumption has been made that pasture-based, traditional, extensive farming, but within limits on the number of cattle is an alternative to the status quo (Fink-Kessler and Lenkert-Hörrmann, 2019).

2. Literature Review

This section describes the literature that this dissertation builds on in order to approach the question of the different actors' scope in transforming the dairy food system in Germany into a more sustainable one. The study aims to combine several research areas and through the review it was identified that a macro approach was necessary, considering systems level approaches, before considering more detailed aspects of individual behaviour. Therefore, the literature review looks (1) into some theories and approaches of **systems thinking, systems transformation and leverage points**, (2) into the impact and the **boundaries of the dairy system** as of special focus for this research, (3) into its **system elements or actors**, that will be presented and set in the context of their roles, responsibilities and challenges, and (4) into theories of **behaviour change** to understand how the actors' concepts and behaviours develop and may be shaped.

2.1. Systems thinking, systems change and transformation

Before introducing systems thinking and the transformational change of systems, it is useful to define that a system is an interconnected set of elements, that is organized in such a way that it produces certain pattern of behaviour over time and creates an outcome. A system therefore consists of elements, interconnections and a function or purpose (Meadows, 2008). Systems can be very diverse in size and level of abstraction (Abercrombie, Harries and Wharton, 2015). Instead of seeing the sum of the parts, systems thinking aims at seeing the whole, by considering and understanding the relationships between the elements, by identifying feedback-loops and by revealing the underlying mental models, assumptions and paradigms (Meadows, 2008; Kennedy, Gladek and Roemers, 2018).

Systems thinking is a useful tool for understanding and supporting systems transformation and for solving complex or wicked problems, where there is no single solution to the problem (O'Brien and Synga, 2013, Vennix, 1999). This makes it a valuable approach in the area of interconnected socio-ecological systems, such as food systems, whose behaviours are hard to predict and wherein one decision or intervention might lead to unexpected outcomes and side-effects (Kennedy, Gladek and Roemers, 2018).

One well-known approach in systems thinking is the "iceberg model" (Meadows, 2008; Senge, 1990) or "four levels of thinking", which divides systems into four levels. Events or outcomes are the tip of the iceberg, on the surface. Patterns or behaviours, structures and mental models lie beneath (Figure 1).

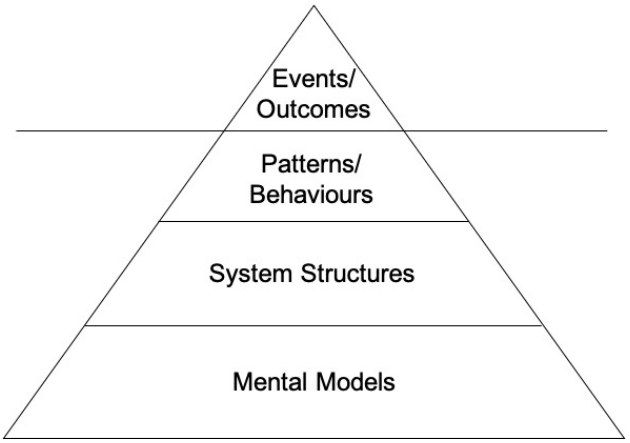

Figure 1: The Iceberg model, showing the four levels to look at in systems (Meadows, 2008; Senge, 1990).

In order to change a system, one should be aware of the fact, that solely intervening on the level of events (outcomes) or behaviour patterns will solely tackle symptoms, rather than bringing about a fundamental, radical and systemic change (Feola, 2015). In order to find strong leverage points, Malhi et al., (2009) clustered Meadows' (1999) "12 places to intervene in a system" into 5 categories in order of descending impact, the "paradigm", "goals", "system structure" "feedback and delays" and "system elements". The "paradigm", which is linked to the "Mental Models" of the iceberg model (Senge, 1990; Meadows, 2008) (Figure 1), is a very difficult level at which to intervene, but can be also very effective. As described above systems have a certain purpose or function. Actions that target these "goals" focus to change the overall aim of the system. The "system structure", the interconnected set of elements, is also part of the iceberg model: by changing linkages within the system or adding new structural elements, the entire system structure is changed. "Feedback and delays", which are found in these interconnections, compile a change in feedback loops and adding new ones to restructure the system. Actions at the level of "structural elements" are required to create system-wide change (Malhi, et al., 2009).

When the aim is to not just create system-wide change, but to alter the fundamental attributes of a system, like the "value system, regulatory, legislative, or bureaucratic regimes; financial institutions; and technological or biological systems" this is defined as transformation (IPCC, 2012). Transformations often challenge the status quo and by doing so, threaten those mostly powerful actors who benefit under these current conditions, and who are therefore resistant to change towards a new and different system (Avelino and Rotmans, 2009; Pelling, 2011).

The system under examination in this research is the Germany dairy system. The next chapter will therefore define the system's boundaries, and show why it needs a transformation. The chapter thereafter presents the system elements and interconnections.

2.2. Environmental and social boundaries of the German dairy system

The immense impact of agriculture on the functioning of the worlds' ecosystems is diverse and widely acknowledged (Costanza, et al., 2017). This functioning is challenged by human action exceeding the planetary boundaries (Rockström, et al., 2009). The dairy food system, which is the second biggest contributor (after beef) to the current food-related ecosystem challenges and puts pressure on both, natural and human systems (WBAE and WBW, 2016; Clay, Garnett and Lorimer, 2019). Dairy husbandry, in the intensified manner in which it is currently practiced in Germany, contributes especially to those boundaries that are already exceeded, namely climate change, biosphere integrity (genetic and functional diversity, former biodiversity loss), biogeochemical flows (nitrogen and phosphorus cycles), and land-system change (Steffen, et al., 2015) (Fig. 2). Clay, Garnett and Lorimer (2019) identify four prominent concerns about this intensified dairy production: environment, animal welfare, socioeconomic well-being and human health. In order to achieve the urgently needed socio-ecological system transformation (Clay, Garnett and Lorimer, 2019) the dairy system would need to remain within not just the planetary, but also social boundaries (Raworth, 2017; (Kennedy, Gladek and Roemers, 2018) (Figure 2).

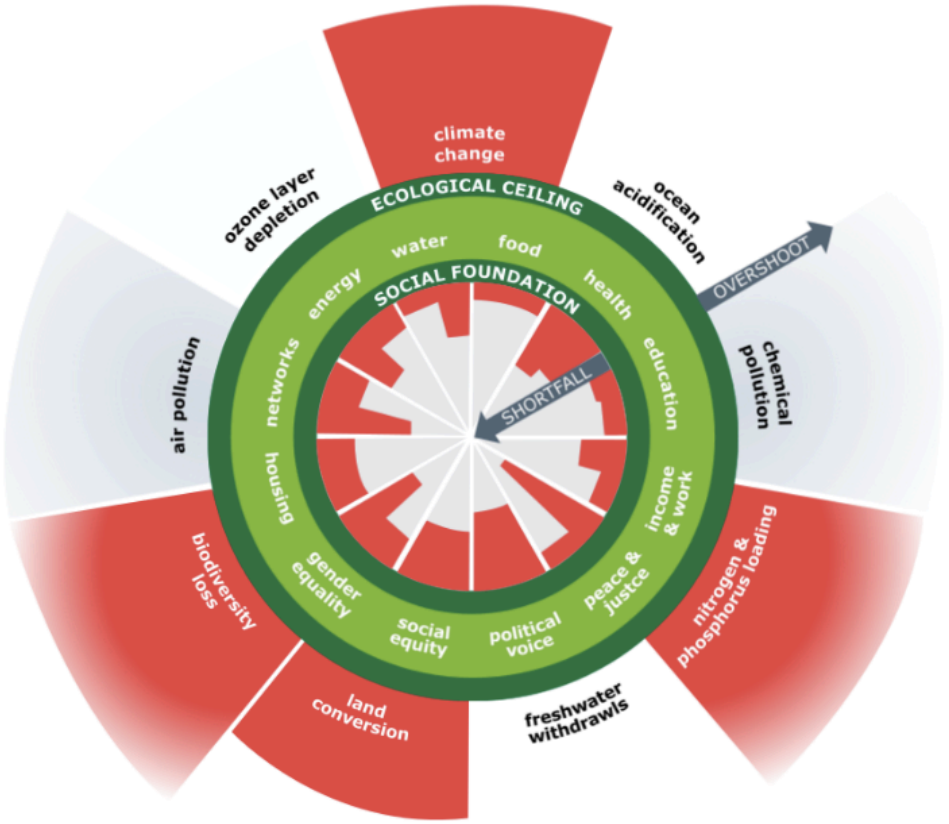

Figure 2: The Doughnut of social and planetary boundaries (Raworth, 2017). The doughnut (green) displays the safe and just space in which humanity can act sustainably. Dark green circles show the ecological boundaries and the social foundation. To the inside red wedges show shortfalls in the social foundation. To the outside red wedges show overshoot of the ecological ceiling.

Environment

Environmental impacts of dairy systems include greenhouse gas emissions (GHGs), biodiversity loss and reduced wildlife health, soil and water pollution, nitrogen and phosphorus cycles and land-use change (Clay, Garnett and Lorimer, 2019).

In Germany, dairy products cause greenhouse gas emissions (GHGs) of approximately 0.6 t carbon dioxide (CO_2) equivalents (eq) per capita per year. This corresponds to about one third of the total food-related emissions (WBAE and WBW, 2016). The contribution of milk consumption to climate change is thus almost as high as meat consumption (approx. 0.8 t CO_2-eq), which is much more widely discussed in society (Hunecke, et al., 2020). These CO_2 equivalents include CO_2 via energy use and land conversion, nitrous oxide (N_2O) from feed production and manure, and methane (CH_4), enteric emissions and from manure (Clay, Garnett and Lorimer, 2019). Arguments have been made for system intensification, (Tilman and Clarke, 2014; VDM, 2020) and Gerssen-Gondelach et al. (2017), for example argue that intensified systems use less land and have lower emissions, but also report that pollution from that land increases. Most of these arguments are somewhat narrow in their scope and usually disregard important aspects, such as animal welfare and socio-cultural considerations (Zimmermann and Heckelei, 2012). Systems based on concentrated feed directly influence CO_2 emissions from land-use change to grow feed, which is connected to increased biodiversity loss (De Lucia, Pasquale and Vecchione, 2017) and N_2O from feed production, as well as soil and water pollution (nitrogen and phosphorous loading) from synthetic fertilizer use and concentrated animal waste (Foote, Joy and Death, 2015; Scarsbrook and Melland, 2015; Cederberg and Mattsson, 2000). By contrast, pasture-based systems are widely discussed as positively influencing these factors (O'Brien, et al., 2012). Grazing has the potential to increase plant, wildlife and overall genetic and functional biodiversity on grasslands and store and sequester carbon (Idel, 2010; O'Brien, et al., 2012). According to Willet et al. (2019), after decreasing dairy production, the remaining production should not use additional land (to produce fodder), should reduce nitrogen pollution (e.g. with circular manure management and area-based livestock farming) and should produce zero carbon dioxide emissions, among others. To achieve this, dairy production would have to be extensified, grass-fed- and area-based and would consequently be organic (Willett, et al., 2019).

Not only is livestock farming responsible to a large extent for climate warming, as explained above; these changes will also affect livestock production along the whole value chain, directly or indirectly, from fodder to reproduction (Gauly, et al., 2013; Brügemann, et al., 2012; Moran, et al., 2009). Little is known about future consequences (of drought, habitat shifts and heat stress), and the sensitivity of farming systems, but it is expected that some crucial impacts on the economics of dairy farming are still omitted (Gauly, et al., 2013).

Animal welfare

In intensified dairy systems, management strategies to increase productivity are often at the expense of animal welfare (Haskell, et al., 2006; LeBlanc, et al., 2006). The combination of high-performance breeds with in-door systems restricts movement (von Keyserlingk, et al.,

2009) and produces a higher prevalence of lameness and other diseases as well as emotional stress (Koeck, et al., Oltenacu and Broom, 2010).

Animal welfare and the environment are increasingly important factors for German consumers (Schipperges, et al., 2019). Concerns are more prevalent for beef products, but awareness about the impact and the conditions of dairy are increasingly seen. Livestock farming has lost considerable social acceptance and is often criticised (EC, 2007; WBA, 2015; EC, 2020). Insufficient space and little access to grazing, high use of concentrated feed to optimise milk yield and a presumed prophylactic administration of drugs as well as the dehorning of calves are most commonly cited concerns (Christoph-Schulz, Salamon and Weible, 2015). One topic mentioned to a lesser, but increasing extent is the “problem” of male calves, that are currently treated as a waste product with a low market value and poor marketing opportunities (WBA, 2015).

When consumers are confronted with conflicting objectives, like animal welfare on the one hand and environmental protection on the other, Sonntag et al. (2017) reported that animal welfare dominates as a criterion and is more important than, for example, a low consumer price, product quality or even other sustainability goals, such as environmental protection. German consumers show a high willingness to pay more for environmentally and animal friendly products, but the actual purchase decision is still mainly driven by price (Heise and Theuvsen, 2017; Enneking, et al., 2019, Nutritionreport, 2019).

Socioeconomic well-being

Livelihoods and well-being are shaped by social, cultural and economic aspects, which are affected by the intensification of dairy farming (Clay, Garnett and Lorimer, 2019). Impacts include many of the social aspects, mentioned in the doughnut (Figure 2), like payment, security, political voice and social and gender equity, of which just some are explained here. While the dairy economy in Germany is a top-seller and the second most important agricultural sector (VDM, 2020) the farmers revenue is comparably small (25%) and many farmers are struggling financially (WBA, 2015). In a European comparison, the milk price payed to German farmers is continuously one of the lowest (34 Euro cent in 2019) (Hunecke, et al., 2020), which leads to frustration, insolvency (Davidson and Schwarzweller, 1995; Krieg, 2014) lack of succession, and even suicide (Heggen, 2009). If this “structural change”, the fundamental change of a certain area or region, or even a society continues unabated, less than 40,000 of today's 60,000 milk producers could be left by 2030 (Hunecke, et al., 2020), leading to losses in employment (lower labour input due to higher degree of mechanization) and the disappearance of cultural landscapes (Davidson and Schwarzweller, 1995; Davidson, 2002).

Human health

The health value of milk is no longer considered to be as unreservedly positive as in the past (Hunecke, et al., 2020) and consumers feel increasingly unsure about it (Haas, et al., 2019). Dairy products can influence health directly through consumption or indirectly through environmental and animal health impacts described in the paragraph above. The

high availability of low-cost, well-advertised dairy products increases consumption levels, (Röös, et al., 2018) but is often associated with social injustice in terms of access to healthy food (Guthman, 2011). Consumers associations like Slow Food, but also the widely cited paper Willet et al. (2019) state that a healthy diet cannot exist without a healthy planet and consequently there has to be both healthy and ecologically, economically and socially sustainable for humans and the planet (Slow Food, 2020b).

The areas in which a transformation would be urgently needed from an environmental and social point of view have been described. Now it is necessary to look into those elements and actors in the system that are necessary to drive this transformation, to find leverage points and identify potential barriers and trade-offs, before forming a strategy of change or an intervention that would lead towards a more equitable, ethical and sustainable dairy system (Meadows, 2008; Kennedy, Gladek and Roemers, 2018).

2.3. Dairy system elements and their interconnection

Dairy systems are increasingly intensified, liberalized and globalized (Clay, Garnett and Lorimer, 2019). The basic elements are land, cows, farmers, dairy (manu-)factories, retailers and consumers and the civil society. They are interlinked in different, often multi-dimensional ways (dependencies, trades, expectations, contracts) and structured by political regulations, financial incentives, culture and traditions, social norms, and land-based preconditions (Clay, Garnett and Lorimer, 2019).

Land – cow – farmer

At present, some 61,000 German milk producers and a dairy cow herd of about four million animals produce about 32 billion kilograms of milk annually (VDM, 2020). With a degree of self-sufficiency of about 115 %, Germany produces more milk than it consumes (Hunecke, et al., 2020). Every dairy farmer keeps an average of 67 dairy cows (Hunecke, et al., 2020). 42% of the dairy cows have access to pasture for at least 5 months a year (BMEL, 2019). 4.7 million hectares of permanent grassland, which accounted for approximately 28% of the agricultural area in Germany in 2016, are traditionally used for grazing and fodder production for dairy farming, extensive forms of cattle fattening and sheep and goat farming (BMEL, 2019).

Supported by policies and financial incentives, mainly through the European Common Agricultural Policy (CAP) many farmers were encouraged to build larger sheds, increase herd size, move to in-door farming systems and focus on high-yielding breeds and a high degree of mechanization and concentrated feed, to be more cost-efficient, to be able to produce at world-market prices and to keep up with international competitors (Uken, 2014; VDM, 2020). Many of these cattle-sheds still need to be paid off (VDM, 2020) herd sizes are too big to allow pasturing (Gassler, et al., 2018), and high-yielding cow breeds depend on concentrated feed and are heat sensitive (Gauly, et al., 2013). This highlights the farmers' structural dependencies to keep this system running, instead of adapting to the changing climate by turning towards fewer animals and robust breeds that can be kept outside, fed with grass but produce less milk.

Dairy (manu-)factories

About 160 dairies in Germany process around 34 billion kilograms of raw milk every year (VDM, 2020) into products of which 49% is exported, just 36% is marketed locally via retailers and 15% goes to the processing industry, the food industry and bulk consumers (VDM, 2020).

About 65 % of the dairies are organized as cooperatives, where the farmers are members. However, the original idea of equalized power structures and decision-making in cooperatives between farmers and dairies has significantly diminished and many dairies have merged together into increasingly complex companies (Hellberg-Bahr, Bartels and Spiller, 2013; BDM, 2019). Dairy farmers usually have contracts with dairy factories, where the amount of milk delivered is fixed, but the price is often set by the dairies and paid with a delay. Terminating the contract with the dairy can threaten the farmers' existence, as fewer dairies are regionally available and many dairies are unable to take on more dairy farmers. (BDM, 2019).

Since the 1980s, milk production in the former European Economic Community and then in the European Union was capped by a governmental quota regulation to prevent overproduction (Sinabell and Schmid, 2008). The globalized dairy economy has always been affected by fluctuating prices, but during the financial and economic crisis (2008-2010) the situation was exacerbated. When international purchases of milk and dairy products fell more sharply than expected in 2009, known as the Dairy Crisis , the milk price paid by the dairies to the farmers fell to 18 – 20 Euro cents, half of the actual production costs (Brandl, 2009) (BDM, 2019).

Milk quotas were abolished in 2015. As a result, the responsibility for managing the delivered quantities now lies solely in the hands of the market players, mainly dairies, for whom an increase in quantity at favourable prices is economically advantageous (VDM, 2020).

Retail

When looking into nationally consumed dairy products (29.6 million tons milk equivalent), 59% of these are nationally produced and 41% are imported (VDM, 2020). On one hand, the retail, especially the discount retail, that has a prominent position in Germany, is considered responsible for pushing prices to a low that makes it uneconomical for the producers to sell their products (Baur, 2013). On the other hand, the retail sector is the interface to the consumer and can also develop measures to increase the appreciation and market share for specialized products, for example those with higher animal welfare or environmental standards (WBCSD, n.d.; Initiative-Tierwohl, 2020).

It can be already seen from sales figures, that consumers are increasingly turning towards products with added value, like specific origin, organic, increased animal welfare standards, fairness to the farmer, or pasture-raised quality products (EPRS, 2018). Organic and pasture/hay milk sales increased by 8.6% and 21%, respectively (GfK, 2019). The share of

organic milk of total sales of drinking milk amounted to more than 10% for the first time at the beginning of 2020, whereas in 2018 it was only 8.5% (ZMB, 2019).

Consumers and civil society

Dairy consumption per capita of milk and milk products in milk equivalents has risen significantly over the last few years. In 2017, consumption was 364 kg milk equivalents per capita, which was 24.7% more than in 2005 (BMEL, 2020). This increase is mainly due to the rising per capita consumption of cheese, dairy products with added value, as well as cheese and dairy ingredients added to convenience foods (OECD/FAO, 2018). Per capita consumption of drinking milk, however, has been declining for years (BMEL, 2020). Relevant trends around this decline can be seen in the market gains of plant-based milk alternatives (Mintel, 2017) and health (Mäkinen, et al., 2016) and environmental consciousness (Haas, et al., 2019).

More and more people are aware of the concept of "sustainable diets", which are increasingly discussed throughout media and in academic publications (Mason and Lang, Zeit, 2020). Willet et al. (2019) link health to sustainable diets for humans and the planet. With regards to dairy, the authors calculated a share of 250 g/day of milk equivalents per capita to be sustainable and within planetary boundaries. Taking the current 365 kg/capita/year stated in the paragraph above (BMEL, 2020), Germans currently consume 1 kg of milk equivalent per day per capita and would need to reduce it to a quarter of the current consumption to follow this recommendation. The German Nutrition Association (DGE) meanwhile recommends the consumption of an amount of milk products and cheese per day (DGE, 2020) that would account for a recommendation of 700 - 850 g milk equivalents (FAO, 2019); nearly three times the sustainable amount measured by Willet et al., (2019).

High expectations are set for a demand-side driven change in purchase decisions (Boström and Klintman, 2019; Mason and Lang, 2017), but the consumers' role in driving transformational change is still rarely examined (Creutzig, et al., 2018). There are several barriers to more sustainable dairy consumption. In Germany, the high willingness to pay more for environmentally and animal friendly products does not represent the actual purchase decision, which is still driven by price (Heise and Theuvsen, 2017; Enneking, et al., 2019, Nutritionreport, 2019). Another barrier would be the increasing standardization of products in supermarkets, due to a concentration of fewer and bigger dairy farms and factories, which make it difficult for consumers to satisfy their purchasing wishes (buy locally, diversely, with added value, like pasture-fed milk) within their usual shopping routines (BMEL, 2017). This raises the concern that the gap between the intention and action cannot be pinned on the individual consumer behaviour, but rather has an underlying systemic cause.

Civil society initiatives can moderate discussions of the different actors' expectations and needs and are doing so by lobbying, creating labelling regulations, strengthening farmer-

consumer-connections, networking, and campaigning, amongst others (BDM, 2019; ProWeideland, 2020; Du Bist Hier Der Chef, 2020, Slow Food, 2020a).

2.4. Behaviour change theories and interventions

Theories of food choice and behaviour change are widely recognised and used in marketing by food industries and retail companies (Padberg and Westgren, 1979) and in health research and interventions (Karevold, Lekhal and Slapø, 2017). However, their application in sustainability research and practice is relatively new and the impact of sustainable food choice is not yet fully understood (BIT, 2020). It is, however, increasingly acknowledged, that behaviours are not solely individualistic decisions, but embedded in and shaped by social aspects (e.g. norms, roles, and influence of peers and family), and physically external contexts (including regulations, policies and infrastructure (Darnton and Horne, 2013). This fact is important to consider not just when analysing consumer behaviour, but also when looking into all actors' behaviours involved in a system. This can also be linked to the iceberg model with its systems' levels discussed above, where behavioural patterns are rooted in systemic structures such as biophysical (material) conditions (markets, and political institutions), which are in turn influenced by the individual mental models and perceptions that are themselves influenced by the social context and that guide our decision-making and the establishment of structures (Meadows, 2008; Kennedy, Gladek and Roemers, 2018).

Decision-making itself is a complex process. In a former work, the author reviewed the literature on factors influencing the farmers' decision making towards pro-environmental farming practice (Leimann, 2019). Farmers' land management practices, which are complex and interlinked with time, space and human behaviour (Costanza, et al., 2017) are important factors to consider, because farmers are the ones shaping ecosystems in their everyday work (Zhang, et al., 2007). Figure 3 shows that within the farmers' cognition process, knowledge and values influence the decision-making process and then lead to farm-management behaviour. This interplay of knowledge and values is influenced by personal attitudes and socio-demographic variables. However, although knowledge and personal values are necessary, they are not always decisive factors. Also, do actual behaviours not necessarily correspond to attitudes (Lamarque, et al., 2014). Environmentally contextual factors (climate, altitude, topography and pest outbreaks) and changes which occur naturally or through farm management feed back into cognitions and decisions (Lamarque, et al., 2014). Political and socio-economic contextual factors, such as the design of political and economic measures or the farm structure directly influence the farmers' cognition or behaviour.

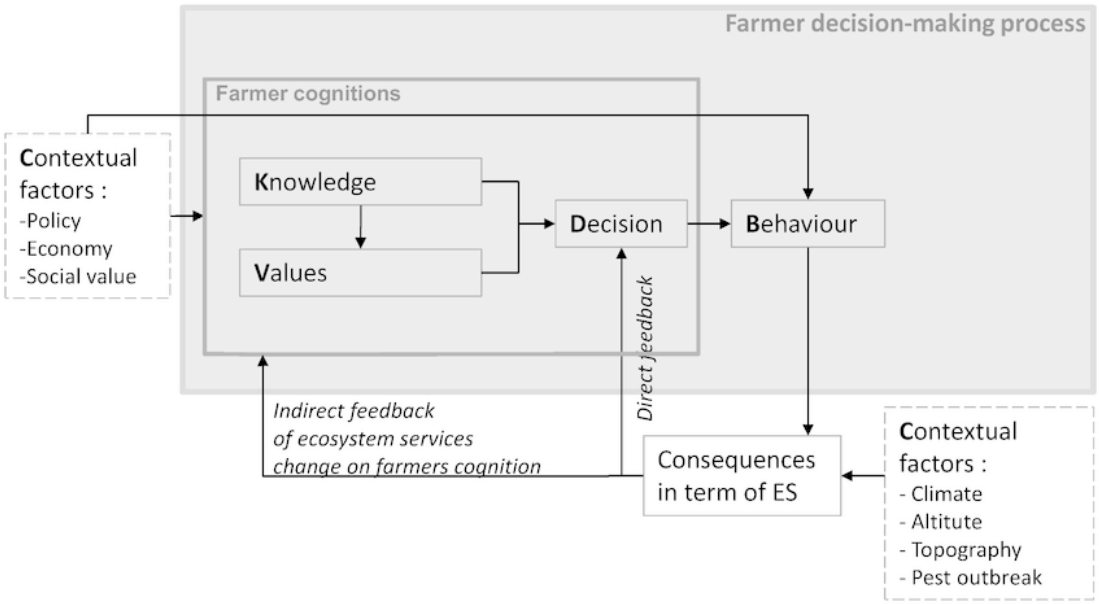

Figure 3: Socio-cognitive conceptual model of contextual feedbacks on farmer behaviour (Lamarque, et al., 2014)

Lastra-Bravo et al. (2015) found that farms with lower dependency on farm income were more likely to implement pro-environmental, governmental voluntary measures (Lastra-Bravo, et al., 2015). More recently, a review of the potential of producers and consumers to reduce environmental impacts of food production and consumption found that even though the producers are a crucial part in delivering the solution, their ability to reduce their impact is limited and that dietary change could deliver greater benefits than production change (Poore and Nemecek, 2018).

This brings us back to the consumer side, where an increasing body of literature exists, covering sustainable food choice, pro-environmental behaviours and their theories (Jackson, 2005; BIT, 2020; Kollmuss and Agyeman, 2002). Stoll-Kleemann and Schmidt (2017) developed a comprehensive model on the drivers of meat consumption, based on the model of pro-environmental behaviour developed in Kollmuss and Agyeman (2002), which could be read across to dairy consumption.

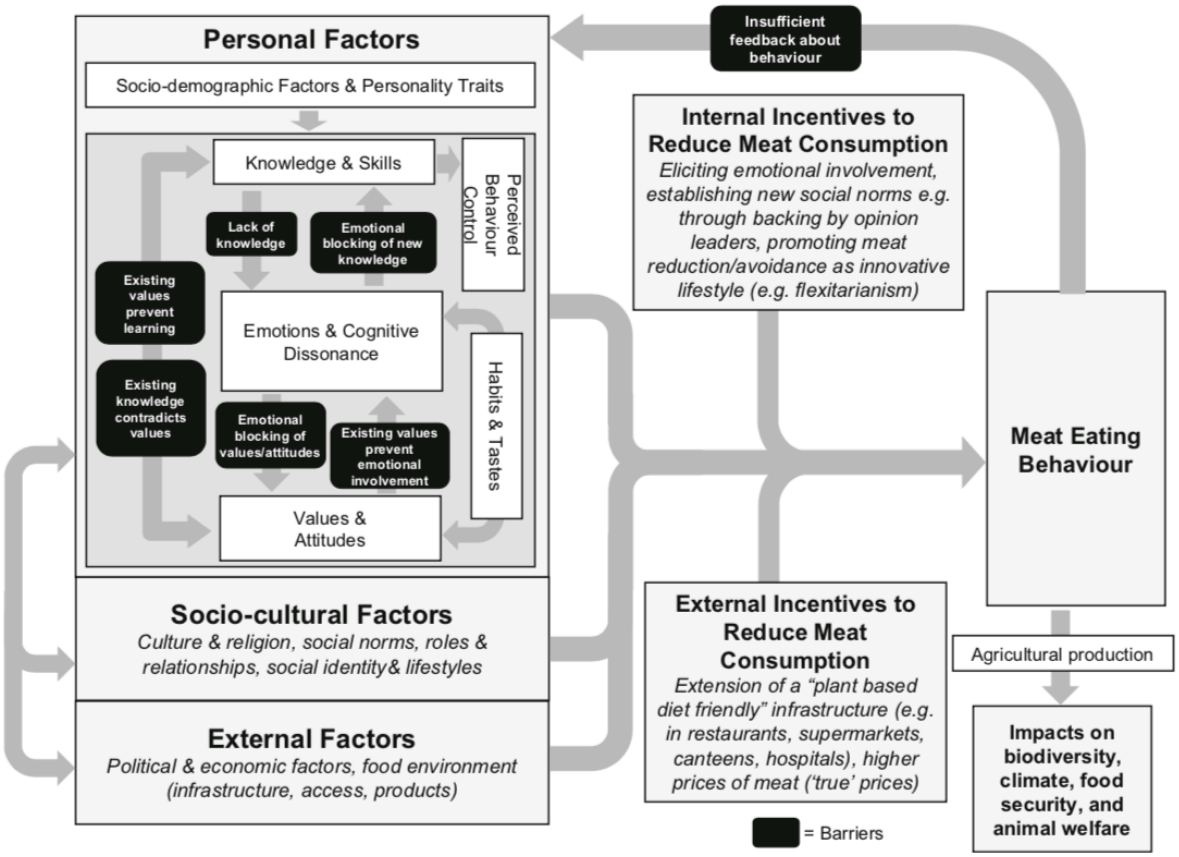

Figure 4: Model of factors that influence meat-eating behaviour (Stoll-Kleemann and Schmidt, 2017)

Figure 4 shows that besides the individual (personal), socio-cultural and external factors already noted, there are barriers, internal and external incentives and feedback loops involved in consumption decisions. This model can provide the basis from which to consider individual consumption behaviours within the wider system, but there are a lack of studies looking into where behaviour change would have a transformative impact on the overall system (Moloney, et al., 2010; Abson, et al., 2017). This is where the leverage points, discussed in the chapter above, can feed in (Meadows, 1999).

When designing behaviour change interventions towards more sustainable food consumption, one challenging behavioural phenomenon is the attitude- or intention-behaviour gap (OECD, 2017). It explains why people fail to purchase more sustainable food, even if they intend to. Reasons for this can be a prevalence of other priorities, such as economic constraints or health concerns, or their inability to process the increasing number of criteria and labels that indicate such product performance (Joshi and Rahman, 2015; Langer, Eisend and Ku, 2007). Due to the fact that real life behaviour change interventions are hard to make and often biased, the majority of research studies are based on analysing purchase intentions and willingness-to-pay, leading to a gap and inability to make recommendations on the real purchase.

When putting behaviours into a broader context, Michie, Van Stralen and West (2011) acknowledge that three main components shape and are essential to behaviour change, namely capability (C), opportunity (O) and motivation (M). Their COM-B model provides a

simple framework for understanding behaviour (Fig. 5). An intervention would have to include all of them to increase the likelihood of the successful action being taken, because behaviours occur as a result of these three necessary conditions (Michie, Van Stralen and West, 2011) and would also require a trigger to enforce the urgency to change immediately (Fogg, 2009).

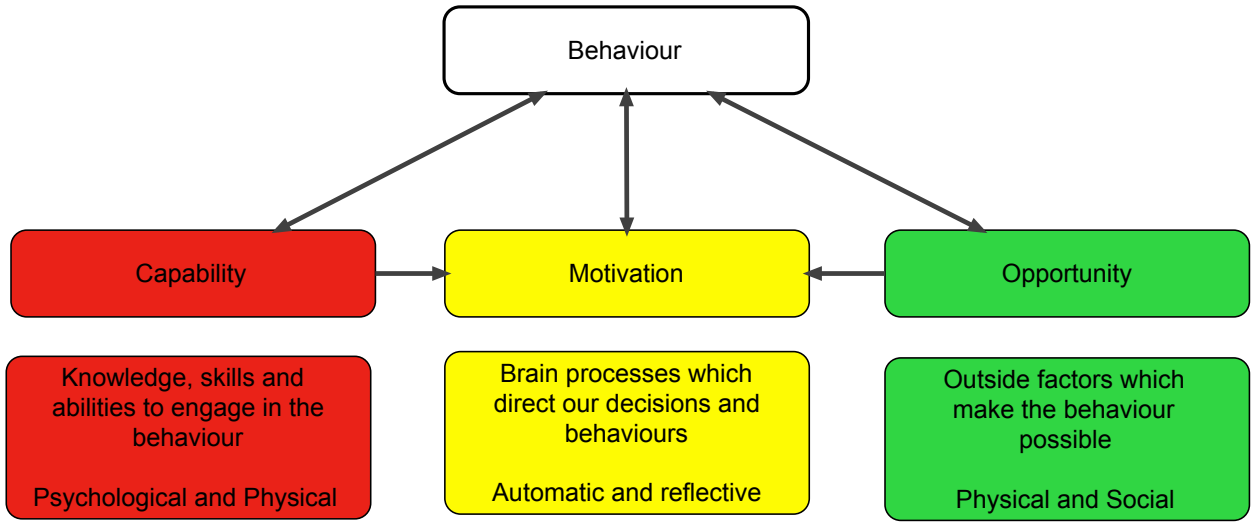

Figure 5: COM-B: a simple model to understand behaviours (Michie, Van Stralen and West, 2011). Capability includes psychological and physical strength, skill or stamina and knowledge. Opportunity is physically afforded by the environment- time, locations, resources, and socially afforded by social factors- cultural norms, social cues. Motivation can be shaped by brain processes that are reflective (plans, evaluations) or automatic (desires, impulses, inhibitions, etc.)

This chapter set out the narrative about systemic transformation, the social and planetary boundaries of the German dairy system as the system under investigation in this study, the relationships between the actors involved and their behavioural and decision-making structures. It highlights the gap in knowledge on the ability, impact and role of consumers, as well as producers in driving a transformation of the dairy food system. It also shows that bridging the gap between behaviour change and system change could add new insights to both disciplines. This makes it an interesting approach to be investigated in this research study, and guides the process of collecting and analysing primary data, which will be explained below.

3. Research Strategy & Methods

This chapter sets out the rationale for the research process and then outlines the methods that were chosen to conduct the research.

3.1. Methodology

A focused literature review was conducted within the existing body of (food) system change and (food) behaviour change literature. Within and beyond this, a special focus on dairy consumption and production was chosen to research both the challenges of the current and options towards a more sustainable dairy system.

When researching behaviour change, although consideration of consumption figures and trends is important, it does not directly provide an understanding of the underlying drivers. Qualitative methods have proven useful in studies analysing the drivers of specific behavioural patterns, attitudes and potential barriers to different ways of behaving (Hammarberg, Kirkman and de Lacey, 2006); This is even more so, when dealing with contextual problems and seeking to explain complex social relationships and mechanisms (Creswell and Poth, 2016) as is the case in this study.

Combining the consumption, production and system perspective in one study is challenging and complex, and led to a two-pronged research approach, where focus groups on dairy consumption provided insights into the consumer side and interviews with dairy system experts added the production side and gave an overarching perspective. The analytical part of the research then looked into the interlinkages between these two parts, seeking to understand behavioural aspects against the background of the underlying system characteristics. This is seen as increasingly important in behaviour change research, as behaviours are not solely individual decisions, but require factors that are influenced by the surrounding system such as the capacity, and social and physical opportunity to behave in a certain way (Michie, Van Stralen and West, 2011). Figure 6 below shows how the approaches, models and frameworks are interlinked to form the structure of this research.

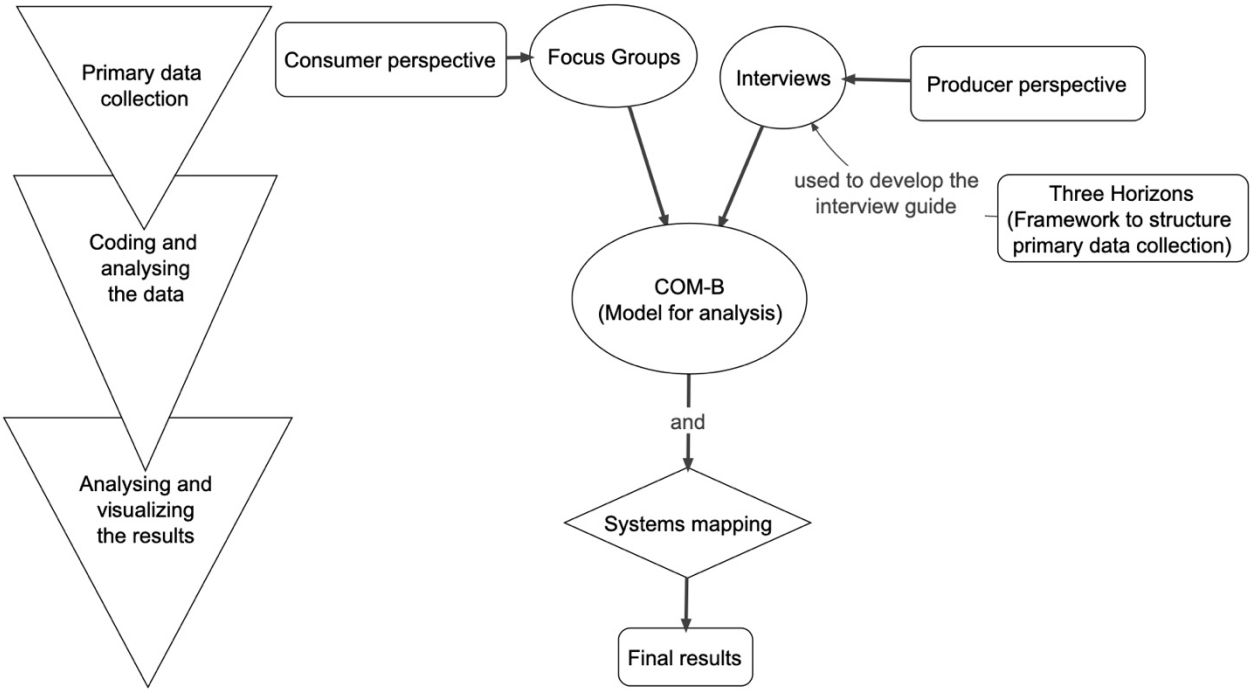

Figure 6: Visualization of the research strategy (by the author)

While the COM-B model (Michie, Van Stralen and West, 2011) was used to analyse the data, the Three Horizon Framework (Sharpe, et al., 2016) was chosen to deal with the level of complexity described, and to inform the process of collecting the expected rich amount of data. The framework is a practical and systemic approach to study and facilitate transformative change by identifying current system challenges, defining a desired future

system and generating transformational areas to move from the current towards the future system (Sharpe, et al., 2016). As a structural frame, these three areas informed the interview guide and were used thereafter to deductively cluster the quotes into current challenges, the vision of a future system and the enablers to get there. However, the analytical focus was on the COM-B model to understand the behaviours that reinforce or alleviate the current problems and that makes it possible to move towards the vision of a different system.

A participatory multi-stakeholder approach would have been useful to bring together the different elements and actors within the system, to allow a common vision of the future system to emerge and to start a conversation on how a change can be implemented together (Sharpe, 2014; H3uni, n.d.a; Vennix, 1999) but bringing together national actors for a workshop was beyond the scope of this study. Since their input was an essential feature of the systemic approach, input from the expert interviews and from the focus groups fed into this framework, which helped with visualizing the potential and necessary transformation processes in the dairy system.

The Three Horizon Framework provides a rather weak guidance in exploring the uncertainties within and between the current and future system and how they are connected (Sharpe, et al., 2016). To overcome this limitation of it is recommended to add systems mapping in order to develop further insights and to develop an understanding of relations and feedbacks (Fazey, et al., 2011). This process was done by keeping the systems definition by Meadows (2008) (described earlier) in mind when designing the interview guide and by adding the practice of system mapping after coding to visualize the data.

To add the behavioural perspective and to understand the behaviours behind consumption and production patterns, the COM-B model (Fig. 5 in chapter 2.4) was used and added the actors capability (C), opportunity (O) and motivation (M) of either driving current practices or enabling or hindering a change towards the desired, future behaviour (Michie, Van Stralen and West, 2011; Sharpe et al., 2016).

Data gathering strategy

The consumer perspective was provided through focus groups and the producers perspective was added through interviews.

Focus groups are a qualitative research method in which discussion groups are assembled according to certain criteria (e.g. milieu- or actor-specific) and where an information input stimulates discussion on a specific topic (Henseling, Hahn and Nolting, 2006). The method is particularly suitable for generating or checking assumptions and ideas and when more in-depth information about the motivations and action background of specific target groups is to be determined (Derndorfer and Klug, 2005), like in the present study. Rather than surveying these motivations, potentially leading to biases, focus groups allow conclusions to be drawn about motivations and attitudes based on the observed conversations (Breen, 2006). However, conformity and cognitive biases may still occur and were considered in the

design of the focus groups, e.g. through writing down opinions before discussing them with the group (Bryman, 2016; Ritchie and Lewis, 2003).

To address the more systemic challenges in dairy production and in the interconnection between consumption and production, the core part of the study is based on the views of dairy system experts. Inviting these experts to discuss the present topics together in a focus group was considered a promising option, but as these experts live in different parts of Germany and many of them are dairy farmers or dairy manufacturers with limited time and travel resources, especially during agricultural peak times like spring, this approach was beyond the organizational and financial scope of this study. Therefore, semi-structured phone interviews were chosen as the best feasible option in line with the qualitative approach and the objectives of this study (Byrne, 2012; Harrel and Bradley, 2009).

Interviewing means asking questions and receiving responses, and has a variety of forms. Whereas structured interviews are more common in quantitative studies, semi-structured or unstructured approaches are more frequently used in qualitative studies (Ritchie and Lewis, 2003). Semi-structured interviews were chosen for this study for the following reasons. The interviews follow a guide in which questions are prepared in a certain order, this means they allow for pre-testing, comparability between interviews and help to ensure that no questions are missed. They also permit a certain flexibility so the questions that have been prepared can be adapted to the profession of the interviewee to widen and deepen insights (Kajornboon, 2005), which is helpful when there is a diversity of interviewees, as is the case in this study (e.g. farmers, cheese makers, politicians, and others).

A number of 11 interviews with average length of 45 minutes was considered adequate against the background of the expected diversity and richness of the data and the limited time resources for processing (Galvin, 2015). The questions asked were developed within the literature research and guided along the Three Horizon Framework (Sharpe, et al., 2016) to research challenges in the present (Horizon 1), a future vision of a sustainable system (Horizon 3) and the way to get there (Horizon 2) (see Figure 7).

Data analysing strategy

Thematic analysis was used to analyse the richness of the data in a meaningful way. Thematic analysis is a widely-used method to identify, analyse and report patterns within qualitative data by encoding information. Some of the particular benefits of this approach are that it can be used within different theoretical frameworks and for different purposes (Braun and Clarke, 2006). With regards to the two sets of different and rich primary data (focus groups and interviews) in this study, thematic analysis was seen an appropriate tool for showing similarities and differences between these data sets and moreover to code, theme, display and parse the rich amount of data and therefore to summarize the essence of it (Braun and Clarke, 2006). Thematic analysis also allows specific or implicit aspects of the total data set to be taken into account which makes it suitable for the research question in this study, as well as helping develop solutions that could help achieve the objectives of the study (Silver and Lewins, 2014). In a comparison of methods, thematic analysis has

limitations as it does not provide information on language usage. However, this is not a concern for this project, given the interviews will be translated from German prior to analysis, and it is not intended to focus on the individual words used (Braun and Clarke, 2006).

There are several ways of using thematic analysis. Within the analysis, a 'contextualist' approach was taken, that recognizes the ways in which individuals give meaning to their experience, and that in turn recognizes the ways in which the broader social context influences these meanings, while maintaining a focus on the material and other limits of their realities and therefore lifestyles. Hence, thematic analysis can be used to reflect reality, but also to remove or dissolve the surface of this reality (Braun and Clarke, 2006). This is well suited to the systemic approach of this study and to analysing systemic structures beyond just the individual (Darnton and Horne, 2013).

To take the complexity of the food system into account, the coding and theming of the data was deductively led by the structure of the Three Horizons and the COM-B model. However, the process of further analysis to identify major challenges and possible solutions stayed open to use also system characteristics and leverage points (Meadows 1999; 2008) to identify interconnections and underlying patterns in a rather inductive approach (Braun and Clarke, 2006).

The software NVIVO was used to conduct thematic analysis. The mapping software 'Visual Understanding Environment' was used to address the challenge of visualising the role of consumption and production behaviour in the dynamic food system and allowed to link causes and problems to consequences by arrows.

3.2. Methods

The COM-B (Fig. 5 in chapter 2.4) and the Three Horizon Framework were used to structure the research and analysis, and to guide the interview questions (see Fig. 7 below). Focus groups were conducted to provide insights from a consumer perspective on dairy consumption and food shopping behaviour. Semi-structured interviews were conducted to add the views of producers and other experts, who were connected with dairy production and/or consumption. Thematic analysis was used to code the data. This is displayed in Figure 8.

3.2.1. Focus Groups

Five focus groups were conducted in Wuppertal, Germany, in October 2019, on behalf of the Horizon 2020 project 'Valumics - Sustainable Food Value Chains'. These focus groups with 6-8 participants each, did not solely discuss milk production, but also beef, salmon, bread and tomato consumption and general food shopping behaviour. However, there was a special focus on milk consumption. The author was involved in the project, and in preparing and conducting the focus groups and was given permission to use the transcripts to analyse them with respect to the chosen aim of this study. They have not been analysed with regards to this aim before, and the funder appreciated the additional use of the data

and the data's use for this study was included in the signed consent forms. The focus groups were held in German and were audiotaped. They were translated into English by the author before they were analysed using NVIVO. The assignment sheet of these focus groups is attached as Appendix 1.

3.2.2. Semi-structured Interviews

Semi-structured interviews with 11 interviewees were conducted between 23 March and 29 April 2020 and piloted on 17 March 2020. They were designed to last about 45 minutes and to provide insights into different actors' perspectives on sustainable dairy production, challenges in the dairy system and possible levers and opportunities to transform the system.

Choosing interviewees

Purposive sampling was used to select interviewees with relevant experience (dairy producers, dairy manufacturers, academics and policy makers) (Cottrell, 2014; Silverman, 2014). The interviewees were approached during 'Biofach', described as the world`s leading trade fair and congress on organic products and services and after screening members from the German Slow Food Network, the Alternative Farmers Associations ('Arbeitsgemeinschaft Bäuerliche Landwirtschaft' and the umbrella organisation 'Meine Landwirtschaft'. Five interviewees were added through snowball sampling and recommendations by contacts.

The interviewees were mainly farmers, but also cheese makers, politicians, academics and people who had set up or worked in dairies. They worked in different parts of Germany. Despite their diversity, they all had in common that they supported changes in the dairy system, demonstrated either by their engagement in an NGO or association or by political activism, or by producing in a more sustainable way (organic/biodynamic certification, short supply chains/direct selling, community supported agriculture, farm-based dairy manufacturing, community-owned dairy cooperatives or mother-bound calf rearing). The farmers had between 15 and 300 cows, some delivering to a big conventional dairy, others selling all their milk directly as drinking milk, dairy products and cheese directly from the farm. In most cases the cows had access to grazing.

Informing the interview questions

The questions in the interview guide were informed by insights from the literature review and the 'Three Horizons Questions for Participants' (Figure 7).

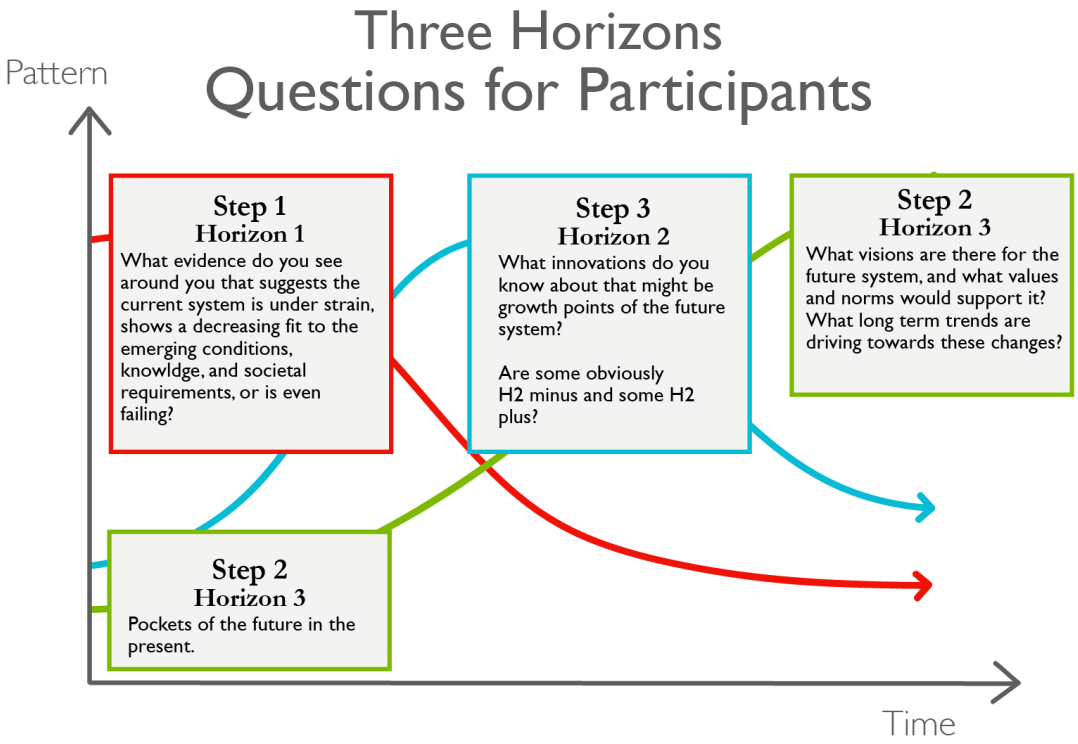

Figure 7: Three Horizons Questions for Participants (H3Uni, n.d.b)

The general interview guide can be found below (Table 1) and in the full guide in Appendix 2. It was adapted slightly to fit to the different actors in the dairy system by clustering farmers/manufacturers and academia/policy makers to widen the expected insights into the overall dairy system. After the pilot interview, the guide was reviewed and adjusted to make the questions even clearer. Set-up and questions were chosen to encourage discussion and create a positive discussion atmosphere, while staying in line with the framework (Ritchie and Lewis, 2003).

Table 1: Interview guide including relevance and rationale for the questions

Welcome and Introduction (5-7 Minutes)	
1. Welcome, thank for taking the time, introduce myself 2. Remember to sign consent form, ask for permission to audiotape the interview 3. Introducing the project, the timeframe and how the data is used	
Questions (33-35 Minutes)	
Steps and question	Relevance and rationale
1. Step to map Horizon 1 - What are the challenges you are (currently) facing/ you can observe within your work/everyday life? o What is the most important one? And why? (How does this impact your work? What part of the system does it affect?) - What challenges for consumers to consume more sustainably can you observe?	To understand the current reality, the problems of the system, the most important challenge of the interviewee, and to understand the reason behind it. This might also lead back to the character of that person, his/her attitudes and behaviours. It reveals where in the system problems occur and

- (eventually: Is the system fit to deal with these strains? (How? Why? Why not?))	how these are interlinked with the actor.
2. Step to map Horizon 3 and potential pockets to get there - What is your definition of sustainable dairy production? - What is your definition of sustainable dairy consumption? - What vision do you have for the future dairy system? o What norms and values would support it? (producer and consumer-side)	To understand how a future (and sustainable) system has to/or is likely to look like, to understand how they define sustainable dairy production/consumption and to link this to their work and practice. To also look into the norms/ attitude-side, what needs to be different socially and behaviourally?
3. Step to map Horizon 2 - What has to happen (and to change!) to get there? (consumer/producer-side) o What actors are needed for that change? What would they have to do? - What are you already doing differently? And why? o What do you think other producers would need to do to follow your example? Why do they do it differently? - What do you think consumers would need to consume more of your/more sustainable products?	To understand the change needed, and the change that is also feasible/possible by the actors, to understand what pioneers already do differently and what might be the enablers and barriers for others to follow that example (also from a behavioural perspective), also to encourage discussion about the role of consumers in enabling change
Closing, thanks and follow-up	
1. Closing, saying how their input will help the research, reassurances about confidentiality 2. thank again for time 3. invite to stay in touch about the course of the project and beyond and to share the results	

Interviews and transcription

All interviews were conducted by telephone in German. They were recorded, transcribed verbatim, and translated into English after the interview took place. Translation was aided by an online translator (DeepL Pro) and manually compared to the original transcript afterwards to minimize errors (Regmi, Naidoo and Pilkington, 2010).

It was agreed that participants should remain anonymous in the written part of the study. Data saturation was reached after 11 interviews (Saunders, et al., 2018; Galvin, 2015).

3.2.3. Coding and analysis

Transcription, translation and another pre-coding read-through was used to become familiar with the data of the focus groups and interviews. The transcripts were reviewed several times and coded data and themes were constantly reviewed, analysed and sorted. To keep track of the sense-making of codes and emerging themes, notes were taken (Bryman, 2016).

The software NVIVO was used to aid the process of coding and to theme the text systematically. Within both the focus group and interview analysis, the COM-B model and Three Horizons approach provided the structure for answering the research question (Fig. 8). The interview analysis was also used to provide further insights into the challenges of the current, a possible future system and the transition between them.

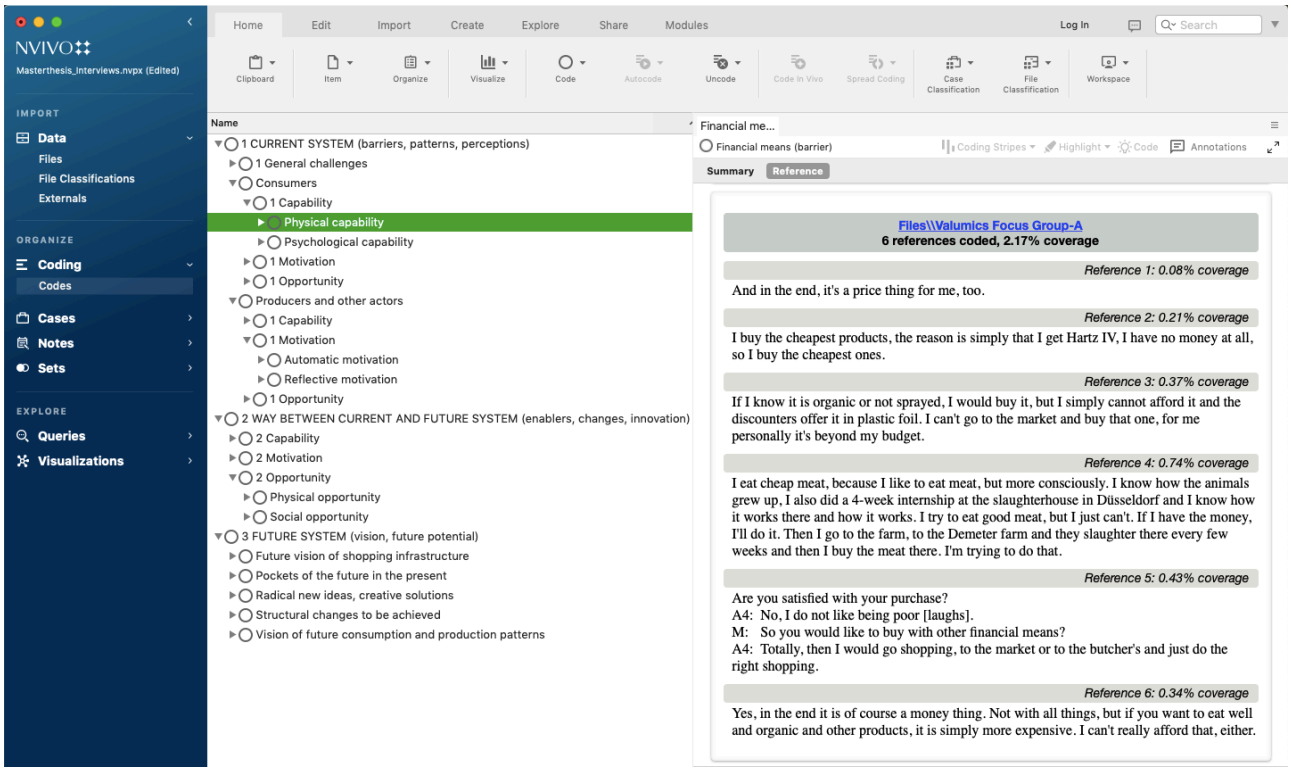

Figure 8: Extract of the coding work, showing the overarching structure and an example of codes from focus group A

4. Results and analysis

Following the COM-B Model in thematic analysis, barriers and enablers of a more sustainable dairy consumption and production behaviour were clustered into the actors' physical and psychological capability, their automatic and reflective motivation and their physical and social opportunity. The vision of the future sustainable dairy system is mapped in chapter 4.3, including some "pockets in the present". Three major challenges that developed from analysis will be presented in chapter 4.4 and visualized by showing the relevant sections of the systems maps, which are set out in Figures 9 and 10.

4.1. Barriers and enablers of more sustainable dairy consumption behaviour

This chapter presents the coding work of the five focus groups (FG-A to FG-E) into barriers and enablers of a more sustainable dairy consumption behaviour, following the COM-B classification (see Table 2 and subsequent explanation). In some cases, the enabler and the barrier were part of the same group and directly connected. In other cases, a barrier in capability, for example, was connected to an enabler in the motivation cluster, which is

shown in green in the table. The interconnections are also mapped in Figure 9 to help visualize the explanation.

Table 2: Consumers' barriers and enablers of more sustainable dairy consumption behaviour. Extract from the author's coding work. Coloured statements with an arrow show a connection to another enabler (green), or a connection to Table 3 (blue).

Barriers consumers	Enablers
Capability (physical)	
Lack of money, financial means	Money available, Price not decisive
Lifestyles, working life, out of home, little cooking	Good work-life-balance, better working conditions
Lack of time - No desire, time or skill to cook - Wish to eat healthily under time pressure	Time available - Time to develop new habits and preferences
Health and intolerance	→ consciousness (motivation) → Improve image of dairy farming and products (farmers' social capability)
Capability (psychological)	
Lack of knowledge - Labels, certification - Subsidies Lack of skills	Knowledge and information available - Animal feed, mother-bound husbandry, early separation - Demeter, fairness, other connected added values - Education, Farm visits - Farmers' protests, Milk price - Cooperatives
Brand consciousness and loyalty	Consistency in decision-making
	Openness, curiosity
Motivation (automatic)	
Lost or no connection to food	Connection to farmers
	Connection to food, mindset
Mistrust - in big corporates and structures - in labels (fair trade, organic, regional) - Price too low to be sustainable	Trust as an opportunity
Mood, pleasure, desire, impulse, laziness	Pleasure of eating and cooking
Preference and taste - Preference connected to bad conscience - Preference differs from habit	→ change of taste (reflective motivation)
Habits and purchase patterns	→ change of habits (reflective motivation)
	Consciousness - Animal welfare and environmental consciousness, including waste - Health consciousness or issues
Motivation (reflective)	
No environmental, ecological or sustainability intention - Reasons to not buy organic - Packaging, plastics and ecological - Stress between intention to buy local produce and actual purchase	Good environmental, ecologic or sustainability intention - Organic as a purchase driver - Plastic packaging - Buying local produce as a purchase driver - Buying seasonal produce as a purchase driver
Low priority for value of food	High priority for value of food
	Consumer willing to pay more
	Disinterest in unsustainable products
	Willing to make an effort to get the product
Reflected habit - Buying in stock, e.g. durable milk	

	Change in habits and behaviours
	Change in tastes
Opportunity (physical)	
Convenience, convenient infrastructure - Challenge to get good milk - Difficulty avoiding dairy products - Packaging of a product	Change of infrastructure, stereotypes - Availability of dairy - Milk filling station - Glass bottles
No sustainable alternative available	Ease of practicing the alternative
Influence of advertisement, promotion	Advertising the alternative
Influence of health recommendations	
Price of food - Comparably high price of sustainable alternative - Organic is expensive - Price as decisive criterion	→ Money available (physical capability) → Consumer willing to pay more (reflective motivation)
Opportunity (social)	
Influence of others	'Freedom' from social influence
	'Good' influence of others - Associations, actions, movements - Media - Children, childhood
Social norms and perceptions - Perceived negative image of organic	
Culture and tradition	

1.1.1. Physical capability

Capability is about an individual's psychological and physical ability to engage in the desired behaviour. The physical capability reflects the extent to which an individual can engage in the behaviour with regards to his or her personal resources, like time, skills and money.

Personal resources (money, time and health)

Throughout all focus groups a lack of money was cited as a barrier to consuming more sustainably even if they considered themselves relatively wealthy or were quite knowledgeable about animal welfare and environmental issues. For example, a participant noted that *"I can't go shopping for our family in an organic supermarket every day, it wouldn't work financially at all, although my husband earns really well"* (FG E).

Particularly where both parents are at work, time limitations were a factor in shopping and increased out-of-home-consumption, for example in work canteens, reduces cooking at home.

More available money and time was an enabler to shop differently for those participants, who had greater knowledge and consciousness and placed a higher value on food, linking to the psychological capability and the participants' motivation to for example 'take the time'.

> *"The quality is important to me. I am on the road a lot and then I go to the discount store more often. If I take my time, I go to the organic market and look for something more specific." (FG-B)*

Health consciousness and lactose intolerance were often mentioned as drivers for either consuming less dairy, better quality dairy or plant-based milk alternatives. For example, one participant stated that *“I don’t even look at the whole cow's milk range because I have an intolerance to it.*“ (FG B)

1.1.2. Psychological capability

Psychological capability refers to the individual’s ability to engage cognitively with the desired behaviour.

Personal resources (knowledge)

Although many participants had a good basic knowledge in environmental and food system issues and were well-informed, there was a gap in the psychological capability in the sense of a lack of knowledge and confusion about labels and certification. With regards to the overall dairy system they showed a brief and patchy knowledge about some issues but lacked an understanding of the bigger picture.

> *“I don't understand the dairy business anyway. I do not know what kind of subsidies are paid there or how it is structured. It is known from earlier times that there was talk of "butter mountains", but in detail I do not know.” (FG-B)*

Personality traits (openness, awareness)

Personality traits, like openness, awareness, curiosity and consistency in decision making provided an opportunity to try out and establish a new behaviour. Brand loyalty could be seen as trait that encouraged sticking with the known preference or taste. A participant stated that *“I like to try new things, e.g. oat milk, also because of the children. I didn't find the taste so convincing now, but you have to try it.*“ (FG-C)

1.1.3. Automatic motivation

Motivation includes factors, that are internal to the individual’s head and heart. Motivation is about brain processes, that create and lead behaviours. The COM-B model divides between reflective and automatic motivation, where the latter includes desires, impulses, habitual processes and emotions and other processes that arise from associative learning.

Habits, preference and taste

Within the automatic motivation, the participants considered their eating habits, preference, taste and familiarity with a known brand and quality as main reasons for their shopping behaviours. Changing these requires more reflective processes and is described in the next chapter. But what can be noted here, is that a connection to food and farmers and consciousness about animal welfare and the environment can act as enablers of changing

these habits and preferences, especially if it then also includes other advantages, as one of the participants explained:

> *Moderator: "What was the trigger that made you look at it more consistently? Participant: Because I don't want to keep animals under bad conditions and also because of the CO_2 emissions. And at the same time, I've been eating much healthier, cooking much more and trying much more. That was such a positive side effect that I experienced afterwards." (FG-D)*

Many participants seemed aware of when their preferences contradicted current trends and intentions. As an example, one participant said *"Otherwise I try to buy ecologically beneficial products. But there are things like avocado, there is simply no regional substitute for it and every now and then it has to be an avocado." (FG-A).* The purchase might clash with their values, when they are *"totally in the mood for something and say, "Today is our cheat day"* (FG-A).

Trust and mistrust

There was mistrust of labelling on fairtrade, organic and regionality. Many participants did not trust that there could be fairtrade milk at all, where the money goes directly to the farmer and that organic is always as organic as it claims on the packaging.

> *Participant: "You can't imagine that.*
> *Participant: Fair milk prices at 1.19...*
> *Moderator: So, you wouldn't believe it?*
> *Participant: I would be sceptical.*
> *Participant: It is just the question where it really goes. You can write a lot on there." (FG-E)*

However, the private label "Demeter" (used for food produced to Biodynamic standards) was more trusted. One participant claimed that "*demeter milk is almost too cheap, because the milk really has one of the highest ecological standards"* (FG-E). In the case where participants had a basic level of trust in labels, or wanted to trust, rather than to inform themselves further, this trust could be seen as a driver to buy a certified product. If participants showed trust in the person instead, this motivated some of them to forego the accreditation and purchase directly from the producer.

> *„A few weeks ago, on Galileo there was something about the difference between milk prices and dairy product prices. Early separation of calves from their mothers and so on... Well, I just like animals, even if I eat them, I found it so formative that I then said: Organic. But organic labels are also very different, from food additives, genetically modified, soy ... etc. But subjectively, I think that if I buy organic, I might get a farm where this early separation does not take place." (FG-C)*

There was also mistrust in big cooperatives and structures. A participant mentioned *"with the products that I buy as dairy products, I make sure that companies like Nestlé, etc., are excluded. I'm already trying to find out which other companies are hiding behind it, but all in all I can say that I'm trying to avoid it." (FG-A)*

1.1.4. Reflective motivation

Reflective processes include plans, intentions and evaluations, for example through conscious decision-making.

Intentions

When participants reflect on their purchase intentions, they recognise the challenge of balancing the different sustainability aspects of food, like organic, fairtrade, food waste, buying local and packaging. *"When I have the choice between an organic product and a local product, I take the local product. It's more sustainable to me than getting organic from far away."* (FG-C). The previously mentioned mistrust and also a lack of knowledge and a need for convenience due to lifestyles plays into this too.

Change of habits and preferences

As mentioned above, while habitual processes belong more to automatic motivation, a change of those habits and preferences requires a more reflected process and also time to develop and establish new habits (physical capability), among other factors.

> *"Yes, I like to eat a lot of muesli and there is also take a lot of milk in coffee. I say with oats - or soy milk, although you can't call them that anymore, which is nonsense, that's not my thing. I don't think they're quite so good. I've tried it all before. My girlfriend drinks it all. I'm still having a little trouble with this. Let's see what time brings." (FG-D)*

Value of food

A high priority for the value of food and food in general is connected to awareness and also to a willingness to pay for higher quality and to make an effort to get the desired product. A participant stated that *"food is pretty much the only thing I spend money on in my life, so I put a lot of emphasis on it." (FG-A)*

1.1.5. Physical opportunity

The consumers opportunity to engage with a new behaviour depends on physical and social factors and includes those factors that are external to the individual, but that are required to perform the new, desired behaviour. The physical opportunities are situational factors, like infrastructure (availability of shops and dairies nearby) and convenience.

Convenience and infrastructure

The abovementioned barriers focussed a lot on convenience. Some participants had a preference for UHT milk, as one participant put it:

“We buy mostly UHT milk, because it has to last a relatively long time, because it is not consumed in such rapid way. I don't have much room in the fridge to keep them refrigerated for so long. That's why I buy UHT milk, because then I can put it in the cupboard as normal.” (FG D)

Packaging and infrastructure were also widely discussed. Participants tend to shop on the way home from work and in the shop that is on their way without the need to take the car or make a detour. Some preferred tetra pack to glass, due to the lower weight and the convenience of being able to readily throw it away.

Availability and packaging of dairy products

Another important topic with regard to physical opportunity is the availability of good quality dairy products. In all focus groups reference was made to “milk filling stations” (vending machines where purchasers can directly fill their own milk bottle). This was new and interesting for some participants, but for those who knew of the concept, there was a barrier to making an extra journey or going by car. This discussion was often connected to the use of glass bottles, as one participant said that “*In V., when you drive out past the prison, there is also a farmer who has milk from the vending machine, even in glass bottles. So, if you happen to drive by there... But the bottles pile up at home, they should be disposed of again.“ (FG-C)*

However, many participants preferred glass bottles from an environmental perspective, but the facts that they perceive them as expensive and wouldn’t know where to return them (capability), wouldn’t be passing by, or that UHT milk is not available in glass bottles prevented them from using them. Quite a few participants were driven by advertisements and promotions in their shopping habits and bought a preferred, but expensive product only when it was on special offer.

To conclude, the physical context seems to play a big role in shaping consumption patterns and in preventing the participants good intentions from becoming reality.

1.1.6. Social opportunity

The social opportunities include cultural issues, community values and social norms that either enable or deter other, new behaviours.

Culture and tradition

In the social context, culture and tradition was not mentioned often, but if they were, it was a strong factor in preventing dietary change, one participant mentioned “*it is difficult to combine Turkish or Oriental cuisine with vegan. It's actually impossible.“* (FG-D)

Influence of others

There was, however, a considerable mention of the influence of others. If children drank a lot of milk, for example, the parents tended to buy an inexpensive UHT milk. But children could also be the reason why parents switched to a more organic and healthy diet to be a role model, or later on, children even demanded more conscious purchase behaviour by their parents. The latter is also encouraged by media and movements like 'Fridays for future'. There are family, partners, visitors or friends, who caused participants to adapt their purchase intentions, either for the better or the worse, and also a 'freedom from social influence' was observed that could enable change. A participant stated that *"personally, if I lived alone, I would probably eat vegan food, but that is difficult in a family."* (FG-D)

Social norms and perceptions

A perceived negative image of organic products and the connected social image of the people buying these products could be observed as another social barrier to consuming those products. On the contrary, many participants had a poor opinion of people who showed inconsistent and unconscious shopping behaviours. One commented on this as "*these are the ones who drive the SUV to the "denn's" (organic supermarket chain)*." (FG-A)

The interconnections between all these aspects are shown in the systems map below (Figure 9), linking it to the consumers' vision and the mutual contact points with the farmers' map (Figure 10).

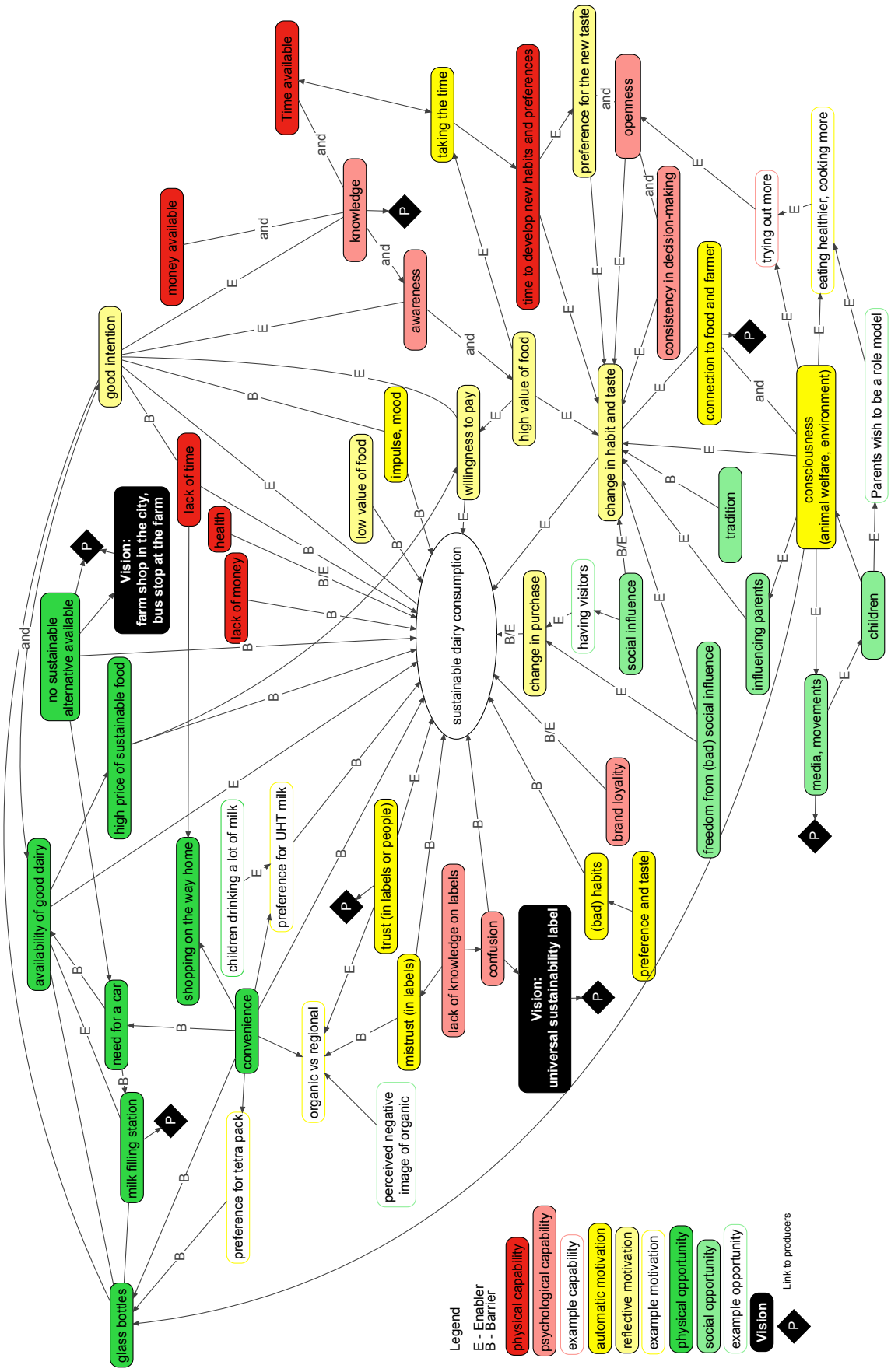

Figure 9: Map showing all the connections between barriers and enablers of more sustainable dairy consumption

4.2. Barriers and enablers of more sustainable dairy production behaviour

As in the chapter above, barriers and enablers are listed and compared in Table 3, as shown in Figure 10, and explained below, following the COM-B classification to produce dairy products more sustainably. This information was drawn from 11 interviews (I-1 to I-11).

Table 3: Barriers and enablers of sustainable dairy production behaviours. Extracted from the author's coding work. Coloured statements with the arrow display a connection to another barrier (red) or an enabler (green)

Barriers producers	Enablers
Capability (physical)	
Lack of money	Money available
Working conditions, Hard physical work, life-balance	Good work-life-balance, better working conditions
Lack of time	Time available - Time to develop new habits and preferences
Farm and dairy handover	
Capability (psychological)	
Feeling, being left alone Frustration Loss in confidence	Enabling, enabled farmers - Confidence, courage → Trust as an opportunity (automatic motivation) → taking responsibility (social opportunity) → personality traits (psychological capability)
	Knowledge and information provision - Education - Mother-bound husbandry, early separation
	Personality traits - Consistency in decision-making - Openness, curiosity
Motivation (automatic)	
	Consciousness - Animal welfare and environmental consciousness - Biodiversity awareness, insects - Health consciousness or issues
	Intrinsic motivation
Motivation, mentality to grow or retreat →Tradition, doing what always has been done, trained to compete (social opportunity)	
Way of thinking	
Motivation (reflective)	
Biodiversity management and expectations	Animal feed
Consumer should be willing to buy the product	Consumer willing to pay more
Political change not possible	→ Will, need for political change (social opportunity)
	Change of habits and behaviours - Change in production of dairy
	Plastic packaging
Opportunity (physical)	
Farm, dairy size and management - Challenges of grazing - Climatic conditions, drought - Sustainable farming more challenging for larger farms - System designed for larger, mechanized companies	

- Technical challenges and issues	
Financial issues - Dairy farming does not pay off - Financial, economic dependency - Increased time in production - Marketing and sales - Milk price too low	→ Advertising the alternative?
Power and dependencies - Concentration of power & structures - Freedom of dairies (and others) - Land price, land grabbing → farm and dairy handover (physical capability) - Orientation towards cheap mass production - System is kept running	→ Availability of dairy? → Milk filling station?
	Change of infrastructure - Availability of dairy - Milk filling station - Advertising the alternative
Opportunity (social)	
General challenges of collaboration	Collaboration, cooperation as an opportunity - Cooperation between dairies and farmers - Cooperation between dairy (or farmers) and retail
	Doing the change together
Producers separate, not holding together	Farmers joining forces
Separation of consumption and production	Connection between farmers and consumers
	Improve image of dairy farming and products
	'Good' influence of others - Associations, actions, movements - Media
	Taking responsibility → confidence, courage (psychological capability)
	Will, need for political change → political change not possible (reflective motivation)
Tradition, doing what always has been done → Motivation, mentality to grow or retreat (automatic motivation)	
Trained to compete → Motivation, mentality to grow or retreat (automatic motivation)	

4.2.1. Physical capability

Physical capability is the individual's ability to engage in the behaviour, including the needed skills, stamina, but also other personal resources.

Personal resources (time, money, strength) and working conditions

Dairy farming and milk processing are hard physical work and more than a full-time-job, leading to a lack of time and power to engage in associations or politically. A lack of money makes access to often expensive land and taking over a farm and dairy is challenging.

“It's impossible to buy anything. We're not millionaires. We founded out of Harz-4. It is especially hard for young farmers, the old ones don't want to give it up, if they can still make a decent business. They only bought the area for 1000 or 2000 Euro per hectare and now they are worth 25000 Euro per hectare.“ (I-3)

Pasture-based systems and reduced production were mentioned as providing the farmers with a little bit more time and increasing work-life-balance. However, this would also require different milk prices (physical opportunity) and a social acceptance to not follow the common path of growth (motivation and social opportunity), as well as the farmers’ confidence to do so (psychological capability).

“The only problem is that if he produces 700,000 kilos less, then he will have to pay less land rent, pay fewer contractors, keep less slurry storage space, drive less slurry and have time for his family. Oh, my God! The thing is, we have to explain to people again that they are human beings.“ (I-4)

“I did that... or we always did. My father did, and I think it's just a - I'm lazy there too, I admit - it's a way of keeping animals where you have comparatively little work, at least in summer, I save myself all the feeding, the manure spreading and so on, I let the animals in and out, and that's my approach.“ (I-6)

4.2.2. Psychological capability

The psychological capability includes factors internal to the individual, like their knowledge and attention capacity.

Frustration and acceptance

There is a high level of frustration that the work is not rewarded or appreciated, or even accepted by society. One interviewee stated that:

“And this resignation, this feeling of powerlessness on the part of the farmers makes them do their business better and better and better, they go into the hamster wheel, but in the outside world they say, what's the point. What should we do, nobody wants that anyway. All they want is organic farms, and that the consumer is certainly happy to buy an organic product because he feels he is doing something good.“ (I-4)

Confidence

Adding to this, there is a lack of confidence at the moment, that their own measures will change the overall structure or lead to acceptance. They feel misunderstood, not listened to and left alone by politics and society.

Altering this perception and enabling the confidence that their changes can make a difference is connected to social aspects, like the connection and conversation between farmers and consumers and between the farmers themselves.

“And it is simply very important to learn: What do the citizens think about the farmers? And for the citizens it is important to know: What do farmers think about it? Simply to break down prejudices and start with what unites us and not with what divides us, then our common image can be developed and we can walk a path together.” (I-9)

Personality traits (openness, emotional involvement)

It also requires the farmers to be open to change, have an intrinsic motivation and a certain degree of emotional involvement.

“I let my cows into the apple orchard for the first time today, which doesn't mean that they'll get pasture now, but they can lie outside in the sun. And yes, that's a nice picture for me, it makes my heart beat a little.” (I-4)

4.2.3. Automatic motivation

Automatic motivation, core to the ‘heart’ of the individual, covers habitual processes, but also emotions, impulses and values.

Habits, continuing the path

As already noted, automatic motivation was connected to and decreased by frustration. Besides this, there are habituated practices that keep patterns the way they are. One interviewee gave the example, that:

"I'm giving a calf to the drover; I'm not selling it. (…) and most farmers are apparently satisfied with it, otherwise they wouldn't do it. They can't imagine anything else. It's also very much ingrained in the farmers' DNA.” (I-6)

Also, the farmers who follow the path of growth and keep their animals in the barn make from the majority of farmers. Many of them do not have the possibility to go back to grazing, because there is no pasture available (physical opportunity) and consequently they are also resistant to attempts to promote grazing.

Consciousness and intrinsic motivation

A high level of consciousness of animal welfare and environmental impact and the already mentioned intrinsic motivation can increase the motivation to change.

“And then I simply see that the animals are much better off on the pasture than in the barn. (…) you only have to see that when you let the cows out on the first day of the year, how they run around and jump. And even old ladies, where in winter you thought: "Hm ... does this make another season?", they are suddenly quite fit again. Well, I see the interest of animal welfare and animal health is also very important in grazing.“ (I-6)

4.2.4. Reflective motivation

Reflective processes, based on the individuals 'head', include intentions, plans, evaluations and conscious decision-making that motivate action.

External requirements and social expectations

With regards to, for example, biodiversity management, the farmers motivation to engage in that topic is reduced by contradicting political regulations and demands by society on how farming should be done, without involving them in the dialogue.

Another issue which decreases the motivation to produce differently is the lack of support by society, the willingness to pay for higher product quality and the political support for such a change in production. One interviewee claimed, that *"last but not least, politicians are also interested in cheap food, if we look at the whole low-wage sector, and the small pensions, and Hartz 4, and so on."* (I-6)

Change of habits, feasibility and acceptance

A change of habits, that was noted under automatic motivation, is easier if farmers experience that it is possible and that it pays off to do things differently, this could be processing their milk themselves instead of sending it to a big dairy or switching to mother-bound calf rearing.

> *"Let's see how it goes. First of all, it's cool that we're independent. It was weird being in a dairy, delivering to a dairy. We have the comparison. Other farmers don't have that comparison, they are always in a dairy. Until they retire. And now we are out of the dairy and can see from the outside how it was and how it felt." (I-3)*

The realization that consumers are ready and willing to support a different, more sustainable way of livestock farming motivates and encourages farmers. However, there is also a wish for more of this commitment and for a will for political change from consumers, but also politicians.

4.2.5. Physical opportunity

Physical opportunity includes factors that are external to the individual, but still shape his or her behaviour, like infrastructure, site conditions and political regulations.

Natural, external factors

There are natural factors that are external to the individual's influence, like climatic conditions and especially droughts. The location of the farm and the availability and quality of land around can restrict the possibility of grazing, especially if it is leased land, because raising lease prices increases the pressure on the economic efficiency of the farm. This adds to the fact, that cows have a lower milk yield when they are only fed grass and hay and when they are on pasture, actively moving and running around. The size of the pastures around the farm restricts the number of animals that can be kept.

Financial issues (milk price) and dependencies

All this links the natural factors to financial issues and dependencies. A particular characteristic of the dairy industry is that farmers do not determine the price of their product themselves, but the dairies set the price. The increasing price of land, diesel and feed, while the milk price does not increase commensurately, drives farmers into intensification to produce more cost efficiently to be able to deliver to that price.

> *"Everything else is getting more and more expensive (…) if we could pass these cost increases on to our customers, i.e. the dairies... but our milk pricing system is not suitable for that. It's the same with cooperative dairies: You deliver the milk and six weeks later the dairy tells you what it is willing to pay for it. So, there is no negotiation about the price. There is also no calculation of the price." (I-6)*

Economic and political regulations and challenges

The dairy system is directed by this cost-efficiency, by an increase in production of cheap milk and by market and export orientation, which is supported by subsidies, but not without consequences. One interviewee added that "*under the current economic conditions there is no dairy farm in Europe, whether conventional or organic, that can cover its costs with subsidies"* (I-2). And still, this system is kept running that way. Another interviewee explained that "a*part from the farmers, everyone profits very well from the surplus quantities. So, for the dairies it is nice to always have a lot of cheap raw material available, for the trade as well. The whole export sector only works like this if there is always an abundant quantity at low prices."* (I-6).

Infrastructure and availability of regional structures

Political farming regulations from national and European levels are the obligatory rules and directions, also in terms of an overall strategy, farmers have to follow. This strategy also affects the availability of regional structures. Farms had to give up or merge, as did the dairies. In some regions farmers literally have no choice as to which dairy to deliver to, and if they are located far from consumers, direct trade is not an alternative. Land grabbing was mentioned as another challenge, where there is no change is in sight. An interviewee added, that *"land grabbing is already the worst. Which we just can't solve. We can do political work, whatever we can do, but it doesn't really help." (I-3)*

The structures of the system are designed for larger companies. For smaller, more traditional (craft-based) companies it is challenging to get loans and subsidies. However, those farms, that had been supported with subsidies to build big barns and increase production are now in debt and are not able to revert to grazing or fewer animals, because their repayments are connected to a certain milk output. One interviewee stated that *"should we tear it down, should we invest in conversion again? We cannot afford that economically. Then all we really have to do is give up, in other words to give up dairy farming"* (I-7).

Power, economic dependencies and governmental support

These power structures and the farmers' dependencies on them are shaping the way farming is done and preventing change, something mentioned throughout the interviews. There are only a few enablers found in the physical capability aspect, but for most of the interviewees a reversal of these structures is their vision of a sustainable dairy system as explained in the next chapter. They mostly agreed, that in order to implement this reversal, there is a need for governmental support to make this other, desired way of production economically feasible, which they do not see happening. One interviewee gave the example, that "*ecological growth, qualitative growth, would be, for example, if we built up humus within our soil. However, humus build-up, financially with farmers, is only recorded in terms of costs. There is absolutely no position in our balance sheets that assign a value to humus growth. It is therefore economically worthless, and therefore, if our economic system is not changed, if it is not evaluated, humus will not be built up. Because this is simply not economically feasible.*" (I-9)

Collaborative structures (social and regional)

The enabler occurs in the social opportunity aspect, in the collaboration between farmers themselves, between farmers and consumers and between farmers and their partners, for example their dairies.

> *"More efficiency gains, more overproduction. And to recognize that - as I mentioned earlier - the solution would simply be to produce less. That is the solution. And... but this cannot be done individually. Because individually, a company or a certain region plays no role in the overall market. So, it's only important for the community as a whole." (I-9)*

Together, regional structures and direct trade could be developed again as a first step, however for this to become a solution for the overall system, it would have to be upscaled.

> *"I'm going to expand direct marketing, obviously. This is independent of what I deliver to the dairy. I'm gonna expand my direct marketing. But this is a single farm solution, it's not a solution for the profession." (I-4)*

It was also described that a good approach, such as a label for pasture grazed cattle, failed due to the different interests of the protagonists. The case of the Netherlands, where most of the milk is pasture-fed milk, shows what can be possible, if all actors work together.

> *"Yes, the whole industry, from farmers to dairies, trade, processors and large parts of society, they advertised it very, very intensively, this grazing was almost identity-forming for Holland." (I-6)*

4.2.6. Social opportunity

Social opportunity includes the external social factors that influence the individual's behaviour.

Separation and individualism

A separation between farmers and consumers, but also between farmers themselves was often described. Linking back to the physical opportunity, one interviewee stated that

> *"Actually ... what would actually be right is to strengthen the position of dairy farmers in the market chain. At the moment they are scattered, each one facing his dairy alone. They have no negotiating position at all. In my opinion, the only way to do this is to bundle them into producer groups. And as many colleagues simply do not do that, it should basically be, well, prescribed." (I-6)*

Farmers are trained to compete and to be the best and this norm to grow is still prevalent, even in young farmers.

> *"Many farms have learned for 40 or 50 years that it is only better if the others leave. And now they have realised that first the others go, and then they go." (I-4)*

Collaboration, conversation and acceptance

The enabling effect of collaboration was already mentioned in the chapter above. It is also the social and emotional support of peers and the opportunity to exchange ideas instead of being isolated in the work and with the problems. The feeling of being heard, being accepted, being appreciated is a valuable social support and conversations between all actors, including the consumer and environmental associations can be an opportunity to achieve this. Media can also feed in by covering topics like brother calves, where the male dairy calves are raised with their sisters and are allowed to drink from their mothers for a certain time, to raise awareness of the topic.

In the dairy production systems map below (Figure 10) the interconnections between these factors are visualized, some visions are also included and the contact points to the consumers' map (Figure 9) are shown.

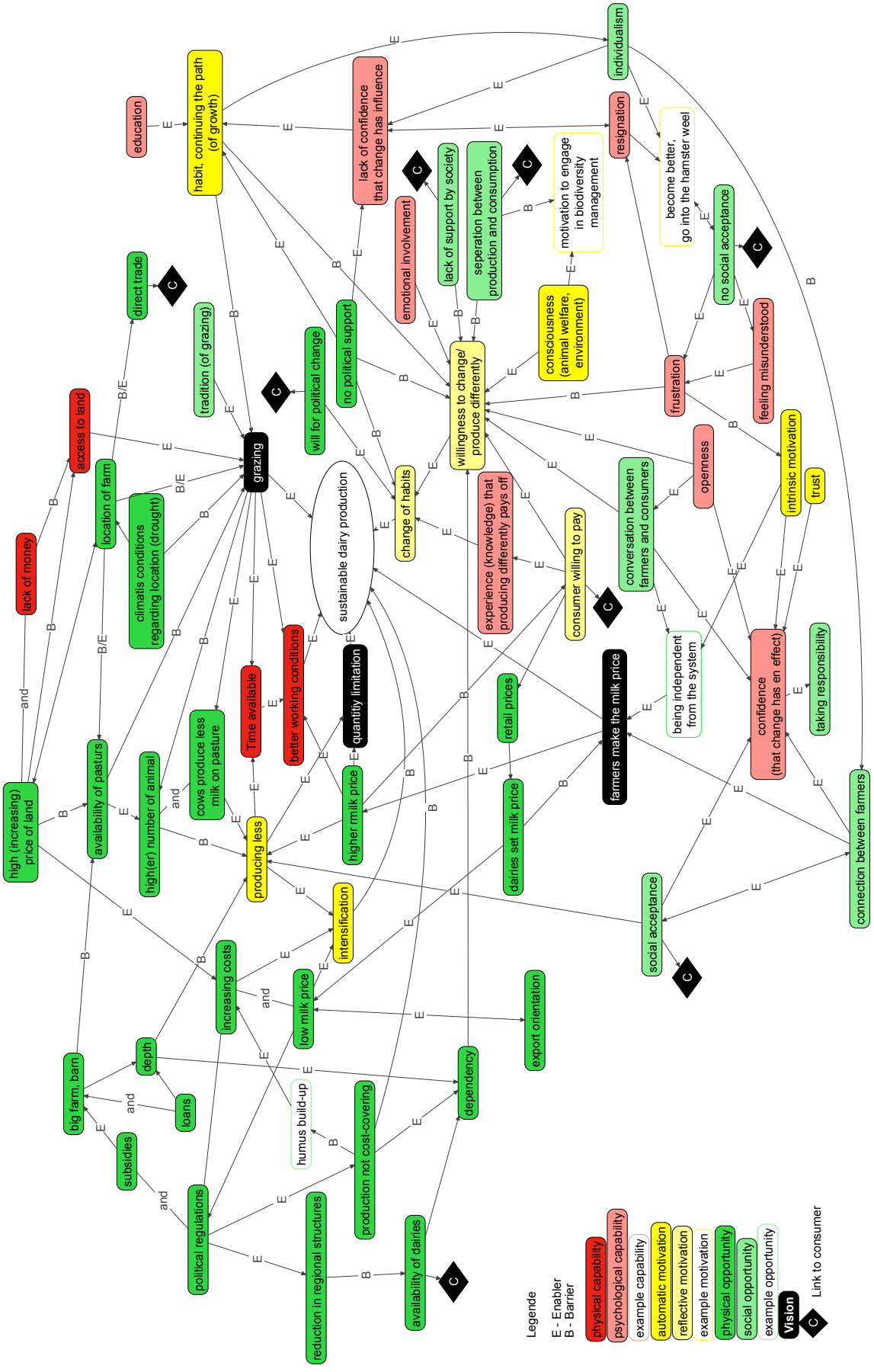

Figure 10: Map of the connections of barriers and enablers of a more sustainable dairy production

4.3. Vision of the future system and its pockets in the present

The interviewees' vision of a sustainable dairy system is first of all mainly grass- and pasture-based, due to the environmental advantages, like CO2 storage, humus build-up and biodiversity. If extra feed is necessary for the health of the cows, then it should be produced directly on the farm. They envision a small-scale and regionally oriented production system with many small farms and dairies. Due to grazing being a criterion, there would automatically be fewer animals with a lower milk yield and therefore less milk available (see Fig. 10).

The more holistic and idealistic vision is that drawn by one interviewee as *"everyone will milk a manageable number of cows and let the calves drink from the cows, and raise the bull calves, and keep all their horns, and all eat grass instead of grain"* (I-3). This vision is already happening at a small scale as explained in the case study below (Table 4).

Table 4: Case study: Pocket of the future vision, already in the present (I-3)

Case study: Mother-bound husbandry and a milk price of 2€ per litre
The "Demeter" (biodynamic) hay milk farm lies in a national park in north-eastern Germany. They have double purpose breeds and raise all the calves, male and female. While 17 cows are milked, the other 13 take care of the calves. They also market three animals a month for meat and sausage. This is also an important message for them to communicate to their customers, that they do not have disposable calves, and that meat and milk necessarily belong together. There is no transportation of animals involved, as cows are shot and milked in the pasture and they have built their own dairy to produce a variety of dairy products. Marketing is organized via food assemblies, direct trade and bulk orders by customers who group themselves together and also involve their families and friends. The milk can also be bought in the local organic shops. One litre milk is 2,80€ in the shop and they manage a milk price of 2€ per litre, even in their dairy products, which is based on their production costs. They work closely together with two neighbouring farms that share the same ideals, to agree on the product range. They still take the time to be active in the public to stand up for their vision of dairy production. This is one example of independence from the bigger system. They found their niche and their unique selling point, but it was a challenging way that demanded a lot of will power, stamina and creativity.

The biggest or most prominent wish of the interviewees was a conversation about quantity limits, in association with quality differentiation. There was a wish to move away from export products and a move to national, or at least European markets to achieve an agriculture that functions regionally, seasonally and according to demand. Farmers would have to determine their milk price regarding their production costs and pass it on to the other actors

in the chain and to the consumer. This is partly already done in direct trade, where farmers built their own dairies and in the concept of community supported agriculture, where the food price is based on production costs.

There is a desire and need, for more collaboration between the farmers themselves and a shared responsibility. This joining of forces was also suggested to help improve working conditions through sharing work and responsibilities. An interviewee proposed that, "*you can also build community barns (…) So you can work together with others and share the work and also take a holiday*" (I-10). Collaboration is partly already taking place locally. There are producer associations, like the MEG milk-board or the Demeter-hay-milk-farmers and also producer-consumer-associations like CSAs, the alliance for society and agriculture, "You are the boss here", and others. The first dairies support their farmers in converting to mother-bound calf rearing by paying them a higher milk price. There are also farmers who have already joined forces and buy or found their own dairies together and are supported by society (consumers and NGOs). These are the first and important steps that can arise through collaboration. However, for the overall system to follow these examples and be inspired to change as well, these approaches need to be upscaled and supported by political and economic will and drive.

There is also a desire for more environmental protection, animal and social welfare, where the criteria of organic farming and socio-ecological agriculture is seen as a first step by some. A healthy soil, humus build-up and diversity of plant and animal species should be possible while producing economically. With regards to animal welfare a shift from milk performance to lifetime performance of a cow was proposed, where the milk yield was calculated on the whole life of a healthy cow instead of the 3-5 years of exhausting life in high-performance husbandry.

This quality differentiation, mentioned throughout this chapter would need to be accomplished by mandatory, transparent labelling, advertisement and consumer education.

> *"We need mandatory labels. Obligatory for animal welfare, climate protection and the Nutri-Score. In my view, this would be a very central instrument in terms of consumer information. Because otherwise there is no chance of seeing through it. " (I-8)*

The participants of the focus groups also wish for a strictly controlled scale, which includes all organic and sustainability characteristics and is understandable and universal to all products. They also wish to have better accessibility to good dairy products, through farm shops or a bus stop at the farms. As little packaging as possible was also mentioned.

Sustainable consumption would require paying the price for a higher quality product, more or less directly to the producer. This includes the relationship between the farmer and the consumer as an added value. This less processed, less transported and fresher milk that spent less time between the cow and the consumer would be desirable, both in demand and production.

There is a wish to develop a common vision shared by society, farmers and associations.

What effect the Covid-19 crisis will have overall is still unclear, but an increase in local structures and local demand could be observed already during the time of the interviews. Those who already have such structures in place are better placed to profit from the crisis. The ones delivering to the more export-oriented dairies will probably face price reductions. The pandemic, with its outbreaks in slaughterhouses and the lack of foreign cheap workforce in the harvesting season due to the closing of borders, has triggered a discussion on working conditions in agriculture, which will continue (DBV, 2020; AktionAgrar, 2020).

Creativity to make things differently is definitely a chance for those within the niche, this could be cow shares, private loans and crowdfunding to start the business, switching to yaks instead of cows, milking in national parks or diversifying the product range (see e.g. Hradetzky (2019)).

4.4. Three major challenges to face

Looking into dairy consumption behaviours showed, that while the availability of money is a chance, it also requires higher prioritisation of quality food, openness, trust and the awareness of environmental and animal welfare issues to purchase differently. Regarding knowledge, a similar picture can be drawn. Knowledge can provide opportunities, but has to be accompanied by consciousness and emotional involvement to be effective. This topic is widely discussed as the knowledge- or intention-action-gap (OECD, 2017) and observed in this study in consumption and also production behaviour (Figure11).

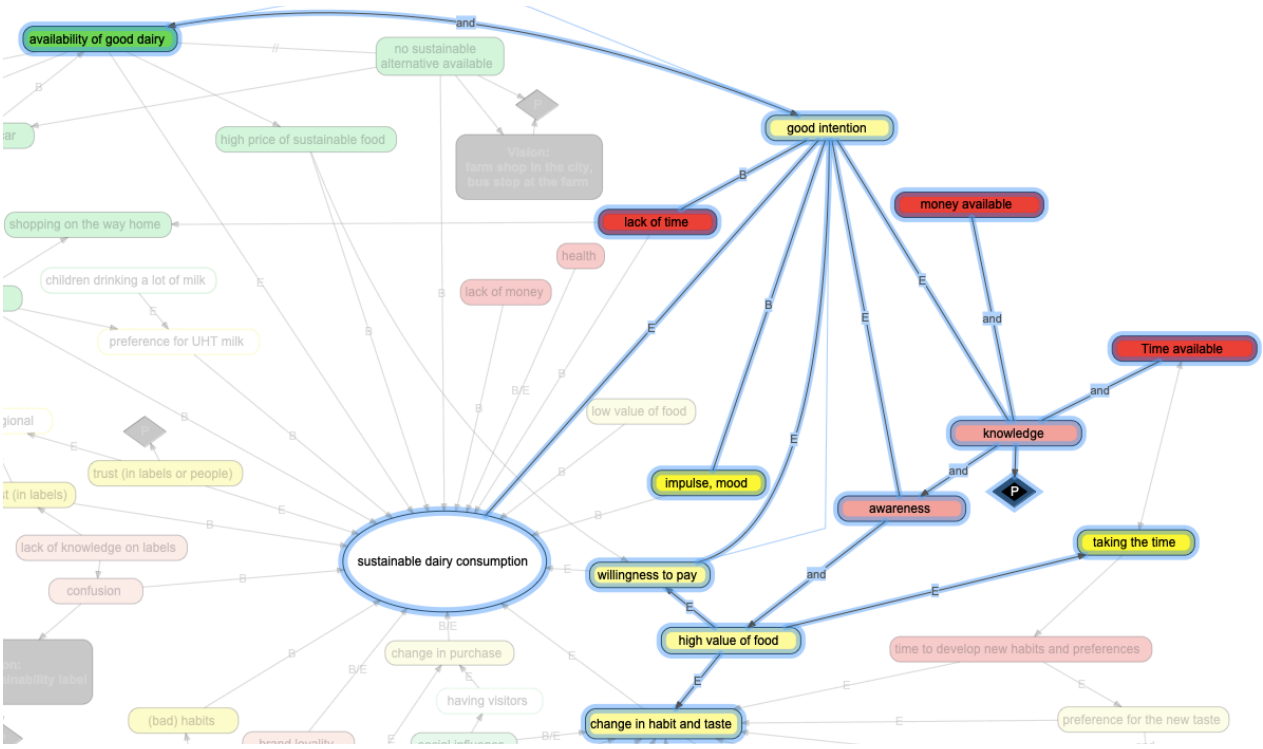

Figure 11: The interconnection of money, knowledge and awareness in order to change consumption behaviours

But if there is, in the end, no sustainable dairy product available, neither money, nor awareness and knowledge will change anything in the overall picture (Figure 12). It is the convenient availability of good dairy and the trusted value people associate with the product that are needed to make a change possible. And it is about the ease of practising sustainable behaviours and the belief that it is the right thing to do.

Figure 12: Gap between the intention and the availability of sustainable alternatives is a strong barrier to consume more sustainably

Looking into dairy production behaviours, revealed the big challenge of structural economic and political dependencies, that are currently in place (Figure 13).

Figure 13: Economic and political dependency is a barrier to the willingness to change

The efforts of those who want to continue, but also the resignation of the others, that this will not change, inhibits the motivation to engage in these topics. There is a lack of confidence that the single actor can make a difference and lack of social support that this will be appreciated. These challenges are further increased by the prevalence of individualism and the separation between all actors (Figure 14).

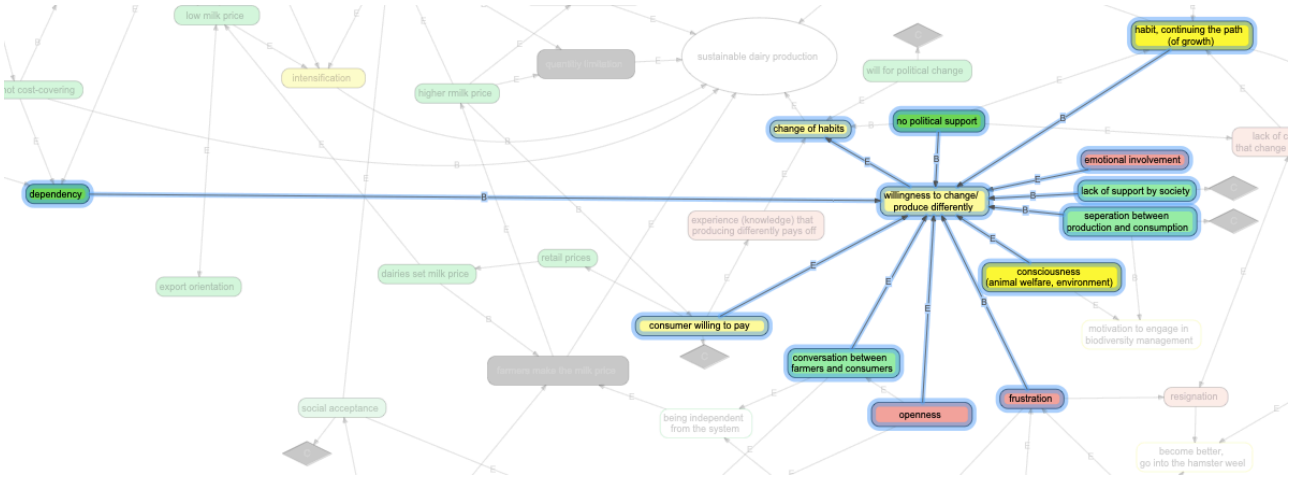

Figure 14: Showing factors influencing the willingness to change production patterns

To summarize, inductive analysis of the insights and interconnections of the factors that are challenging a behavioural shift in consumption, and to a larger extend from production, revealed three major challenges:

1. Personality, individualism//values//trust, **mental models**
2. Infrastructure, dependencies//availability, **bigger structures**
3. Practices, separation//appreciation, **social patterns**

Interestingly, these challenges represent the three levels beneath the surface of the iceberg model which is based on Meadows (2008) levels of system thinking, as shown below (Figure 15). This supports, that these are important challenges to tackle, because when changing a system it is essential to not only look at the outcomes of it, but to look beneath into the patterns, structures and the mental models to achieve the fundamental, radical and systemic change that is needed (Feola, 2015).

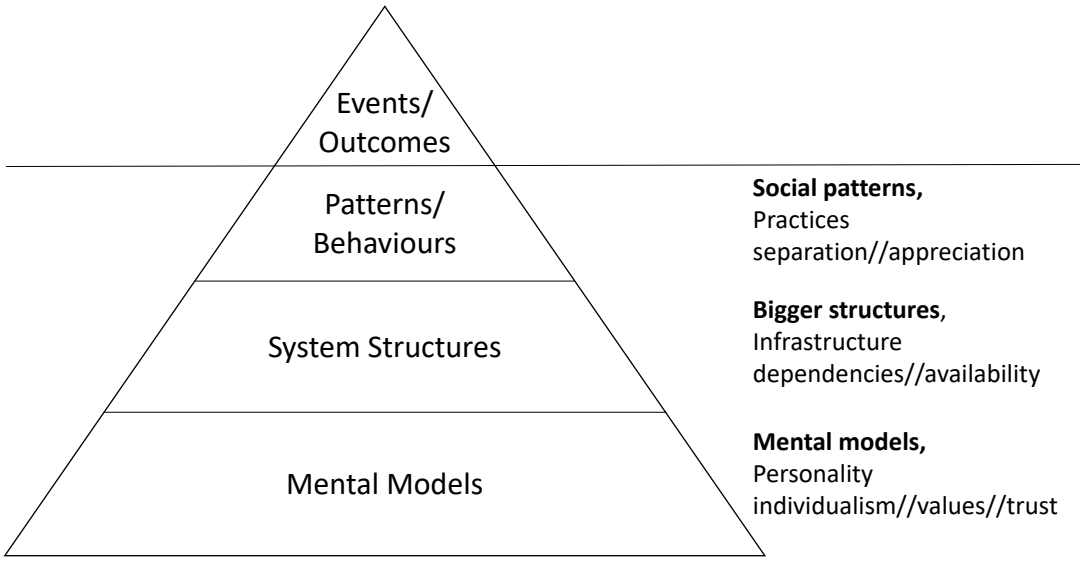

Figure 15: The Iceberg model, showing the four levels to look at in systems (Meadows, 2008; Senge, 1990), adapted by the author

Linking these main challenges to the clustered version of Meadows' (1999) leverage points to intervene in a system, presented by Malhi et al. (2009), highlights the impact and feasibility of tackling those challenges (tab. 5). Actions to achieve a change in the mental models and the paradigm of individualism and growth are difficult but can be very effective. Examples for changing the goals include a shift from export-oriented production of cheap mass products to regionally and quality oriented milk production that is limited in quantity. Actions to change the aim of the system would also target, or rather require a paradigm shift by all actors and elements. The system structure conforms to the current goals and paradigms of the system. However, changing interlinkages or adding new structural elements, like a regional or farm dairy or avoiding intermediaries by selling directly to the end consumer can change the dynamic behaviour of the system over time. Feedbacks allow the system to regulate itself and adding new loops or changing feedback delays can potentially restructure the system. One example to intervene here would be the milk price set by the dairies, which is paid with a delay and therefore makes it difficult for the farmer to calculate his or her costs. Actions in the structural elements, the subsystem and actors in the system, address the niche production or increase a change without transforming the current system. Mainstreaming them can then affect the wider system.

Table 5: List of leverage points based on Meadows (1999) and Malhi et al. (2009) in decreasing potential for systemwide transformation, with added examples from this research.

Leverage points	Explanation	Example	Potential for systemwide transformation
Paradigm, mindset	System's mindset and beliefs, linked to mental models. Difficult to intervene, but effective	From individualism and growth to collaboration and awareness	Very high

Goals, purpose	Conformity to the paradigm. Actions change the aim of the system and target a paradigm shift	From exporting cheap mass products to regionality and quality differentiation	high
System structure	Elements and interconnections that make up the system. Conforms to the goals and paradigms. Actions to change the system structure change interlinkages or add new structural elements	From big, centralized structures to introducing regional or farm dairies and direct selling	medium
Feedback & delays	Feedbacks allow the system to regulate itself. Actions aim to create new or increase the gain of existing feedbacks and can restructure the system.	From a milk price set and paid by dairies with a delay to a calculation based on production costs	low
Elements	Actors and physical elements of the system are connected through feedback loops and information flows. Actions at this level affects these and are required for system-wide change.	From single farm solution to informing the main system about a different way of producing	Very low

4.5. The actors' ability to overcome these challenges and drive the solution forward

The previous chapters helped provide an understanding of where the challenges in transforming the system lie, what hinders, or enables producers and consumers to engage with more sustainable behaviours. This is necessary information before answering the underlying question of this research, which is about the producers' and consumers' ability to bring about sustainable transformation of the dairy system. This will be discussed now by looking into the actors' possibilities in overcoming these challenges and in driving the solution forward.

4.5.1. Changes in the structure and the goals of the system

Starting with the system structures, there are several changes to be achieved. That farmers should set their own milk price based upon their costs was already mentioned. The system's goal should be a move away from market and export orientation and towards regional and demand-oriented structures. The other shift would be from cheap mass production towards quality differentiation. These changes will need governmental support, a political will to be changed by society and politicians and the collective voice of the farmers. This new way of thinking and practises would have to be included in training in agricultural schools to also change the underlying paradigms.

Changing the goal towards regional structures

Regional structures are a very important opportunity for farmers to produce and offer good quality milk and dairy products and make them available to consumers. A higher number of

farm dairies or dairy cooperatives, delivery services, milk filling stations, community supported agriculture, and retailers that offer regional products on dedicated shelves come into play here, but require the intrinsic motivation of farmers and their experience that this pays off. Consumers can support this actively through their purchase, support or in their role as citizens through setting up CSAs or farm shops in the city.

The small-scale local and the bigger structure might not even be in competition with each other as they address different target groups and also produce different products. One interviewee proposed, that *"if the system and the alternatives could work together, or a structure in between would emerge, those small farmers and farm dairies could be relieved"* (I-11). For those farms with farm dairies the milk could be collected by a dairy on the weekends, if the cheesemaker is ill or if there is too much milk. There are already producer cooperatives, where milk is processed communally and work is shared.

Changing the goal towards quality differentiation

Quality differentiation towards 'good' (healthy and sustainable) milk will be needed, but also needs to be communicated clearly and in a transparent manner to the consumers to also reach them. The consumer willingness to pay a higher price is increased if there is trust and awareness in the added value. There are for example pasture-fed labels, but the higher price does not end up with the farmers yet. For an increase in pasture-based products everyone would have to be on board and advertise it and the added value would have to end up with those who carry the higher costs for it, with the producers. A sustainability label for milk, including aspects like animal welfare, environmental or climate impact and social fairness could be a way to establish clear standards and transparent communication of the quality differentiation to justify a higher price. This is also desired by consumers and needs to be developed with all actors involved to make it feasible to implement and socially accepted.

A change at these system levels would have a medium to high potential for systemwide transformation. Unfortunately, it must be said in summary, that the actors' influence in this area is rather limited in terms of achieving overall structure change, but small achievements on the level of actors, elements and their connection are possible through collaboration, which is discussed in the next chapter.

4.5.2. Collaboration at the level of elements and their feedback connections

On the level of elements and their feedback connections, collaboration is the key feasible solution where many other aspects are interlinked. It has many dimensions and includes strengthening the position of farmers in their cooperative dairies to negotiate better prices and other contracts and starting a conversation between farmers and dairies on how to position themselves in respect to the retail sector. There is also a need for dialogue between farmers, consumers and NGOs or other actors in civil society. The need for dialogue with and between farmers and an appreciation of the farmers themselves should not be overlooked. This all requires farmers to join, it needs a conversation about their vision,

respect and shared responsibility. Collaboration requires time, which is not a common commodity amongst farmers, but even more, it requires the motivation to make that time. Civil society can support or initiate this conversation.

Collaboration is enabled by openness and the confidence or trust that it will pay off to do things differently. It is challenged by the economic pressure producers and also consumers face. Having some economic leeway could free up time for activities beyond daily work. The key factor here for the farmers is the low milk price and the need to calculate the milk price based on their costs and then pass it on to their customers, as discussed in the change of goal and structure discussion above. This is enabled by being independent of the system, by building cooperative farm dairies or establishing forms of direct trading, like CSAs, delivery services or food assemblies, and by quality differentiation that is transparently communicated to the consumer, who is willing to buy the product. To increase the consumers' capability, their awareness and knowledge and coming to value the product and the farmers' work, could be enabled by open farm days and discussions with customers at the markets already take place, but there is also a need to introduce lessons on the value of food and cooking and more practical courses in schools.

Changes at the level of elements and their connections are feasible for the actors, but also low in transformative impact on the overall system. When looking into collaboration as one solution, this highlights, that a change would have to occur at several layers of the system and would require a paradigm shift to be effective.

4.5.3. Collaboration requires paradigm shifts

Collaboration requires a collective social and structural move away from the norm of individualism and competition through education, awareness raising, social connection and the will to do it. This is, however, hindered by political and regulatory structures, external to the actors' influence, as discussed above.

Openness and awareness can enable a paradigm shift

Animal welfare and environmental consciousness was not just mentioned in the focus groups, but was also raised in a number of the interviews. Farmers prefer to live their values and would be willing to change some of their current practices, that currently contradict their values. They realize the consumers' interest in biodiversity and insect protection programs and in animal welfare. Mother-bound calf rearing and brother-calf initiatives, where the male dairy calves are raised with their sisters and not sent abroad for fattening, are becoming more common and the topic is very slowly also reaching the consumer. Media offers an opportunity here, but coverage of this topic is still low. Both, pasture-based farming and mother-bound calf rearing can offer an opportunity but would need the financial support of society and government.

The supreme discipline in transformative change is a change of mental structures and paradigms, which are actually involved in all of the discussed solutions.

5. Discussion

This chapter will discuss the results of the study in three parts by focusing first on the usability of the methods to achieve the aims and objectives of this research, secondly on how adequately the results have answered the research question of transforming, rather than changing the dairy system through behaviour change, and thirdly on implications for policy makers.

5.1. Usability of the methods in this research

The research was designed to set behaviour change in consuming or producing dairy products more sustainably into the wider context of a transformational sustainability change in the dairy system. The question of the scope of consumers and producers to transform the dairy system was answered by combining systems thinking with behaviour change theories and by using semi-structured interviews and focus groups. The four objectives were met using the Three Horizon Framework and the COM-B model (Sharpe et al., 2016; Michie, Van Stralen and West, 2011).

There is a large body of research on behaviour change theories and models, ranging from simplified to complicated and from holistic to specific (Jackson, 2005). The COM-B model is relatively recent and was developed based on current behaviour change research to provide a simple framework for understanding behaviours. It can be extended by the behaviour change wheel, an evidence-based tool to create possible interventions which can be allied across behaviours and settings (Michie, Van Stralen and West, 2011; Michie, Atkins and West, 2014). Rather than seeking to create interventions, this study sought to link the influence of behaviour change to approaches taken from systems thinking, by studying how behaviour change can unlock levers of systemic change. Abson et al. (2017) state that the places to intervene in a system to effectively transform it, are largely overlooked. This highlights that researching the leverage points for behaviour change in this field is a rather novel approach. The COM-B model was found to be relatively straightforward, while still providing rich insights. However, there were challenges in sorting the information obtained from primary data into the three categories. For example, when coding for motivation it became clear, that it is challenging to differentiate between what motivates farmers (automatically and reflectively) intrinsically, and what factors are rather socially or traditionally implemented in their habits and ways of thinking.

Additionally, coding into classifications (capability, opportunity and motivation) was also challenging due to the feedback loops that are integrated in the model and by the systemic dimension, that was added to it. It should be noted that capability and opportunity can influence motivation and that all three factors can bring about behaviour change, but the resulting behaviour change can also feed back into the capability, opportunity and motivation classifications (Mayne, 2018; Michie, Van Stralen and West, 2011). This connection of factors could not be easily depicted in the more linear coding process into these classifications. Adding the conceptual framework of the Three Horizons to this model helped to partly bridge this limitation, by dividing quotes into current patterns and barriers of

change (Horizon 1) and enablers of change (Horizon 2) (Sharpe, et al., 2016). In the end it was the mapping process undertaken thereafter, that made the visualization of these interlinkages, feedback loops and connections possible. This was especially so, given this research is dealing with wicked and complex problems (Vennix, 1999; Malhi, et al., 2009).

Even without applying the participatory approach of the method, the thinking behind the Three Horizons framework was particularly useful in structuring the research and including the planned multi-stakeholder perspectives into the aim of rapid transformative change (Sharpe, et al., 2016; O'Brien, 2012). It helped with achieving the second research objective about the future vision of the sustainable system. Together with the behavioural aspects added by the COM-B model it also helped with achieving the first objective of identifying barriers and enablers of more sustainable behaviours. By comparing barriers with enablers and current patterns with the future vision by using thematic analysis, major challenges (objective 3) could be identified. Thematic analysis helped to successfully reflect the reality, but even more to look under the surface of it (Braun and Clarke, 2006). This characteristic of thematic analysis was especially helpful in combination with the chosen interviews and focus groups. The methods were useful in delivering the anticipated data, and identifying possible bias within the primary data collection, whereby participants communicate a perceived and reflected version of their behaviours, something that was limited by the potential of thematic analysis to reveal what lies below those perceptions (Braun and Clarke, 2006).

The use of semi-structured interviews based on purpose sampling (Bryman, 2016) allowed for the alignment of the diversity of insights through the multi stakeholder perspective with a comparably similar vision and definition of a sustainable dairy system. This helped with gathering diverse insights without getting contradicting visions (Ritchie and Lewis, 2003).

The process of linking back the results, which focused on behavioural aspects and were structured following the COM-B model to the systems' definition of Meadows (2008) illustrated the difficulty of representing the relationships between behaviour and the system definition, consisting of elements, connections and the goal. The systems mapping process based on the results to showcase connections and interlinkages between the elements their behavioural patterns, helped bridge this gap, answering the third objective and developing possible solutions.

To identify the behaviour change scope of the actors in driving the change forward, the solutions were presented along Malhi et al.'s (2009) version of Meadow's (1999) leverage points. Measurement of the solutions' impact would have been insightful but was beyond the scope of this paper. However, the leverage points still helped in assessing the potential for a systemwide transformation, and were seen as a helpful orientation.

5.2. Achieving system transformation through behaviour change

As discussed earlier, the dairy system is intensive and globalized (Clay, Garnett and Lorimer, 2019) with strong goals and directions, that are manifested in the (power) structures

and overall functioning of the system (Fischer, et al., 2015), which is shown in this study's results. There are powerful actors seeking to maintain the status quo, and farmers are facing economic, political and social dependencies (Offermann, Nieberg, and Zander, 2009; Popp and Nowack, 2020). Transformative change in this area is challenging, where complex and wicked problems need to be tackled and where there is not only one screw to turn, but several (Vennix, 1999; Davies et al., 2015; O'Brien and Synga, 2013). As reported in a number of studies, the food system is such a complex system, where changing something at one end, might have diverse and unexpected outcomes at different other ends (Malhi et al., 2009; Kennedy, Gladek and Roemers, 2018). However, change is also urgently needed (Clay, Garnett and Lorimer, 2019) and the results of this research show that there is a willingness to do so, and in part there is already change happening, with farmers producing differently (BÖLW, 2020) and consumers increasingly demanding a connection to farmers and products with an added environmental or animal welfare value, like for example organic, or milk from pasture or hay fed cattle (GfK, 2019; EC, 2020).

The consumer group investigated in this research was surprisingly knowledgeable about dairy and overall food system issues, showed a high consciousness about animal welfare and their environmental impact, leading to a noticeable intention to purchase sustainable products. Initially perceived as a limitation due to the lack of representativeness, the group turned out to provide a good sample to investigate the barriers the individual faces in their actual purchase decisions and also the enablers that made the intention become action, adding to the body of research about the intention-action-gap (Jackson, 2005; OECD, 2017).

With regards to the leverage points, where an intervention in the system would have the biggest, most transformative impact, these small changes in purchasing patterns would link to a change in the structural elements and their feedbacks (Malhi, et al., 2009; Abson, et al., 2017), where the consumers support a subsystem that acts within the wider scope of the existing system (Meadows, 1999). The direct impact on a systemwide transformation is comparably little. However, changes are achievable, perceivable and required to pave the way towards a different system (Malhi, et al., 2009; Abson, et al., 2017). Increasing the access to sustainable dairy products that fit the taste and preferences of the consumers is one proposed idea arising from the results. This is in line with other publications, which note the starting points of making things easy, appealing and normal in terms of buying these products (BIT, 2020). The latter concept of making it normal, links back to mindsets and the mental models that are prevalent in a system. When designing interventions, behaviour change experts propose that one should bear in mind the need to distinguish between changing behaviours and changing assumptions (Jackson, 2005).

Intervening at this level of mental models, paradigms and assumptions has a much higher impact on transforming the overall system, but is also more challenging (Meadows, 1999). If it leads to changes in mindsets that underlie behavioural patterns, then one could assume that behaviours are a powerful lever, but only if the other obstacles, as described above, have already been removed. Mindsets or intentions were mentioned in all the proposed

solutions deriving from the results. They were more prominent in the farmers' data than in the consumers' data mentioned above. Collaboration, for example, was one suggested solution, also supported by Popp and Nowack (2020). Whereas there are interventions that are possible in the level of elements and feedbacks, there is also a shift in paradigms necessary to enable collaboration between the farmers, but also with the farmers and their dairies, the retail sector, consumers and environmental NGOs. Additionally, the overall system structure would have to be restructured towards a goal that encourages collaboration, and further obstacles to collaboration would have to be removed. A change at these levels currently seems somewhat improbable, due to prevalent power dynamics in the current system, but would be quite effective. Implications for enabling this change through political and legislative actions will be discussed in the next chapter.

Returning to the influence of behaviour change in driving system change, it can be concluded that behaviour change of the sum of individual actors and elements is one factor needed to drive a change within the system and to develop subsystems, but that connected to this, a change in paradigms, social norms and mindsets is required to achieve systemwide transformation.

5.3. Policy implications

The limitation of the single actor's behaviour change in achieving systemic change is confirmed in this research and acknowledged in other publications (Moloney, Horne and Fien, 2010; Avineri and Goodwin, 2010). Building upon the results and the chapter above, there is a need for political guidance in driving a change towards a different goal and structure of the system. Ideas of goals and structural changes are presented in the actors' vision of a sustainable dairy system in chapter 4.3. Moloney, Horne and Fien (2010) confirm the critical role of governments in changing regulatory practices, but add also their responsibility in changing the social contexts and mental structures of the system.

There are some approaches to be mentioned, which are already in place, both for and to some extent against the proposed transformation and vision of a sustainable dairy system, for example the focus on regional structures and markets and a move away from cheap mass produced exports. At the end of 2019, almost the entire German dairy industry agreed on a new sector strategy (Hunecke, et al., 2020). Therein, the key players in the dairy industry stated, that Germany and Europe are dependent on exporting and that exports play an important role in supplying a growing world population and thus contribute to achieving the sustainable development goals of the United Nations (SDGs) (VDM, 2020). This interpretation of the SDGs already says a lot about the sustainability efforts of the dairy industry. If changes are considered, then the goal is still to sustain efficient and increased dairy production to address an increasing population and food demand (Gauly, et al., 2013). A reduction in production or fostering organic production is not considered (VDM, 2020; Hunecke, et al., 2020). This highlights the challenge of implementing the change towards quality differentiation, which is needed and also socially requested, based on this research and supported by a recent European Commission paper (EC, 2020)

The same actors are also involved in the “dairy sustainability tool”, funded by the Federal Ministry of Food and Agriculture in 2017-2020 (QM-Milch, 2017). The pilot, which aimed to deliver facts on the sustainability of the Germany dairy industry, involved over 7000 farms and 27 dairies and concluded that milk producers show enormous achievements in terms of sustainability. The pilot also shows where dairies, together with the producers, can still improve. The dialogue initiated in the project was also reported to increase mutual understanding (Gierse-Westermeier, 2020). The project will continue for the next three years, funded by participating companies, including the dairies (Gierse-Westermeier, 2020).

Nevertheless, based on the present research findings, starting a dialogue between the actors by involving farmers, dairies, the industry, associations and politicians is a promising approach with the potential to achieve a powerful mind shift, however, in this case this potential was neither exploited nor even formulated as a goal. Based on this research and supported by Wiek and Lang (2016), strategies should rather aim to achieve a sustainability transformation than to just acknowledge the status quo.

On a European level, it is becoming apparent that the sustainability issue has reached the political arena. In December 2019, the *European Green Deal* was set out by the European Commission to make Europe climate-neutral by 2050 (EC, 2019). Half a year later, in May 2020, the *Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system* was presented as the heart of the *European Green Deal* to address the challenges of sustainable food systems. It proposes a just transition for all citizens and operators across the value chain towards healthy people, healthy societies and a healthy planet, while acknowledging the inextricable connectedness of ecosystems, health, supply chains, consumption patterns and the planetary boundaries. These are becoming even more critical due to the COVID-19-pandemic, but also due to droughts, floods and other natural threats. The strategy proposes a transition towards a resilient and sustainable food system and states the need to act now (EC, 2020). Two of the aims of the strategy, addressing producers and consumers, can be linked directly to this research:

> “*The creation of a favourable food environment that makes it easier to choose healthy and sustainable diets*” and *“ensuring a sustainable livelihood for primary producers, who still lag behind in terms of income, is essential for the success of the recovery and the transition.”* (EC, 2020, p. 4)

The strategy even proposes goals, which are in line with this research, like encouraging the possibilities for cooperation, strengthening the farmers’ position in the supply chain, ensuring that farmers receive a fair share of the added value of their sustainable products, and creating a mandatory labelling system to facilitate the consumers’ ability to choose sustainable products (EC, 2020).

Overall, this ambitious strategy has the potential to unlock transformative change in the European food system, but the paper needs to be followed by actions and real change on a national level. Therefore, new legislation will be needed to enact change. The objectives and measures have to be integrated into the Common Agricultural Policy (CAP) (Slow Food,

2020c; Biohandel, 2020). The new version of the CAP, which was supposed to start in 2021, has been postponed and it was just recently decided that the current CAP agreements will be continued for 2 more years to bridge this gap (Schürer, 2020). This is a chance to bring the objectives of the Farm to Fork strategy into concrete implementation by modifying the CAP towards these goals. This could also take into account the suggestions for improvement made by many environmental, consumer and agro-ecology associations during the last years of discussing the changes, for example to reward farmers directly for their voluntary work on environmental, climate and animal protection (Jasper and Rehmer, 2019; UBA, 2018; Roveran, 2018).

With regards to demand-side policies to support diets that support the aims of the Farm to Fork strategy, there is an urgent need to shift from the present information-based policies that focus solely on human health, towards more coherent and effective policies that align human with planetary health (Temme, et al., 2020).

6. Conclusions

This research study aimed to combine aspects of behaviour change with systems change to research the possibilities for transforming the German dairy system by changing consumption and production behaviours towards sustainability. To answer the question:

> *What is the scope for behaviour change by producers and consumers in unlocking a sustainability transformation of the German dairy system?*

The four objectives were to 1. identify barriers and enablers of a more sustainable dairy consumption and production, 2. map the vision of the future, sustainable dairy system, 3. identify major challenges of the dairy system transformation and to 4. identify the actors' scope for change towards this future system. The research aimed further to provide data for policy guidance to enable a sustainable dairy system and to deliver insights for creating transformative interventions in the dairy food system that aim to support sustainable dairy consumption choices, as well as more sustainable dairy production systems. A literature review was conducted focusing on theories and approaches of systems thinking, systems transformation and leverage points, the impact and the boundaries of the German dairy system, its elements or actors and on theories of behaviour change. The objectives were achieved by a two-pronged methodology approach, where focus groups provided the consumer insights, and semi-structured interviews added expert views of dairy farmers and other dairy system actors.

The following sections will summarize the key findings, present the limitations of the research and give implications and suggestions for further research.

6.1. Summary of findings

The literature review found that the dairy system is a complex and diverse system with powerful elements and actors and that it currently transcends its social and environmental boundaries (Raworth, 2017; Clay, Garnett and Lorimer, 2019; WBAE and WBW, 2016). It

would need radical changes in terms of environmental friendliness and socio-economic well-being (Clay, Garnett and Lorimer, 2019), animal welfare (Christoph-Schulz, Salamon and Weible, 2015), and human health (Willett, et al., 2019) to become future-proof. Systems thinking came out as a useful tool for understanding and supporting systems transformation, especially in the area of those interconnected socio-ecological systems, where humans, animals and nature are connected through political and social regulations (Kennedy, Gladek and Roemers, 2018; Fischer et al., 2015). As with other systems, the dairy system consists of elements (land, cows, farmers, dairies, retailers, consumers, civil society), their interconnections and feedbacks and the structure that develops from them. The system has a current goal or purpose (to provide/export affordable dairy products and produce cost-efficiently) and there are mental models and paradigms (individualism and growth-orientation) underlying, shaping and sustaining the system (Meadows, 2008). In order to intervene in the system in a transformative way, changing the goal and changing the underlying mental structures is most effective, but also most challenging.

In recent years, behavioural change has been given much prominence as the holy grail for change, but also the great obstacle that prevents change (Boström and Klintman, 2019; BIT, 2020). How to increase sustainable food choice is not fully understood (BIT, 2020) and there is little agreement on what strategies might effectively influence a transformation through behaviour change (Moloney, Horne and Fien, 2010). Behaviour change requires the individual's physical and psychological capability and motivation to engage with the new behaviour, but also their social and physical opportunity (COM-B-model) (Michie, Van Stralen and West, 2011).

This structure was used to categorize and analyse the rich data content of the focus groups (consumer perspective) and semi-structured interviews (producer perspective), when researching the enablers and barriers of a more sustainable dairy system. Consumer insights confirmed the intention- and knowledge-action gap (OECD, 2017). They showed a high level of awareness, knowledge, and good intention, but lifestyle issues and barriers in the physical and social opportunity (availability of sustainable dairy products and social norms) hindered different behaviour, whereas a high value for food and the connectedness to food and farmers came out as an opportunity. The producers' good intentions were limited mainly by economic and political dependencies and the social norm of growth, whereas collaboration and the experience that it pays off to do things differently enabled them.

The producers' vision of a sustainable dairy system was mainly grass- and pasture based and oriented towards functioning regional structures (more, smaller farms and dairies, farm dairies, direct trade). This would include a quantity limitation (due to availability of pasture) and a quality differentiation (environmental, animal welfare, socio-economic, regional). In order to adapt the current goal of the dairy system to this vision, three main challenges towards this future emerged from the systems thinking approach:

1. Personality, individualism//values//trust, **mental models**

2. Infrastructure, dependencies//availability, **bigger structures**

3. Practices, separation//appreciation, **social patterns**

Linking these challenges to Meadows' (1999) leverage points on their potential for systemwide transformation shows that in order to achieve the required transformation, the underlying mental models would be the most effective, but also most difficult to achieve particularly in terms of changes in the system's goals towards the future vision. These mental models become apparent in the individual behaviours (1.) but also shape social interaction (2.) and further support the development of bigger structures (2.)

These challenges are highly interlinked and possible solutions were found to address several layers within the system. The results propose that the capacity of consumers' and producers' behaviour change in transforming the goal and structure of the system towards regionality and quality differentiation, is limited for direct achievements in the overall structure. However, small achievements on the level of actors, elements and their feedback connection are possible through collaboration. Collaboration itself requires a paradigm shift, which can be enabled through openness and awareness. A deep transformation towards a sustainable, collaborative dairy system requires a shift in social norms, paradigms and practices.

6.2. Limitations

The German dairy system is diverse in its natural geographical conditions and availability of regional structures and in its farm management and production methods. Purpose sampling aimed to represent this diversity, but the number of interviewees had to be restricted due to time constraints and it is likely that potentially relevant voices could not be represented.

The focus on interviewees, who already seek a change in the system made it possible for the author to summarize a common vision and manageable first-step solutions, but also excluded the majority of producers who do not share this vision and who may want to prevent such ambitious change.

Time constraints, the wide geographical distribution of respondents and their limited time and travel resources, due to production peak, influenced the choice of methodology. Focus groups could have probably deepened the social and discursive dimension of the data and strengthened the multi-stakeholder approach, but were out of scope.

The original approach of interviewing actors from as many sectors as possible in order to map the whole system has given way to a focus on producers of milk and dairy products plus expert views in order to ensure the depth of the results on milk production.

The consumer group investigated in this research was surprisingly knowledgeable about dairy system issues and showed pro-environmental intentions and behaviours. Initially perceived as a limitation due to the lack of representativeness, the group turned out to provide a good sample to investigate the barriers the individuals face in their actual purchase decisions.

Whether dairy consumption and production can be sustainable at all was also outside the scope of this research.

6.3. Implications of this research on behaviour and system change

This research confirms the information- and knowledge-action-gap, highlighting the limitation of behaviour change interventions that focus on information and knowledge provision alone (OECD, 2017).

This research further confirms the intention-action-gap, highlighting that the intention alone is not enough, to lead to a desired purchase, but that the availability of the product and the ease of practising the alternative behaviour must also be given (BIT, 2020).

Combining behaviour and system change methodologies in one piece of research reinforces the need for specific focus on social norms in both, behaviour and system change (Moloney, Horne and Fien, 2010), but increasingly also as the potentially influential link between the two disciplines. Social norms, patterns and practices are important factors to consider, on one hand, in behaviour change when moving beyond the individual's patterns and assumptions to design effective interventions. On the other hand, when systems thinkers want to intervene and change the mental models and paradigms of a system, insights from behaviour change can help to eliminate other behavioural factors that might further prevent a paradigm shift.

6.4. Suggestions for further research

The broad approach of this research suggests a number of areas for further research. First of all, the connection of behaviour and system change could be further developed for other systems and targeted behaviours to create wide reaching transformation throughout both disciplines. As explained above, researching social norms, mindsets and personality traits could link behaviour and system change. The mutual interaction between leverage points with a higher or lower potential to drive systemwide transformation represents a gap in current understanding (Abson, et al., 2017), which became apparent in this research and could be further developed.

Further research could look into collaboration as a practical solution to enable a sustainability transformation in the German dairy system. One could examine how collaboration is linked to the diverse leverage points to intervene in a system, what paradigms are involved and how they could be transformed and also what further behavioural or structural aspects enable or hinder collaboration. The role of civil society associations, or grassroots organisation could be analysed, either by concretely looking into how they could increase collaboration of the actors, or by their potential to unlock a paradigm shift of the involved actors. When researching further into paradigm shifts, it could provide useful insights to look into agricultural schools and institutions to see how a change in knowledge transfer can enable a shift in values and paradigms and therefore lead to a change in production patterns.

The methodological approach of this research could be applied to other systems, or the dairy system in other European countries. Furthermore, the results of this study could be used to research how policy measures can be designed to be effective and feasible in their implementation. Overall, research in this field should not remain theoretical, but include a practice approach by involving the responsible actors to implement actual change.

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Appendix 1: Extract from Participant Assignment Sheet (Valumics Focus Groups)

ARBEITSBOGEN

FG Nr.: _____
Vorname: _____
Alter: _____

AUFGABE 1 (VERBUNDEN MIT DER HAUSAUFGABE): GEWICHTUNG DER HAUPTGRÜNDE

In Verbindung mit dieser Fokus Gruppe hatten Sie die Aufgabe, die Produkte Ihrer drei letzten Einkäufe zu fotografieren und die Aufnahme inklusiver der Kaufbelege mitzubringen. Denken Sie nun an diese letzten drei Einkäufe und versuchen Sie sich zu erinnern, warum Sie genau diese Artikel eingekauft haben. Unter diesem Text befindet sich eine Liste mit potentiellen Gründen und Motivationen hinter dem Einkaufen, welche Ihnen helfen soll, Ihre Gedanken zu ordnen. Natürlich trifft nicht ein einziger Grund auf alle ihre gekauften Produkte zu, deshalb überlegen Sie bitte, welche Gründe für die meisten der Artikel zutrafen. Wählen Sie bitte die fünf Hauptgründe für den Kauf und markieren Sie diese in dem freien Feld hinter der Zeile. Wenn möglich, kennzeichnen Sie auch bitte die Reihenfolge der Wichtigkeit hinter jedem der fünf Gründe und nutzen den freien Platz unter der Liste für zusätzliche Notizen. Sie haben 10 Minuten, um Ihre Hauptgründe zu markieren, bevor wir eine Gruppendiskussion dazu führen.

Die fünf Hauptgründe:

- Wir essen diese Produkte täglich in der Familie (Essgewohnheiten und Geschmack) _____
- Ich versuche ökologisch vorteilhafte Produkte zu kaufen _____
- Ich habe die günstigsten Produkte gekauft (günstigster Preis) _____
- Aus Zeitnot griff ich einfach zu den mir bekannten Artikeln _____
- Ich versuche beim Einkaufen meiner Produkte auf faire Arbeitsbedingungen zu achten_____
- Mir gefiel das Design der Produkte (Aussehen und Anfassen) _____
- Mir gefällt die Marke _____
- Ich versuche saisonale Produkte zu kaufen_____
- Ich ernähre mich vegan _____
- Ich ernähre mich vegetarisch _____
- Ich versuche gesunde Produkte zu kaufen _____
- Mir gefiel die Präsentation und Platzierung des Produktes im Laden_____
- Ich versuche auf faire (Preis-)Bedingungen für die Bauern zu achten_____
- Mir ist eine hohe Produktqualität wichtig _____
- Ich bevorzuge regionale Produkte_____
- Für das Produkt gab es eine spezielle Rabattaktion _____
- Ich wurde durch die Werbung auf das Produkt aufmerksam _____
- Es war keine Alternative verfügbar _____
- Andere Gründe: _____

Weitere Gedanken:

_____
_____
_____
_____
_____
_____
_____
_____

AUFGABE 2: DIE AUSWAHL DER PRODUKTE (MILCH)

Nun sehen Sie verschiedene Sorten von Milch auf dem Tisch vor Ihnen. Schauen Sie sich diese bitte gut an und wählen eines der Bilder vor Ihnen mit dem Produkt, welches Sie normalerweise kaufen würden und nehmen dieses mit zu Ihrem Platz. Wenn Sie nicht die Milch finden, die Sie normalerweise kaufen würden, nehmen Sie bitte das Bild mit einem ähnlichen Produkt.

[Diskussion]

AUFGABE 2: MIT WELCHEM EINKAUF KÖNNEN SIE SICH AM BESTEN IDENTIFIZIEREN UND WIE WÜRDEN SIE GERN EINKAUFEN?

In der folgenden Aufgabe werden Ihnen fünf verschiedene Einkaufswagen präsentiert, die zu fünf sehr verschiedenen Menschen mit unterschiedlichen Einkaufsgewohnheiten und Lebensstilen gehören. Schauen Sie sich die Einkaufswagen bitte einmal an und denken Sie dann über folgende Frage nach: **Was ist der Käufer für ein Personentyp und warum hat er genau diese Produkte eingekauft?**

Sie haben 15 Minuten Zeit sich zu verschiedenen Einkaufswagen Notizen in den folgenden Zeilen zu machen.

[…]

Appendix 2: Interview Guide (German)

Willkommen und Einleitung (5-7 Minuten)

1. Willkommen, danke, dass du dir (in diesen turbulenten Zeiten) die Zeit genommen hast mit mir dein Wissen zu teilen.
    - Ich stelle mich vor (Nachhaltige Ernährungssysteme sind mir seit langem ein Anliegen, daher jetzt der Master, zudem Ökotrophologin und Konditorin, (ggf: Slow Food Vorstandsmitglied, Nachhalfigkeitsforschung/Projekte zu Verhaltenswandel und Lebensstilen, wir haben uns auf der Biofach gesehen?)
2. Falls noch nicht geschehen: Einverständniserklärung bitte unterschreiben
3. Bist du einverstanden, dass ich das Telefonat aufzeichne? (J/N) → Aufnahme starten
4. Einführung in das Projekt, den Zeitrahmen und die Verwendung der Daten
    - Wir werden uns etwa 45 Minuten unterhalten, passt das noch bei dir?
    - Ich führe diese Interviews im Rahmen meiner Masterarbeit. Es geht dabei um den Zusammenhang von Konsumverhaltensänderung und Systemveränderungen im deutschen Milchsystem. Für die Verbraucher*innen-Perspektive nutze ich die Ergebnisse von Fokusgruppen, die ich letzten Herbst im Rahmen eines EU-Projektes durchgeführt habe. Dein Wissen, sowie das von anderen Akteuren in der Milchwirtschaft wird in die eher systemische Perspektive einfließen und ist dazu gedacht den Zusammenhang zwischen Verbrauch und Produktion aufzuzeigen.
    - Deine Daten werden selbstverständlich vertraulich und anonymisiert verwendet. Die Ergebnisse des Projektes fließen in meine Masterarbeit und gegebenenfalls auch in weiterführende Projekte und Veröffentlichungen.
    - Das Interview gliedert sich in drei Teile. Im ersten wird es um den Jetzt-Zustand und um deine Herausforderungen als Akteur im System gehen. Im Zweiten Teil geht es um deine Vision eines zukunftsfähigen Milch-Systems. Im dritten Teil geht es um den Weg dahin, darum wo du Möglichkeiten der Transformation siehst, was du anders machst und was andere Akteure bräuchten, um nachhaltig(er) zu produzieren und zu konsumieren.
5. Hast du noch Fragen bevor wir starten?
6. Erzähl mir doch bitte zunächst kurz von deiner Arbeit auf deinem Betrieb und was du eventuell daneben noch machst

Fragen (33-35 Minuten)

Schritte und Fragen	Relevanz und Grund
4. Schritt um Jetzt-Zustand zu bestimmen • Welchen Herausforderungen stehst du in deiner Arbeit gegenüber? ○ Was ist die größte Herausforderung? Und warum? (Welchen Teil des Systems betrifft es?)	Die aktuelle Realität, die Probleme des Systems, die wichtigste Herausforderung des Befragten, zu verstehen und den Grund dafür zu verstehen. Dies kann auch auf den Charakter dieser Person, ihre Einstellungen

• Welche Herausforderungen der Verbraucher*innen nachhaltig Milch und Milchprodukte zu konsumieren kannst du in deinem Alltag beobachten? o Was ist hier die Wichtigste? Warum? • Ist das System bereit, mit diesen Belastungen umzugehen? (Wie und warum? Warum nicht?)	und Verhaltensweisen zurückführen. Es zeigt auf, wo im System Probleme auftreten und wie diese mit dem Akteur zusammenhängen.
5. Schritt um wünschenswerte Zukunft zu bestimmen • Was ist deine Definition von nachhaltiger Milchproduktion? • Was ist deine Definition von nachhaltigem Milchkonsum? • Welche Vision hast du für das zukünftige Milchsystem? o (Welche Normen und Werte würden dies unterstützen? (Erzeuger- und Verbraucherseite) o Was müsste sich im Sozialen verändern? Was in den Werten der Verbraucher*innen und Produzent*innen?)	Zu verstehen, wie ein zukünftiges (und nachhaltiges) System aussehen muss und/oder wahrscheinlich aussehen wird, zu verstehen, wie sie nachhaltige Milchproduktion/-konsum definieren und dies mit ihrer Arbeit und Praxis zu verknüpfen. Auch die Norm-/Haltungsseite zu untersuchen, was muss sozial und verhaltensmäßig anders sein?
6. Schritt, um den Weg dahin zu bestimmen • Was muss geschehen (und sich ändern!), um dorthin zu gelangen? o Welche Akteure braucht es dazu? Was müssten die tun? (Verbraucher-/Produzentenseite) • Was machst du bereits anders? Und warum? • Was glaubst du hält andere Landwirte davon ab deinem Beispiel zu folgen? Was bräuchten sie, um deinem Beispiel zu folgen? • Was glaubst du bräuchten die Verbraucher*innen, um mehr nachhaltige Produkte zu konsumieren? Warum tun sie es Ihrer Meinung nach derzeit nicht?	Den notwendigen und auch von den Akteuren durchführbaren Wandel zu verstehen, zu verstehen, was die Pioniere bereits anders machen und was die Möglichkeiten und Hindernisse für andere sein könnten, diesem Beispiel zu folgen (auch aus einer Verhaltensperspektive), auch um die Diskussion über die Rolle der Verbraucher bei der Ermöglichung von Veränderungen anzuregen

Abschluss, Dank und wie es weiter geht

1. Damit wären wir am Ende der Zeit, vielen Dank für deine Zeit und Offenheit
2. Du hast viele interessante Punkte genannt, die sehr wertvoll für meine Arbeit sein werden. Wie zu Beginn gesagt, werden deine Daten werden selbstverständlich vertraulich und anonymisiert behandelt werden.
3. Wenn du das möchtest, schicke ich dir gerne die Ergebnisse der Masterarbeit zu.