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Sufficiency in social practices: An underestimated potential for the transformation to a circular economy

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To date, the circular economy has fallen short of its promise to reduce our resource demand and transform our production and consumption system. One key problem is the lack of understanding that highly promising strategies such as refuse, rethink, and reduce can be properly addressed using research on sufficiency. This article argues that a shift in focus is required in research and policy development from consumers who buy and handle circularly designed products to consumption patterns that follow the logic of sufficiency and explain how sufficiency-oriented concepts can be incorporated into existing social practices. The authors show that sufficiency is not necessarily as radical and unattractive as is often claimed, making it a suitable yet underrated strategy for sustainability and the transition to an effective circular economy. The case of urban gardening shows that small interventions can have far-reaching effects and transform consumption patterns as the logic of availability is contested by newly developed concepts of "enoughness" and opposition to "über-availability." The authors propose utilizing comprehensive state-of-the-art theories of consumption and human action when developing strategies and policies to make the circular economy sustainable while being more critical of utilitarian approaches. Using social practice theories that have proven to be beneficial allows human actions to be comprehensively analyzed by recognizing their embeddedness in social and material frameworks; addressing the meaning, competences, and materials of routinized human behavior; and examining indirect effects.

KEYWORDS

circular economy, sufficiency, theories of social practice, sustainability transition, sustainable consumption, urban garden

1. Introduction

One of the currently most popular and widely discussed strategies for achieving sustainability is the transformation of our linear make-use-dispose economy to a circular economy (CE) in which the resource base operates in a circular manner within a society (abiotic materials) or in sustainable exchange with the biosphere (biotic materials). This is sorely needed as several planetary boundaries are being crossed at once due to our high resource extraction and emissions, making it essential to rethink and reorganize our production and consumption systems (Steffen et al., 2015). For most industrialized countries, lifestyles are associated with average resource demand of 40 to 50 tons per capita per year (Bringezu and Bleischwitz, 2009). In this context, Lettenmeier (2018) advocates for a sustainable material footprint of eight tons per capita per year by 2050. To successfully transition to a sustainable circular economy that is truly within planetary boundaries, it is therefore absolutely essential that resource consumption be reduced. At the same time, a decent living standard for all should be achieved, meaning that a minimum level of consumption that allows every individual to live a good life must be ensured (Fuchs et al., 2021).

It is often said that the CE is based on the consistency strategy and hence follows a different logic than many other environmental protection approaches that rely exclusively on efficiency (Brinken et al., 2022). Consistency refers to the circularity of materials, using them correctly instead of efficiently so that no waste occurs (Brinken et al., 2022; Speck et al., 2022). Some even think that this idea of effective resource handling will be enough to achieve absolute sustainability (McDonough and Braungart, 2002). This reductionist view is certainly easy to criticize as perfect material cycles are not technologically achievable in the foreseeable future in many cases.[1] More fundamentally, consistency alone is not sufficient, either, as every material potentially entering the cycle must originate from nature, and so absolute consumption levels must be taken into account to limit environmental degradation (Bringezu and Bleischwitz, 2009; Lettenmeier et al., 2014).

More comprehensive approaches to the CE go even further and describe several sub-strategies that are not limited to the consistency strategy and are open to sufficiency. The Ellen MacArthur Foundation (2014) distinguishes between four different kinds of circles, describing the "power of the inner circle" as the potential to reduce harm to the environment and society by keeping materials in use for longer to decrease efforts to repair, remanufacture, and recycle. While this does not necessarily have to be interpreted as a call for sufficiency, it already points to the problem of circular material flows being energy- and labor-intensive, leading to further environmental degradation due to our current energy provision system as well as the degradation of material quality. Morseletto (2020) shows that, in contrast to the problem of high material throughput within a CE, most CE targets do not consider an overall reduction of materials but rather focus on recovery rates, resource efficiency, recycling targets, and waste reduction. In their critical discussion of the failed promises of CE, pointing out dissipative losses, energy demand, and complex global value chains, Corvellec et al. (2022, p. 426) state: "It is therefore important to dispel the myth that circular systems are necessarily more environmentally sustainable than linear systems."

Several strategies that come under the umbrella of CE are now discussed in academia regarding their environmental potential and, e.g., the art of innovation (Potting et al., 2017; Reike et al., 2018). What started as the reduce, reuse, and recycle hierarchy (which still essentially forms the basis of the waste hierarchy in many countries, including the European Union) can now be further distinguished as more comprehensive sets of resource value retention options (Ros; see Reike et al., 2018 for a critical literature review on the conceptualizations of CE and the various RO strategies). What Potting et al. (2017) and Reike et al. (2018) have in common is the idea that the refuse RO offers the greatest environmental potential. However, while Potting et al. (2017) focus exclusively on production and product design, Reike et al. also emphasize the role of consumption and even stress post-materialist lifestyles. While they do not make explicit connections to the sufficiency debate, they invite researchers to work out the connections between CE and sustainability concepts.

On the one hand, great hope is placed in the concept of sufficiency as a true all-rounder that aims at a total reduction of resource consumption by shifting the focus from economic growth to a good life (Schneidewind and Zahrnt, 2014; Wynes and Nicholas, 2017; Hüttel et al., 2018). On the other hand, sufficiency is often excluded from current debates on CE (Bocken et al., 2022). This has created a paradoxical situation in that the necessity of a radical transformation of our production and consumption system has finally been acknowledged by all stakeholders working on CE (Welch et al., 2017; European Commission, 2020), but when it comes to implementing policies, comprehensive sufficiency strategies are off the table as they are too radical (paradoxical because it is difficult to achieve radical results without radical measures). It is far more often the case that sufficiency and its counterpart overconsumption are presented as consumer issues in that consumption science of the last 20 years is entirely neglected (Warde, 2005; Røpke, 2009; Shove, 2010; Camacho-Otero et al., 2018; Bocken et al., 2022). As a result, the environmental potential of sufficiency is often disregarded as its "radicality," which means it cannot have a truly large-scale impact on society. It is therefore only implemented within small niches that have no or only minor systemic impact (Speck, 2016; Gossen and Kropfeld, 2022).

1 See Reuter et al. (2019) for an in-depth discussion on metallurgical, thermodynamical and infrastructural issues.

This becomes a self-fulfilling prophecy that has been increasingly criticized in recent years as research demonstrates that CE concepts struggle to deliver on their promises (Welch et al., 2017; Morseletto, 2020; Zwiers et al., 2020; Jaeger-Erben et al., 2021; Corvellec et al., 2022).

Thus, a clear sense of ambivalence toward the debates on sufficiency can be identified at this point. Sufficiency is seen as a form of renunciation, but if we take the strategy of sufficiency seriously, it, in fact, operates according to a very different logic. It stands in contrast to the dominant market logic that shapes production and consumption globally. This different logic of renunciation is often only found in niches. Nevertheless, some sufficiency-related social practices are also quite widespread (e.g., cycling) or even considered socially desirable (e.g., reducing food waste).

Research on sustainable transitions emphasizes the importance of protected spaces for sustainable niche innovations (Kemp et al., 1998; Raven, 2005; Schot and Geels, 2008). Niches are characterized by alternative and proactive actions and the development of alternative ideas and innovations in the respective fields, for example, community-supported agriculture which also supports non-processed and plant-based food. Thus, niches provide an opportunity to do something different. Niches are shielded from current logics and can define themselves as different (Fuenfschilling and Truffer, 2014). Niches, therefore, emerge precisely where actors try out alternatives that differ from the dominant logic and the rules and routines of the regime and where safe spaces are created for alternative actions (Geels and Schot, 2007). This not only involves technological innovations but also "novel ways of doing (practices), thinking (narratives, imagination) and organizing (structure)" (Ehnert et al., 2018, p. 2) that break with dominant, often unsustainable logic (which is why they are novel or different in the first place), and need to be scaled up to achieve a systemic change (Ehnert et al., 2018; Von Wirth et al., 2019; Loorbach et al., 2020).

Sufficiency can in fact be located precisely in such niches of alternative logics and in the doing, thinking, and organizing of a new or alterative way of doing something that could potentially be scaled up. For example, plant-based diets using community-grown vegetables represent just such an alternative way of doing things and are currently still a (growing) niche. These may well differ from the incumbent agri-food systems based on an animal- and machine-intensive, conventional, industrial system, and its associated rules and logic (El Bilali, 2019). The level of sufficiency depends heavily on how well it fits into existing logic and, of course, on what exactly is understood by sufficiency. As Sandberg (2021) shows, sufficiency is possible at different stages: the current animal- and plant-based diet with its (overly) high intake of meat and meat products could be substituted by an entirely vegan diet. However, this still seems very radical. Alternatively, it could be changed to a plant-based diet with a very low intake of meat and meat products, which would be less radical and potentially more realistic, not least because it is linked to the logic of the current food system.

When looked at from a transition perspective, the ambivalence of sufficiency becomes apparent. It can usually be assumed that niches need to find points of contact with the dominant logic of the current system to scale up and transform the system itself (Augenstein et al., 2020). This can work very well in conjunction with a CE that is often based on dominant logic (optimization of resource use). Thus, depending on the degree of connection to the CE, it would appear that sufficiency can do both: find points of connection to the existing system and be extremely radical. From the perspective of transitioning to a CE, sufficiency is thus ambivalent in the best sense.

This article aims to explore how sufficiency can spread in our consumption system by providing a low-threshold entry point. The authors have approached this task from the perspective of social practice theories. A theoretical discussion on how sufficiency can be identified using social practice theories is followed by an empirical study that illustrates how sufficiency spreads within consumption systems. This is demonstrated by analyzing a specific form of urban gardening, namely an aquaponic system called "Farmbox."

2. Theoretical background: What makes social practices sufficiency-oriented?

Over the last few decades, we have missed out on a great deal of potential to reduce environmental impacts by reducing our energy demand as much of the academia and most political institutions have relied on either the homo economicus or the effectiveness of behavioral economics, such as nudging (Shove, 2010; Hampton and Adams, 2018). The same mistakes should be avoided when discussing CE again (Zwiers et al., 2020). Research on (sustainable) consumption instead suggests shifting the focus from consumers and their behavior to routinized types of behavior itself using social practice theories (Shove, 2010; Huber, 2017; Welch et al., 2017; Hampton and Adams, 2018; Suski et al., 2021).

In a literature review on consumption in the context of CE, Camacho-Otero et al. (2018) show that most scientific papers use utilitarian approaches, such as the theory of planned behavior, and economic approaches, such as rational choice (both focusing on "the consumer"), while studies that rely on social practice theories (focusing on consumption) are in minority. Studying this situation, Welch et al. (2017, p. 6) concluded that "[t]he imagined futures of Circular Economy often elide everyday life, even while acknowledging the centrality of consumption to the model" and that even concepts that put special emphasis on aspects such as collaborative consumption are "offering little by way of projected context as to how such changes will come about, and a simplistic understanding of

consumption." The fundamental problem is clear: how are we to achieve the much-needed, fundamental transformation of our consumption system when we do not really understand consumption or transformation? Is this going to happen by chance or wishful thinking? Rabiu and Jaeger-Erben (2022) just recently provided a model to address the appropriation and routinization of circular consumer practices with the help of social practice.

To gain a better understanding of what sufficiency-oriented social practices are and how they can be identified, social practice theories are introduced along with a brief overview of the research on sufficiency itself.

2.1. Social practice theories

Social practice is a routinized type of behavior that incorporates a bundle of things, such as knowledge, skills, ideas, meanings, etc. (Reckwitz, 2002). The closely linked elements of a social practice make specific behavior somewhat complex as multiple aspects have to come together (e.g., driving includes the car, the road, knowing how to shift gears, and the masculine urge to burn oil; Shove et al., 2012). However, as all these aspects of a given social practice, such as driving, seem to fit together so naturally, we perceive them as one entity, one social practice, which helps to reduce complexity, enabling orientation and easing communication. If I tell my colleague that I am going to drive home now, they have a very clear understanding of what I am about to do even though my actions are as complex as driving, and they might not know anything about the specific route, the car, or my personal driving skills.

The meanings, materials, and competences of social practices (Shove et al., 2012) are shared within or located in social and material contexts. Therefore, social practices do not describe individual behaviors but rather behaviors that exist as entities in themselves within society. A practice "provides a template in terms of which actions are adjusted and calibrated [...] [but] not all enactments of practice are consistent or faithful and that each performance is situated and, in some respect, unique" (Shove et al., 2012, p. 122). Individuals participate in social practices (and hence are the carriers of social practices), and social practices can only be observed as they are performed by them. Lifestyles can therefore be described by the combination of social practices involved in everyday life (Suski et al., 2021; Kropfeld, 2022). However, we are not totally free in choosing social practices as they are themselves linked in an infinite network of social practices within our social-material contexts (Røpke and Christensen, 2012). Eating is connected to cooking (or driving to a restaurant) and cooking is connected to grocery shopping, which is connected to going to work, which is connected to paying attention in school, etc. While these connections are not necessarily definitive necessities on an individual level (one can drop out of school, steal food, and still be able to eat), it is difficult to break free from many path dependencies. When discussing strategies to reduce environmental impacts, keeping this network characteristic in mind is crucial to address the unintended side effects of a given intervention (Suski et al., 2021).

Shove et al. (2012) observed that social practices emerge, exist, and cease to exist over time by building and losing connections between the dimensions that constitute the practice. Emerging social practices, also called proto-practices, are often found in niches where the connections between the various elements are only in the making and more prone to change within shorter periods of time.

As some sort of material base is crucial in all social practices, which we also consider to be actual physical entities rather than just symbols (Warde, 2005; Shove, 2017), we are able to address consumption by analyzing the materials that are being transformed into waste by utilizing them as part of the participation in social practices (Røpke, 2009; Suski et al., 2021). Products and infrastructure are used within social practices, and once they are used up, they become waste (in the form of emissions, municipal solid waste, etc.).

2.2. Sufficiency

Sufficiency is, in some regards, similar to CE. There has been an increasing amount of research in recent years as well as high hopes for sustainable transformations, but no coherent definition as scholars from very different disciplines are working on it with different agendas (Jungell-Michelsson and Heikkurinen, 2022). In principle, sufficiency or somewhat similar concepts (e.g., voluntary simplicity, simplification; Alexander and Ussher, 2012) aim to achieve a good life by reducing the material wants in our lives (Spangenberg and Lorek, 2019). This means that the consumption levels of many will decrease as the focus shifts to alternative measures and cultures of wellbeing and wealth (Schneidewind and Zahrnt, 2014). The goal is to reduce the pressure society puts on the environment by reducing resource demand (Speck and Hasselkuss, 2015). Typical examples include a vegan diet, avoiding flights and other elaborate long-distance travel, reducing individual car use, or moving to a smaller suburban house or flat. A sample calculation by Speck (2016) demonstrates that sufficiency lifestyles reduce resource demand by 30–70%.

As sufficiency provides a fundamentally different approach to living compared to the growth and efficiency-oriented society of the past 250 years, the research field is multi- and inter-disciplinary, ranging from economics and marketing (Gossen et al., 2019; Kropfeld and Reichel, 2021; Bocken

et al., 2022) to political sciences (Spangenberg and Lorek, 2019) and environmental modeling (Speck and Hasselkuss, 2015), to name but a few. See also Santarius et al. (2022) for a truly multi-disciplinary approach to addressing digital sufficiency.

Depending on one's scholarly background and goals, sufficiency is defined in various ways: from a radical concept of non-consumption (Princen, 2005; Stengel, 2011) and systemic change to a low-threshold option that fits into our daily lives, such as cycling daily commutes (Speck, 2016). Furthermore, several degrees of sufficiency are defined by Fischer et al. (2013). They argue that a low level of sufficiency can be found in many lifestyles, e.g., lowering the interior temperature by 1°C (from 20 to 19°C) or not using a car.

Sufficiency in the field of nutrition is associated with diets, whereby a plant-based diet with no food waste is often the starting point toward greater intellectual engagement with the production and consumption of food and the general field of sufficiency (Speck, 2016).

Recently, Bocken et al. (2022) defined sufficiency as having enough to live well without excess, satisfying essential needs to live and function comfortably, while prioritizing quality of life in work, education, and leisure, but not needlessly striving to satisfy infinite human material wants. "Enoughness" was coined as a central description of what is enough for the individual while also leaving enough for everyone else (Fuchs et al., 2021). Similarly, Speck (2016) defines sufficiency in private households as implementing modified cultural techniques in the form of social practices in as many household-related consumption areas as possible. What is important here is that everything is done under the premise of reducing negative ecological and social impacts, thus underlining the idea that even though the ecological impact is not always a leading aspect, ecological reduction often occurs. This idea is also taken up by Sandberg (2021), who identifies several types of pathways to sufficiency: absolute reductions, i.e., reducing the amount of consumption; modal shifts, i.e., shifting to a consumption mode that is less resource-intensive; product longevity, i.e., extending product lifespans; and sharing practices, i.e., sharing products among individuals, and notes that several sufficiency practices have an environmental benefit.

Sufficiency is connected to the circular economy by its shared goal of reducing dependencies on raw material extraction and the associated environmental impacts. However, in contrast to strategies of consistency (e.g., reuse and recycle), there are no actual material cycles as the goal of sufficiency is the absence of material throughput.

Whereas an extensive body of literature addresses a definition of sufficiency, only a few go into the discourse on social practices (Lahusen et al., 2016; Speck, 2016; Kropfeld, 2022). A clear description (or even a broad discussion) of how sufficiency can be identified from the social practice perspective is lacking.

2.3. Sufficiency in social practices

Adopting the perspective of social practices, sufficiency is a set of daily practices that avoid the demand for energy, materials, land, water, and other natural resources while delivering wellbeing for all within planetary boundaries. Sufficiency bridges the inequality gap by setting clear consumption limits to ensure fair access to space and resources (Saheb, 2021).

In the investigation of routines and practices, a variety of examples of more or less sufficient practices in everyday life are available (Sandberg, 2021). Many social practices and (social) initiatives such as neighborhood gardening, bicycle lanes, and corporate calls for less consumption are associated with sufficiency (Gossen et al., 2019; Suski et al., 2021). However, focusing exclusively on decreasing the use of material through social practices is not enough to identify sufficiency. Efficiency also aims at quantitatively reducing the materials used. In sufficiency, one could argue that the quality of the material base is different (a car is not replaced by a lighter car but rather by a bicycle). This, however, would require a specific situational analysis as aspects such as poverty should not be confused with sufficiency. A bicycle can also be ridden for sport and to compensate for sedentary work to increase productivity, not just to get from A to B. One would not necessarily refer to exercise as sufficiency. Hence, the meanings of practices are important to identify sufficiency.

What meanings associated with sufficiency require a prior definition of sufficiency? Environmental concerns? Yes. Stress reduction? Maybe. Positive self-image? No. This article argues that there is a broad gray area of meaning that may indicate sufficiency, but not necessarily. To the authors' knowledge, there is no coherent list of meanings of practices associated with sufficiency. Furthermore, their qualitative nature prohibits a definitive list. In her literature review on sufficient social practices, Kropfeld (2022) compiled a list of meanings (as well as competences, materials, and rules) that are found in the literature on social practices referred to as sufficiency-related. However, this does not mean that every meaning (or material/competence) is in itself related to sufficiency. For instance, one could examine the social practice of renting goods and the identified meaning of "access to a greater variety of goods" (Kropfeld, 2022, p. 13; based on Retamal, 2019). This is the complete opposite of sufficiency as it promotes the ideas of materialism and growth. Depending on what one aims for in a study, it can be argued that a social practice with no characteristics of sufficiency in its meaning cannot be considered a sufficiency-oriented social practice (as is the case with renting goods in Kropfeld, 2022).

In addition to sufficiency-oriented meanings, access to specific sets of competences is necessary to reduce the material demand for social practices or one's lifestyle by participating in new social practices. Growing your own vegetables requires knowledge of sowing, watering, pest control, etc., while repairing

things requires manual skills. Not driving a car to get from A to B requires skills such as riding and maintaining a bike or understanding the rules of public transport. However, in many cases, these competences can be acquired over time by attempting them (learning by participating) as sufficiency is often rather low-tech and low-cost. The first time one repairs a flat tire will take the most effort, but by the fourth time, it will become routine.

Just as competences are relevant to performing specific social practices, so too is access to materials such as tools for repairing things or land for growing plants. Hence, materials can have two characteristics, namely becoming obsolete and being necessary. Again, the question arises as to when can a social practice really be considered sufficiency-oriented. Is this when the materials required have a lower environmental impact than the materials saved? This is a very quantitative understanding, but it is in line with the definition of reducing the use of resources and environmental impacts. This net saving result is often not as easy to estimate as one might assume. For example, Lahusen et al. (2016) analyzed the drying of washed clothes and argued that using a drying rack is a sufficiency-related social practice whereas using a tumble dryer is not as it consumes additional energy. This analysis fails to consider the additional energy consumption for the heating necessary to dry clothes on racks (if clothes are dried indoors during the colder months). Rüdenauer et al. (2008) conducted a life cycle assessment in this case and showed that using a tumble dryer might be an environmentally friendly alternative in cold months depending on specific drying, airing, and heating practices. This example can be taken further by saying that what might have been correctly referred to as sufficiency in the past (drying cloths on racks) is not sufficiency anymore due to the increased energy efficiency of tumble dryers and reduced carbon intensity of our electricity grid (while room heating is mostly still fuelled by oil or natural gas).

Figure 1 provides an overview of sufficiency aspects within several dimensions of social practices. This demonstrates that identifying and scaling up sufficiency-oriented social practices is a complex endeavor with several potential pitfalls as explained above (renting goods, using drying racks). However, it also provides a framework for comprehensive analysis. Furthermore, by giving serious consideration to the connections, it also allows researchers to ask new questions, e.g., how does meaning x correspond to the materiality of social practice y?

Many examples evolve around the idea of abandoning existing social practices, such as driving, while recruiting carriers for other or newly evolving social practices, such as riding a bicycle. However, social practices themselves are also under pressure and able to change over time, as Shove et al. (2012) discuss regarding the history of driving, and Shove (2003) notes regarding cleanliness practices. For sufficiency, this means that connections between the meanings, materials, and competences might loosen in part, but the overall social practice remains. Ways of eating dinner may change in that animal-based food (material) is replaced by plant-based food, but the practice of "having dinner" itself does not change. This remains true even when additional meanings become part of the social practice (environmentalism and animal ethics) and competences change (there is no longer any need to know how to cook a rare steak as there is no blood involved). However, in the infinite network of social practices, one can find abandoned social practices over time when sufficiency prevails, at least in the production realm. When the material of meat becomes detached from the social practice of cooking, there will no longer be a connection to the social practice of slaughtering animals, which will (rightfully) lead to the practice becoming extinct.

The transition from a conventional to a sufficiency-oriented social practice is therefore fluid and often cannot be determined by just one factor.

Another important feature in the context of sufficiency also warrants consideration: non-action. Instead of using a bicycle to get from A to B, one can just stay at A. Or one could go to C instead, which is much closer (a nearby forest instead of a pacific island). In the context of sufficiency, we often underline renunciation as sufficiency is always associated with non-consumption. Empirically, this is a problem as not engaging in a social practice cannot be observed. The practice-as-a-performance perspective is missing. To analyze non-participation (narrative), interviews can be utilized to specifically address social practices that are known to be environmentally intensive but are not identified in surveys or observations, e.g., flying or eating animal products. Here, the authors can find out whether the research participants choose not to fly because of environmental concerns or because they are just scared of flying. To make this manageable (interviewees cannot be asked about every social practice they have not mentioned in a survey), quantitative knowledge of the material world of consumption is necessary to focus on environmentally relevant social practices (Lettenmeier et al., 2014; IGES, 2019).

When placing the research focus on non-action, one must keep in mind that it is not possible to follow the dynamics in social practices to the point where a specific social practice ceases to exist. Research that analyses the dynamics of social practices does so by looking at the past (Shove, 2003; Shove et al., 2012). Instead, one is more likely to examine smaller groups of people not participating in specific social practices, e.g., flying, which does not mean that the social practice itself is already non-existent. Rather, one is searching for the first signs of the disintegration of social practices.

When investigating transition pathways for sufficiency-oriented social practices or assessing the sustainability potential of such practices, it is recommended that a given case be analyzed not as a singular social practice but as part of a network of practices to address side effects (Røpke and Christensen, 2012; Speck and Hasselkuss, 2015; Suski et al., 2021).

In the interim, taking the social practice perspective, it can be concluded that deciding whether or not a social practice

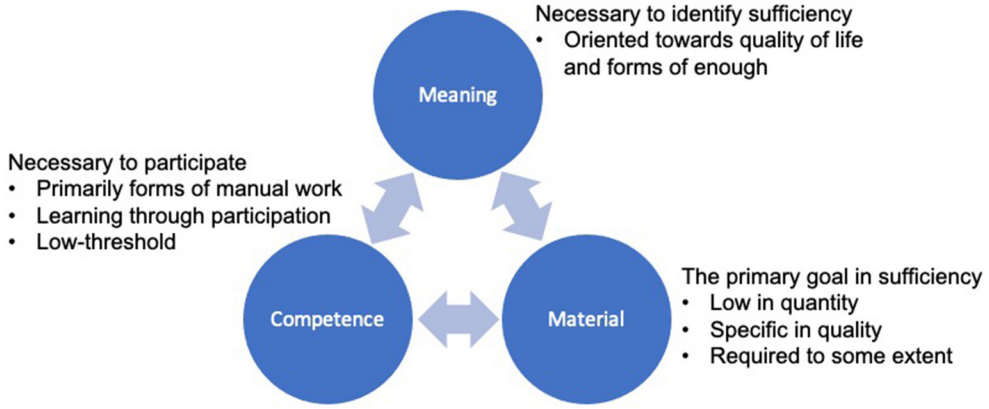

FIGURE 1
Locations of sufficiency in social practices (own depiction).

can be called sufficiency-oriented is quite complicated. However, this should be understood as a worthwhile analytical process when aiming for the sustainable and circular transition of our consumption and production system, as this allows us to focus on social practices that:

1) Have environmental potential in themselves by actually reducing the material base rather than just hoping to do so,
2) Share meanings that are relevant for consumption transitions, e.g. slowness, environmentalism, anti-consumerism, and hence have the potential for positive network effects, and
3) Build a knowledge and skill base that enables practitioners to participate in other sufficiency-oriented practices, which in turn can have positive network effects.

3. Methodology

3.1. Choice of case

To control for the above-mentioned theoretical postulations on how to identify sufficiency in social practices and further explore the phenomenon of sufficiency through the lens of social practice theory, the authors analyze the case of urban gardening (Hacking, 1992). The focus is on a single case as the research design itself is being tested. However, further studies might want to compare multiple cases or perform analyses in combination with longitudinal or retrospective studies, depending on the specific interests (Flick, 2021).

The case focused on is the Farmbox,[2] a more technically sophisticated urban garden involving hydroponic farming and aquafarming in symbiosis (an aquaponic system). This case was chosen as the result of a longer process as a part of the authors' work on a transdisciplinary project in the real-world laboratory of Wuppertal, a large city in Germany (Schneidewind et al., 2018).

First, the authors talked to the organizers of the "Aufbruch am Arrenberg" ("Departure on the Arrenberg") neighborhood association. The civic initiative is extremely active in the field of bottom-up collaborative urban development and neighborhood activities that focus on sharing, sustainability, and achieving a good life. Arrenberg is the name of the city district. As the initiative was already a project partner, the authors wanted to find a common interest for a study to boost urban sustainable initiatives. The Aufbruch am Arrenberg initiative is organized into three thematic fields: energy, mobility, and food. They also have some smaller projects categorized under "miscellaneous." As there was no mobility project with a current, real impact on everyday life, we disregarded that field. An energy-related project was discussed but later discarded when the funding was canceled. Food and other projects were more promising as they focus more on short-term, real-life actions rather than long-term, political engagements. This is in line with Lettenmeier (2018), who discussed the high potential for environmental savings and upscaling in the food sector because dietary choices can be made again every day.

The authors then organized an online workshop, inviting people involved in any food-related or other projects within the Arrenberg initiative. Table 1 provides an overview of the projects represented. One goal of the workshop was to gain a better understanding of each project and how they are organized to select one for in-depth analysis.

We chose the Farmbox project for further analysis as this was one of only two activities that was attended by several people. The other group was soon disregarded as everything had to be organized online (due to the COVID-19 pandemic), and they were an elderly, tech-averse group who already struggled with attending the online workshop and failed to complete the

2 https://arrenberg.app/projekte/die-farmbox/

TABLE 1 Projects represented at the online workshop.

Project	Description	Number of participants	Sustainability focus
Food sharing	Saving food from grocery stores and bakeries and sharing it with the public	4	Environment and society
Farmbox	Aquaponic system to grow food	4	Environment
Open restaurant day	People opening their private kitchens to the public for one day to meet and eat	1	Society
The taste of my childhood	Mainly migrants serving traditional food to the general public	1	Society
Free barber shop	Providing free shaves, fun and food to destitute people	1	Society
Clothes swap	Quarterly shop to donate or get clothes for free	1	Environment

surveys. The workshop took place in December 2020, followed by interviews in the Fall of 2021.

The Farmbox project was primarily managed by four people and was located next to a busy bike lane and café. The Farmbox is quite small (a trailer), so it is more of a test facility and place to learn about alternative ways of farming (teaching passers-by, too) and not a means of producing significant amounts of food (in a later project, some of the group scaled up this urban farming idea and provided proof of concept to build an aquafarm on an economically feasible level in the city). This special kind of garden attracted various people from different backgrounds. Three of the participants were men and one woman, all in their thirties. One participant, a biology student, who the others called the "walking biology encyclopedia," was already an experienced gardener, active in several gardening projects. For others, gardening was a new experience.

3.2. Data collection and analysis

The data collection was based on the principle of zooming in on and zooming out from social practices (Nicolini, 2009). The objective was to learn about the social (proto-) practices themselves (zooming in) to determine what was necessary for participation, what meanings the social practices had, and whether they inherited sufficiency principles, etc., as well as how they are integrated into the seamless web of social practices in daily life (zooming out, see Suski et al., 2021 for a framework on how to use this zooming duality in environmental assessments). A range of data collection methods was used for various dimensions of social practices (material, competence, and meaning) and at different points in time (current vs. at the beginning). In addition to this, the authors had intended to conduct group work for collective narratives and individual data collection as a contrasting, more personal form of narration. Table 2 provides an overview of the data collection methods used and what they each covered. The data collection was intended not only to provide data for this article but also for the work of others (focusing on social cohesion and social capital as well as a quantitative environmental assessment). Here, the focus was on the parts crucial for this article, but other parts were also mentioned to provide a full picture of what actually happened.

TABLE 2 Overview of data collection methods used and what they covered.

Method of data collections	Time	Dimensions of social practices covered	Zoom
Survey 1	Late 2020	Meaning and material	In (meaning) Out (material)
Online workshop	Late 2020	Competences	In
Survey 2 (timetables)	Late 2020	Material	Out
Interviews	Late 2021	Meaning	In and out

First, the authors conducted an online workshop with eleven participants in late 2020, which was accompanied by two surveys, one at the beginning to capture socio-demographic information and general information regarding the participants' personal lifestyles and one afterward to learn about the structure of their daily lives. The first survey asked the participants for:

- Socio-economic data (age, gender, income, profession/job, and education),
- Their role in the "Aufbruch am Arrenberg" initiative (the social practices they participated in, their motivation for participating in the project), and
- General information on private consumption (dietary information and hobbies).

The rationale behind this initial brief survey, which took around 5 min, was to gather some hard facts efficiently without interference. The motivation to participate was of the utmost importance for this article so that the authors could compare the responses with those from the interviews conducted later on where the interviewees described how they became involved in the project. This allowed the authors to make comparisons regarding different times in their engagement. The decision was taken to conduct this survey at the beginning because longer

TABLE 3 Overview of interviewees involved in the Farmbox.

Interviewee background	Main role	Length of interview
Biology student	Everything biology-related	40 min
Gastronomy manager	Artificial light	62 min
Designer	Public relations	64 min
Emergency paramedic	Handyman	54 min

group discussions on environmental protection, inclusive of living in the neighborhood, gentrification, etc., may have altered some of the responses.

The workshop aimed at gaining a broad picture of Arrenberg itself, its people, and the organized activities; in other words, the setting. The skills and materials of the social (proto-) practices were also captured.

The workshop was organized using the zoom online video call platform and online whiteboards (Google Jamboard), which were prepared beforehand. This not only allowed the participants to talk to and see each other but also to work collaboratively as in offline meetings. The whole session took 90 min. The participants captured the results themselves on the whiteboards in the form of text boxes, sticky notes, and drawings. The process was divided into three parts consisting of the following tasks:

1) Explain what you do in the Farmbox/food sharing etc. in such a way that someone else could do the same work afterward. This zoomed in on the skills, knowledge, and materials needed to perform the social practice.
2) Draw a map of how you are connected to each other (less relevant for this article) and the kind of people you are looking for to participate.
3) Show (on a shared map of the district) and describe important places in your daily lives. This zooming-out activity aimed to generate a general picture of how important the Arrenberg quarter is to the participants, which may imply sufficiency in mobility and satisfaction with their living environment. It was shown that this was less relevant for the Farmbox project because for some reason they were the only group who mainly lived outside the Arrenberg quarter.

A further online survey regarding social practices structured according to time and space (Røpke and Christensen, 2012) was conducted afterward by filling out timetables for an ordinary week and travel activities over the last year. This aimed at capturing material consumption, but it was less relevant for this article.

The semi-structured interviews conducted in late 2021 with the four Farmbox practitioners were most relevant for this article. The interviews were conducted during online video calls and were recorded. Table 3 provides the specifics of the interviews and interviewees. Each interview was structured into three main parts. The objectives and some sample questions can be seen in Table 4.

TABLE 4 Structure and goals of the semi-structured interviews.

Thematic topic	Objective	Questions (examples)
Description of what they personally do at the Farmbox and why.	Personal motivation and background for participation. The meaning of "Farmboxing" (zooming in).	Tell me again what you do here in Arrenberg and how you came to be here. What do you tell your friends about why you do this? What keeps you motivated when you are annoyed or face barriers?
Life in the Arrenberg quarter and, if they lived somewhere else, how this relates to their own living environment.	Exploring the setting in which the daily social practices occurred.	Tell me about life in Arrenberg. When friends from other cities visit, do you show them around Arrenberg? What do you do here then? Can you take something from life in Arrenberg back to your living environment or are these two completely separate worlds?
Consumption in everyday life (food, mobility, leisure, travel).	Meanings of other social practices in order to look for similarities with Farmboxing (zooming out).	What role does nutrition play in your everyday life? How do you source your food? Tell me how you get around in everyday life. Where will your next holiday be after Covid-19? What else do you like to do in your spare time besides the Farmbox? What do you consider important to have or achieve in your free time?

While the second survey already provided data on what the participants did and how often, this part of the interview was intended to provide information on the meaning of their consumption patterns. This is important as the meanings of social practices are always in competition with individual meanings. For example, the authors wanted to know why the interviewees avoided flying to go on holiday. This allowed the

social practice of "Farmboxing" to be connected to other social practices through shared meanings. This requires a level of self-awareness or reflective thinking and articulation. This presented certain challenges when it came to regional farming of products the interviewees bought at markets as they often could not articulate why regional production was so important to them, but rather just repeated that it was.

Prior to the interviews, the authors did not state that they are especially interested in the environmental aspects of what they were doing, just that they were interested in what the interviewees were doing. However, as the authors' names can easily be linked to environmental topics by doing a quick Internet search, they asked if the interviewees knew what we were working on, especially if the authors felt that the interviewees were really pushing environmental topics. None of them knew and they were interested to hear what it was all about. However, it is widely known in Wuppertal that the Wuppertal Institute works on various topics relating to sustainability, so the authors suspect that the participants had some idea of their areas of interest. This was also suggested by the fact that the interviews were very casual in style, implying familiarity and trust, perhaps based on a mutual interest in the topics of sustainability and environmentalism. Several cooperation projects have already been conducted between the Wuppertal Institute and the University of Wuppertal on the one side, and the Aufbruch am Arrenberg initiative on the other. Even though the interviewer had no previous history of involvement in such projects, this might have helped indirectly. This level of trust and openness was further supported during the interviews, helping to gain insightful answers on the interviewees' individual meanings and the meanings of the social practices they participated in. Here, it was helpful that the interviewer also grew food in her garden.

All these research activities were conducted during COVID lockdowns, so the authors tried to address irregularities in their routines, e.g., by asking what their first holiday after the COVID restrictions would be like. The interviews were conducted online, recorded, and transcribed.

The interviews were transcribed (clean read) and analyzed by conducting a qualitative content analysis (Mayring, 2014). As the authors were interested in the meanings of social practices and individual motivations to identify sufficiency and how it connects various social practices, the focus was exclusively on content that discussed such aspects. This means that the authors gathered all the meanings expressed by the interviewees and only later tried to identify the ones that were sufficiency-related. As there was no prior set of expected meanings of social practices in everyday life, a category system was developed inductively. As the category system grew with each interview, two runs were conducted with two different authors of this article to analyze the material. As the meanings are contextualized (meanings of specific social practices), the coding unit was a phrase.

4. Results and discussion

4.1. Zooming in on Farmboxing

At first glance, urban gardening, especially taking care of hydroponic and aquaponic systems, does not necessarily appear to be a sufficiency-oriented social practice. It is more directly linked to CE strategies such as reuse and recycling as nutrients and water run in circles between the two systems. From a technical perspective, sufficiency comes into play as hydroponic farming avoids using soil as the medium in which plants are grown and substitutes this with water. Data from the online workshop provided quite a broad picture of what the Farmbox project was all about. The authors summarized three general themes in terms of meanings that can be associated with "Farmboxing": *environmentalism*, *teaching and learning*, and *community*.

4.1.1. Environmentalism

While listing the requirements to participate in the Farmbox during the workshop, several people stated that motivation was necessary, though without clarifying what motivated them exactly ("Don't forget why you are doing this," "Motivation is important, be there regularly, no other basic requirement," or "The main requirement: be up for it, be interested."). However, they also vaguely stated that doing the work paid off. For instance, one participant explained: "Go the extra mile and you soon notice the benefit."

From the interviews, the authors learned that this vagueness of meaning could be linked to very different initial, individual motivations. While the biologist saw the environmental potential ("Using the same amount of effort, we can work in a more nature-friendly and environmentally friendly way that is also more effective and more efficient."), others reported an initial economic interest or just an interest in doing manual work in their free time. However, this initial motivation quickly grew to include the idea of environmental protection.

One person stated that, until recently, they had no connection whatsoever to topics regarding sustainability, but that this had changed since they started gardening in the Farmbox project. The reason for getting into urban farming was economic interest, as the participant saw, working in gastronomy, an opportunity to reduce the price of basil through hydroponic farming.

The participant explained: "But there, too, I saw the economic factor quite blatantly. So, I knew we had a problem, the curve in the price of basil. I want to make a flat line out of it. And that's how I sort of got into sustainability and Close the Loop and the circular economy. And so, I fell in love with shock." (Close the Loop refers to a project where the participants conducted a proof of concept to scale up the Farmbox.).

This growth into the sphere of environmentalism was also shared by another interviewee, jumping abruptly from a description of quality free time to environmentalism:

> "Everything is very technical, high-tech, a lot of things can be computer-controlled and IoT monitored. And that, for example, is actually what attracts me so much about it, this technical playfulness. We men turn seven, and after that we just grow, and we are children until the end, and that's a very big point I have to say, and simply because of that we dealt with sustainability a little bit at the beginning; you knew about it, you knew what was behind it, a little bit, but not so exactly yet either. And of course, this has been deepened by the Aufbruch am Arrenberg initiative and especially by the Farmbox project, and meanwhile, it has also become part of our everyday life."

This development toward more idealistic meanings can also be seen in the answers to the survey question asking participants to complete the sentence "Motivation: I participate in the activity because…." They all sounded very ambitiously sustainable, stating an interest in bottom-up urban development, local sustainability, climate neutrality, and collaborative engagement. However, when describing how they got into gardening in the interviews, they sounded very different. One stated that they always liked working manually with and on technical equipment but did not have a workshop at home to do so. The student reported that they were looking for a place to complete a mandatory internship (later it was made clear that the university would not accept the Farmbox as an internship, but this did not stop the student from participating). The participant who worked in gastronomy reported that they were not allowed to try hydroponic basil farming in the restaurant, so they had looked for another place to play around with the concept and test the technical aspects of it, taking a deep dive into the physics of light and its role in growing plants. The fourth participant came into contact with urban gardening and the Farmbox project during a project for their master's degree course.

4.1.2. Teaching and learning

Another aspect of the Farmbox project was the setting and its integration into city life. In the description of the Farmbox during the online workshop and in the interviews, it was mentioned several times that explaining their activities to passers-by, teaching science to ordinary people, and seeing that the project was considered an important task, was very rewarding ("As soon as somebody enters the Farmbox, they leave everything behind," "And we really used it to take people by the hand and walk them through the Farmbox to show them how it works. [..] And that was extremely enjoyable, because I'm here and I really like explaining things," "So, on the one hand, we want to gain a bit of experience, but also to inform on the other hand, to look at the whole thing as an extracurricular place of learning. And yes, in principle it is a learning and communication object.").

In addition to reaching out to other people external to the Farmbox and teaching them, learning things themselves was pointed out as well ("The knowledge that we have generated there, the practical experience that we have gained, I think we will also take much of that with us to Gut Einern." [Gut Einern is a newly-developed sustainable neighborhood project at a different location in Wuppertal founded by people from the Arrenberg area, one aspect being sustainable urban farming. Some of the people from the Farmbox project subsequently got involved in Gut Einern], "And also the learning, so X has really dug into the topic of plants, especially artificial light and things like that. […] that's why I think that personal learning and all the aspects I mentioned are definitely present in all of us," "[…] where everyone really benefited was the know-how and no, no real monetary amount").

It is hard to tell, but there is often no clear distinction between learning and teaching as they both involved the excitement of newly-gained knowledge. That is why these are summarized as one central meaning of "Farmboxing,"

4.1.3. Community

Finally, the aspect of community was pointed out by the participants. This can be traced back to its origin in the Aufbruch am Arrenberg project, which is based on an open neighborhood community. When asked about their motivation to continue working on the Farmbox project, they replied: "And just to stay in contact with the people and also to somehow work together with the Farmbox group," or "On the one hand, of course, the people, and because somehow everything has developed in such a sustainable, yes, it is a bubble sometimes, sustainable direction, which is extremely, extremely exciting," or "I am a very social person. I really, really like being around people, but also looking for common ground with people." The community aspect, however, was discussed less often compared to environmentalism and teaching and learning. The reason for this was unclear, and the authors cannot conclude that community was less important. It is probably just less present as an articulated topic.

In summary, it can be stated that the Farmbox project was a time-consuming social proto-practice that focused on piling up and sharing intangible assets such as knowledge of environmental food production and the pure joy of collaborative work. The material products aimed for were simply basic food, hopefully, produced in a resource-saving manner. There was no high competence threshold to participate in the Farmboxing practice as the only requirement was motivation. Expertise was gained over time and the yield was of secondary importance. As the Farmbox concept is a high-tech version of urban gardening, the necessary material base for implementing a

project similar to the Farmboxing project would be quite high (a container, pumps, photovoltaic panels, etc.), especially in relation to the low yield. The authors did not conduct a full environmental assessment comparing the Farmboxing concept to regular farming. Therefore, the conclusion can probably be drawn that, in this state of technological development, the Farmboxing concept is more resource-consuming. However, if the Farmboxing approach is seen as a specific aspect of living in an urban neighborhood focusing on the environment, community, and sharing knowledge, as is the case within the whole Aufbruch am Arrenberg project, a broader picture of how such a life evolves around "Farmboxing" is needed. This can be obtained by zooming out to see the whole potential.

4.2. Zooming out of Farmboxing

While zooming out of Farmboxing, a distinction has to be made between food-related and other social practices as Farmboxing is in itself food-related and, hence, has higher impacts in this consumption area.

4.2.1. Food-related social practices

The interviews showed that growing some food made the participants far more aware of seasonal and regional food production and the energy demand for vegetables that require external heating or transportation. In this way, the Farmboxing project is connected to food shopping. All four participants reported that they had stopped or reduced buying fruits and vegetables from faraway regions due to environmental concerns. In doing so, they fundamentally questioned the idea of all fruits and vegetables being available all year round (which leads to high energy demands for storage and to heat greenhouses), all day long (which leads to food waste in the evening), and from all over the globe (which leads to high transportation requirements). This negatively associated meaning of "über-availability," the availability of everything at all times without the fear of missing anything, was primarily linked to the social practice of shopping for food, as one interviewee said quite clearly:

> "I am simply of the opinion that a coconut that grows in North Africa cannot be flown to Central Africa to be removed from its shell, packed in plastic packaging and flown to Germany. I am simply of the opinion that this does not have to be."

Further stating:

> "So yes, if you think you have to have a coconut at all times, OK, then pay for it so that it shows up in some balance sheet somewhere. You can probably tell me a little bit more about that, but as long as that is the case, how can renunciation take place when everything is available and affordable in the supermarket? At the expense of some cross-subsidisation financing."

Another interviewee proved this point using their broader knowledge and experience of the topic of different seasons in Spain:

> "Absolutely right, but they will be heated. Yes, so even these greenhouses, houses in Spain will be heated at some point. And I don't think that's quite so justifiable in terms of energy. If you look at the half white cabbage, it probably wasn't heated, it's still standing until probably the middle of the month, can it be harvested, or was it harvested, or palm kale or green kale or something. Yes, it does relatively well without heating, in the fertiliser balance too. Whereas you have to supply the tomatoes and peppers with endless nutrients and energy."

Furthermore, the interviewee made clear how his own farming activities (not just the Farmbox project) were directly connected to shopping in supermarkets:

> "Yes, well, by seeing what's in my field and by seeing what's on offer in the supermarket, I can discriminate a bit and say okay, I haven't had peppers for 3 months now. Why should I buy them at Aldi?"

This seasonality of vegetables makes this sufficiency behavior easier for the interviewee, as it is always a temporal renunciation.

> "When I'm in the shop and I see a red pepper and I feel like eating a red pepper, but at the same time I know that if I eat this red pepper now, it's really not ecologically justifiable at all, I can put myself off by telling myself: okay, come on, then you'll just eat red peppers again from June."

Here we see a strong meaning of "enoughness" associated with farming and food shopping as the direct counterpart to the dominant über-availability.

4.2.2. Other social practices (mobility, leisure, and travel)

The meanings of environmentalism and enoughness were not as strong in other consumption areas. However, several social practices were reported after internal reflection. The following two quotes from different interviewees exemplify this:

> "But I just notice that when I tell people that I think it's totally cool to drive such a fast car and allow myself this luxury, but on the other hand I stand in front of the coconut shelves in the supermarket and say 'Oh, but that doesn't have to be there now', then I find myself thinking that somewhere the finger has to point in the other direction."

> "That really is schizophrenia. So, you really save your peppers here in winter and then still have the nerve to say, 'Ah well, we're going on a week's skiing holiday to Austria and we're all going there by car."

This demonstrates the tension inherent to connections of meanings between social practices. What is remarkable in the second quote above is that driving fully packed cars from Germany to Austria for one's main holiday is regarded as insane compared with other sufficiency-oriented social practices engaged in by the participants. Surprisingly, none of them were planning to take flights in the foreseeable future or had taken them in the last couple of years. One even said that they planned to take a flight but decided not to when they saw how cheap the tickets were and realized that something is fundamentally wrong when faraway places are too available.

Another participant said that they had only left Europe once for a business trip to Istanbul and struggled to find good reasons for such long flights:

> "Exactly, but never before actually leaving Europe. So, all the time I think of Asia once. [..] And I was such a big Lord of the Rings fan at the time and I thought the landscape was so great, but then I went to Norway [..], and you can compare the landscape there quite well at least with the New Zealand landscape I am familiar with from pictures. And that's just it, there are so many countries besides Spain, Italy, and France that I think are also very, yes, worth exploring in Europe."

Luckily, these observations are in opposition to other research, where it has been observed that even environmentally aware people forget all about the environment on their holiday trips (Anciaux, 2019). While we have no data that can explain why our sample is more environmentally aware when it comes to traveling, we hypothesize that regional aspects of environmentalism learned through the Farmboxing practice led to this specific sufficiency-oriented mindset of "the whole world is not accessible to everyone, neither for coconuts nor for holidays." Figure 2 gives a rough and abbreviated overview of the newly emerging network of social practices due to the emergence of Farmboxing. As Farmboxing is not yet fully established, many links within Farmboxing and to other social practices are still considered weak.

Upon closer examination of the reports on social practices referred to simply as sufficiency-oriented, in this chapter, some difficulties arise in the field of food purchasing. Here, sufficiency can be found in the meanings (über-availability, regionality, and environmentalism), the competences (knowledge of global value chains in the food sector and what to look for in the supermarket), and in the materials, as some products are excluded from the act of purchasing. However, it is not quite clear if overall, life-cycle-wide, material demand is really reduced. Transport distances are not necessarily that environmentally relevant. A study has shown that apples from Germany can have a higher environmental impact when purchased in Germany than apples from New Zealand, depending on the season (this is due to the energy demand of cooling apples for many months, Wuppertal Institute, 2016). Additionally, when intercontinental vegetables are replaced by regional meat, nothing is gained (Poore and Nemecek, 2018). However, our study did not go deep enough to observe food purchasing over a longer period of time. Seasonality was reported by some interviewees as a factor in their grocery shopping, but further insight was lacking. It was only observed that the two participants with longer histories of environmental lifestyles and broader competences in this regard were more committed to sufficiency as they were vegan and pescetarian. However, the other two also reported a reduction in the consumption of animal products in recent years.

The case of sufficiency is surprisingly clear for the reported holiday trips. The travel plans consisted of the image of beauty at closer proximity and the idea of enough (Norway is sufficient, no need to go to New Zealand as a European), the skills to individually plan holiday trips that meet personal needs and reduce the material base through shorter distances. Here, it must be pointed out that sufficiency is relative since traveling to Norway (from Germany) as a substitute for New Zealand landscapes is a reduction, but with the potential for even further reduction. At least refusing to fly for private activities was very well developed.

In summary, the authors observed that sufficiency-oriented social practices can emerge, develop, or be successful in recruiting carriers as a result of participating in social practices that inherit sufficiency-oriented meanings but are not necessarily sufficient in terms of material (due to the high material demand of the Farmbox project).

5. Conclusion

The authors provided a novel approach to address CE strategies with high environmental potential that evolved around the concept of refusing, rethinking, and reducing by shifting the perspective from the consumer to social practices. In doing so, the concept of sufficiency was introduced as a key concept in the CE discourse, which is necessary if environmental pressure is to be substantially reduced by CE and the transformation of our production and consumption system is to be taken seriously. To be very clear, the authors state that there will be no sustainable circular economy without sufficiency as a central principle. In this way, refusal, rethinking, and reduction must be understood as sufficiency strategies and not limited to product design concepts.

We were confronted with an interesting case where there was no high threshold preventing contact with radical new logic, but where such radicality quickly evolved, the concept of über-availability was brought into question and replaced

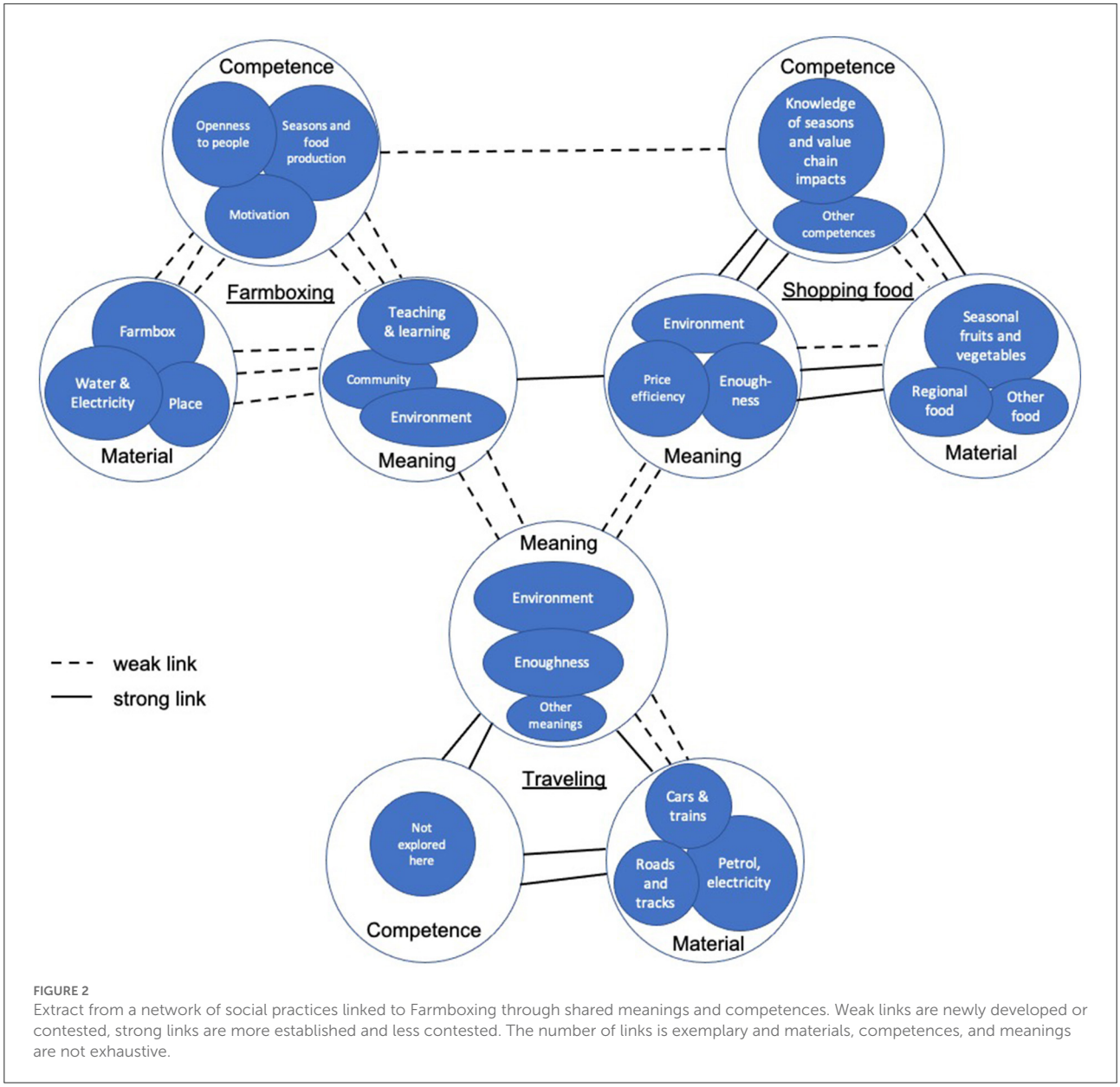

FIGURE 2
Extract from a network of social practices linked to Farmboxing through shared meanings and competences. Weak links are newly developed or contested, strong links are more established and less contested. The number of links is exemplary and materials, competences, and meanings are not exhaustive.

with enoughness. This is what makes the explicit consideration of sufficiency so interesting for CE approaches from a transition perspective: there are intersections with alternative and existing logic. The authors observed that sufficiency found its way into the lifestyles of the participants, even though it was questionable whether the Farmboxing approach studied actually reduces overall material demand and, hence, counts as sufficiency. This shows the importance of zooming out from social practices. The study showed that introducing sufficiency in a low-threshold manner simply by providing a public space for gardening activities can be successful as its radicality is tamed and it can be linked to the dominant logic (there is a long history of allotments in Germany). The upscaling potential of the Farmboxing concept is then that it still challenges the dominant logic and thus brings them into tension.

All this, however, was a very small case, and generalization would be inappropriate. There are many aspects that this study was unable to address. While the authors were able to identify some relevant factors, it was unclear how they worked together. For example, the importance of the social setting is unclear: how interchangeable is the presence of the "walking biology encyclopedia" who brought much environmental knowledge into the group? How would sufficiency spread into the lifestyles of the participants if the case had not concerned agriculture, which has strict rules of seasonal availability, but rather mobility or food waste? What sufficiency-oriented meanings show high potential to connect to other social practices? Here, more

empirical work is needed. The time to conduct such research seems right as the war in Ukraine, rising energy and food prices, and stressed supply chains overall have led to even greater demand for strategies and policies to reduce our resource dependencies. As this is congruent with the proposed goals of CE advocates, both topics, sufficiency and CE, should finally be merged.

As a life-cycle-wide environmental assessment was not conducted and the lifestyles described therefore could not be quantitatively evaluated, especially when it came to groceries, this presented problems in the analysis. Therefore, the authors have already planned a follow-up study that combines qualitative and quantitative analyses of different bottom-up neighborhood activities by utilizing social practice theories and life cycle assessments. Comparative and longitudinal studies might help to further explore the impact of interventions.

The authors also propose future research that delves deeper into social practice theories to understand and describe how opposite meanings are connected. What is referred to in this article as "über-availability" and what other studies have already called "enoughness" seem to be counterparts.

In this article, the authors have avoided coining clear, new definitions of reuse, rethink, and reduce, but they think that this should be done in the future by providing empirical data on the logic of such strategies and exemplifying this with meanings in observed social practices.

Finally, researchers are also welcome to explore the potential of social practice theories for other CE strategies as social practices are not limited to private consumption.

Data availability statement

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

PS, AP, and MS developed the idea for the article. PS performed the empirical analysis, data collection, wrote most of the original draft, and the revised manuscript. AP contributed to the idea of sufficiency as a transition strategy. MS supervised the writing process. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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