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The role of agri-food related initiatives in sustainability transitions of agri-food systems

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Abstract

Agri-food systems both contribute to global environmental change and are simultaneously affected by its consequences. Thereby, human activity and interactions shape desired and undesired agri-food systems' properties. The undesired properties of current agri-food systems result in environmental, social and economic costs. Sustainability transitions of such systems are influenced by changes in social relations and deeper structural mechanisms. Individuals and groups of individuals or initiatives engage in activities, taking actions for agri-food system change. The ways these initiatives engage in change reveal systems' malfunctions and provide insights into potential solutions and strategically relevant entry points for fostering engagement. Moreover, the ways these initiatives engage in change offer insights into tensions, goal conflicts, collaborations and resource conditions under which the initiatives operate. Existing agri-food literature on initiatives often portrays these initiatives as bottom-up driven actors within the niche. However, as agri-food system sustainability transitions are ongoing transition processes and some global or supra-national agreements to sustainable development are set in place, it is worth questioning whether all transformative activities indeed remain confined to the niche level.

Drawing on transition theory, this research elaborates on the functions of agri-food related initiatives (AFIs) and the activities they perform to realise their goals as well as the influencing factors in this endeavour. Thereby, this research builds on transformative social innovation and intermediary conceptualisations and elaborates on the necessary adaptations for agri-food system analysis. The multi-level perspective on socio-technical transitions (MLP) is used to structure the analysis of the activities taking place, the functions that are being fulfilled and the influencing factors being faced. A systematic review of 58 articles on the use of MLP in agri-food system sustainability transition research paves the way for this research' empirical investigations. The empirical analysis relies on 22 semi-structured interview transcripts conducted with 17 AFIs engaged in making their local food system more sustainable from five territorial cases in Europe (Denmark, Germany, Italy, Poland) and Northern Africa (Morocco) and on survey data of Food Policy Groups (FPGs) (n = 260), as one specific group of AFIs, across United States, middle Europe (mainly Germany) and Australia. Data is analysed using a mixed-methods approach, applying qualitative coding and statistical measures.

The results show that AFIs aim to contribute to bring about change by proposing mainly agri-food related social innovations and by intermediating in the context of changing practices and social relations. Thereby, their role is influenced by drivers and barriers but not so much by their relationship to government or their type of organisation (in particular for FPGs as AFIs). A cluster is derived structuring the socially innovative activities according to social interaction processes and agri-food fields. This cluster may inspire policymakers to foster enabling environments for AFIs and support informed decision making on the types of social innovations that future agri-food systems should incorporate. The analysis of the intermediary functions shows that AFIs (here especially FPGs) intermediate between actors at the interface of civil society, science, policy and practice and assume their role through nine intermediary functions. Whether the identified niche and intermediary functions and activities are sufficient for the social innovations to diffuse remains an open question within the scope of this thesis. However, the functions and activities can be compared to those functions that the literature suggests as essential for the diffusion of technological innovation systems. Based on this comparison, the necessary functions for *agri-food related social innovation systems* are derived which partly deviate from the functions of technological innovation systems. Future research could take this up and develop a conceptualisation on the functions necessary for the diffusion of *social innovation systems*, currently lacking in the literature.

The AFIs operate in interaction with other system elements, which are perceived as either enabling or constraining to their activities. The drivers AFIs face seem to be more about social relations and people whereas the barriers tend to be more of a structural or processual nature, implying that a general societal acceptance of AFIs' activities and functions seems to be present, facilitating and justifying structural changes. The analysis of challenges suggests that support mechanisms, especially funding schemes, should be tailored to the development of social innovations and funding should not only be granted to innovation development but also to their (long-term) implementation. The results indicate that role constellations within AFIs seem to matter when it comes to the actions an AFI focuses on, which could be further pursued in future research.

Zusammenfassung

Heutige Ernährungssysteme sind sowohl Mitverursacher globaler Umweltveränderungen als auch von deren Auswirkungen betroffen. Dabei beeinflussen menschliches Handeln und Interaktionen die erwünschten sowie unerwünschten Eigenschaften der Ernährungssysteme. Die unerwünschten Eigenschaften derzeitiger Ernährungssysteme resultieren in hohen Umwelt-, sozialen, und ökonomischen Kosten. Nachhaltigkeitstransformationen solcher Systeme sind beeinflusst von Veränderungen in sozialen Beziehungen und tieferen strukturellen Mechanismen. Individuen und Gruppen von Individuen engagieren sich in Aktivitäten, die einen Wandel hervorbringen könnten. Die Art und Weise wie sich diese Akteure für den Wandel einsetzen offenbaren die Fehlfunktionen von Systemen und geben Einblicke in mögliche Lösungen und strategisch relevante Ansatzpunkte, um das Engagement der Initiativen zu fördern sowie in die Zielsetzungen, Zielkonflikte, Kooperationen und Ressourcenverhältnisse, unter denen die Initiativen agieren. In der bisherigen Literatur zu Initiativen im Ernährungssystem werden diese Initiativen häufig als bottom-up initiiert wie auch als Nischenakteure dargestellt. Da Veränderungsprozesse zu nachhaltigeren Ernährungssystemen jedoch fortlaufende Prozesse sind und einige globale oder supranationale Vereinbarungen für eine nachhaltigere Entwicklung getroffen wurden, ist zu hinterfragen, ob alle transformativen Aktivitäten tatsächlich auf die Nischenebene beschränkt bleiben.

Auf der Grundlage der Transformationstheorie erforscht diese Thesis die Funktionen und Aktivitäten von Initiativen (AFIs), die sich für einen Wandel im Ernährungssystem einsetzen. Darüber hinaus werden die Faktoren analysiert, die die AFIs dabei beeinflussen. Dabei greift diese Arbeit auf die transformative soziale Innovationsforschung und intermediäre Konzepte zurück und beschäftigt sich mit den notwendigen Anpassungen für die Anwendung im Ernährungssystem. Die Mehr-Ebenen-Perspektive soziotechnischer Übergänge (MLP) wird verwendet um die Aktivitäten und Funktionen der AFIs sowie deren beeinflussende Faktoren zu strukturieren. Eine systematische Literaturrecherche auf Basis von 58 Publikationen über die Verwendung der MLP in der Forschung zu Nachhaltigkeitstransformationen von Ernährungssystemen bildet eine der Grundlagen für die empirischen Untersuchungen dieser Forschung. Die empirische Analyse stützt sich auf 22 halbstrukturierte Interviewtranskripte, die mit 17 AFIs geführt wurden, die sich für eine nachhaltigere Gestaltung ihres lokalen Ernährungssystems einsetzen. Die Interviews wurden in fünf Gebieten in Europa (Dänemark, Deutschland, Italien, Polen) und Nordafrika (Marokko) geführt. Des Weiteren basiert die empirische Analyse auf Umfragedaten

von Ernährungsräten (FPGs) (n=260), als eine spezifische Gruppe von AFIs, aus den Vereinigten Staaten, Mitteleuropa (v.a. Deutschland) und Australien. Die empirischen Daten werden mit Hilfe eines Mixed-Methods-Ansatzes analysiert. Dabei werden auf die strukturierende qualitative Inhaltsanalyse sowie statistische Methoden zurückgegriffen.

Die Ergebnisse zeigen, dass AFIs zu einem Wandel beitragen wollen, indem sie vor allem soziale Innovationen vorschlagen und im Kontext sich verändernder Praktiken und sozialer Beziehungen vermitteln (*intermediation*). Dabei wird ihre Rolle durch Treiber und Hindernisse beeinflusst, allerdings nicht so sehr durch ihre Beziehung zur Regierung oder des Organisationstyps (dies gilt vor allem für FPGs). Auf Basis der Analyse wurde ein Cluster abgeleitet, das die sozialen innovativen Aktivitäten in soziale Interaktionsprozesse und Bereiche des Ernährungssystems strukturiert. Dieses Cluster kann politische Entscheidungsträger:innen dazu inspirieren, ein günstiges Umfeld für AFIs zu schaffen und eine fundierte Entscheidungsfindung über die Arten von sozialen Innovationen zu unterstützen, die in künftigen Ernährungssystemen integriert werden sollten. Die Analyse der intermediären Funktionen zeigt, dass AFIs (hier insbesondere FPGs) zwischen den Akteuren an der Schnittstelle von Zivilgesellschaft, Wissenschaft, Politik und Praxis vermitteln und ihre Rolle durch neun Vermittlungsfunktionen wahrnehmen. Ob die identifizierten Funktionen und Aktivitäten ausreichen, um die sozialen Innovationen zu verbreiten, bleibt im Rahmen dieser Arbeit offen. Die Funktionen und Aktivitäten können jedoch mit den Funktionen verglichen werden, die in der Literatur für die Diffusion von technologischen Innovationssystemen wesentlich sind. Auf der Grundlage dieses Vergleichs werden die notwendigen Funktionen für soziale Innovationssysteme (im Ernährungssystem) abgeleitet, die sich teilweise von den Funktionen technologischer Innovationssysteme unterscheiden. Künftige Forschung könnte daran anknüpfen und eine Konzeptualisierung der Funktionen entwickeln, die für die Verbreitung sozialer Innovationssysteme erforderlich sind und die derzeit in der Literatur fehlen.

Die AFIs agieren in Wechselwirkung mit anderen Systemelementen, die entweder als förderlich oder als hinderlich wahrgenommen werden. Die Treiber, die AFIs begegnen, scheinen mehr durch soziale Beziehungen und Menschen bestimmt, wohingegen die Hindernisse eher struktureller oder prozessualer Natur sind. Dies deutet darauf hin, dass die von den AFIs durchgeführten Aktivitäten und Funktionen gesellschaftliche Akzeptanz erfahren, was Veränderungsprozesse erleichtert und rechtfertigt. Die Analyse der Herausforderungen legt nahe, dass Unterstützungsmechanismen, insbesondere im Bereich Finanzierung, auf die Entwicklung sozialer

Innovationen zugeschnitten sein sollten und dass die Finanzierung nicht nur für die Entwicklung von Innovationen, sondern auch für deren Umsetzung gewährt werden sollte. Die Ergebnisse deuten darauf hin, dass die Rollenkonstellationen innerhalb der AFIs bedeutend sein könnten, wenn es um die Aktivitäten geht, auf die sich eine AFI konzentriert. Dies könnte für zukünftige Forschungsarbeiten aufgegriffen und weiter untersucht werden.

List of Publications

1. Elsner, F., Herzig, C., Strassner, C., 2023. Agri-food systems in sustainability transition: a systematic literature review on recent developments on the use of the multi-level perspective. *Front. Sustain. Food Syst.* 7, 1207476. <https://doi.org/10.3389/fsufs.2023.1207476>
2. Elsner, F., Herzig, C., Pugliese, P., El Bilali, H., Matthiessen, L.E., Góralaska-Walczak, R., Aboussaleh, Y., Zanasi, C., Strassner, C., 2025a. Agri-food related social innovations in sustainability transitions: a multiple case study of initiatives across Europe and Northern Africa engaged in change. *AGRICULTURE AND HUMAN VALUES*.
<https://doi.org/10.1007/s10460-025-10742-z>
3. Elsner, F., Herzig, C., Strassner, C., 2025b. Policy intermediation for agri-food system transition: food policy groups from middle Europe, Australia and United States. *Environmental Science & Policy* 173, 104227. <https://doi.org/10.1016/j.envsci.2025.104227>

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Abbreviations

| | |
|------|--|
| AFI | Agri-food related initiatives |
| AFS | Agri-food system |
| CSA | Community supported agriculture |
| FAO | Food and Agriculture Organization |
| FPG | Food Policy Group |
| HLPE | High Level Panel of Experts on Food Security and Nutrition |
| MLP | Multi-level-perspective on socio-technical transitions |
| NGO | Non-governmental organisation |
| SDGs | Sustainable Development Goals |
| SIS | Social innovation system |
| ST | Sustainability Transitions |
| TIS | Technological innovation system |
| WHO | World Health Organization |

Chapter 1. General introduction

*“We don’t have to engage in grand, heroic actions to participate in change.
Small acts, when multiplied by millions of people,
can transform the world.”*

– Howard Zinn

Agri-food systems are both drivers of global environmental degradation and a sector vulnerable to its impacts. The intensification of agricultural practices, land-use changes, rising demand and consumption of animal products (especially in countries of the Global North), corporate concentration of power in few hands, amongst others, have directly or indirectly led to biodiversity loss, soil depletion, emissions of greenhouse gases or food access disparity and food insecurity (FAO 2018a, IPCC 2019, iPES Food 2021). At the same time, agri-food systems suffer from floods, droughts, declining soil fertility or soil degradation (IPCC 2019, iPES Food 2021) and a vast number of people experience hunger (Willett et al. 2019). The global commitment of eliminating global hunger by 2030 of the agenda 2030 by the United Nations (Sustainability Development Goal 2) seems unlikely to be achieved. The global pandemic Covid-19 only worsened the situation, leading to an increase of people having no access to food (iPES Food 2021). At the same time, obesity as a major public health concern (“obesity epidemic” – WHO) and hidden hunger (micronutrient deficiency) are on the rise (i.e., triple burden of malnutrition) (Berry 2020). The challenges agri-food systems are facing are interconnected and range from social issues over environmental impacts to economic tensions while influencing each other (Hinrichs 2014, Leeuwis and Wigboldus 2017, Leeuwis et al. 2021).

In response to these pressing issues, a number of actors are advocating for change, testing innovative approaches, dismantling incumbent structures of power, exploring new forms of co-existence within the agri-food system or proposing new ideas and ways of organising agri-food systems in a more sustainable way (e.g., Konefal 2015, Blay-Palmer et al. 2016, Rut and Davies 2018, Kump and Fikar 2021, Holtkamp and van Mierlo 2022, Mooney 2022). In these groups or initiatives, individuals or groups of human actors convene in different formats and engage in, for instance, agroecological practices, community approaches such as community supported agriculture, food security, enabling food access or strengthening democratic participation in (local) agri-food system governance (e.g., Diekmann and Theuvsen 2019, Moragues-Faus and

Sonnino 2019, Anselmi and Vignola 2022, Anderson 2023). By their activities diverging from the incumbent structures, practices or organisation of the agri-food system, these initiatives question dominant ways of production and consumption and propose new ideas and ways of organising agri-food systems.

This thesis explores how these agri-food related initiatives aim to contribute to sustainability transitions of agri-food systems and is structured as follows. Section 2 presents the theoretical state of the art, focussing on sustainability transition research and models as well as system understandings, agri-food systems and actors in sustainability transitions. Section 3 describes this thesis's underlying ontological and epistemological assumptions, the research design including a definition of this thesis's research objective (i.e., agri-food related initiatives). Moreover, section 3 outlines the research questions as well as the methodological procedure. Section 3 concludes with a synthesis of the main results of sections 4-6. Sections 4 to 6 each discusses one of the thesis sub-questions, which contribute to answering the main research question. These sections are self-standing parts, each submitted to and published in a peer-reviewed scientific journal. Section 7 discusses the results from sections 4-6 in light of the main research question, provides recommendations to policymakers and governors of agri-food sustainability transitions and outlines future research avenues. Section 7 finishes with a critical examination of the strengths and limitations of this thesis. Finally, section 8 concludes this thesis by summarising the main results and outcomes.

Chapter 2. Theoretical background

“We need to think about transforming the food system as a whole, not just changing individual pieces of it. It is a system that is interdependent and has to be viewed in its totality.”

- Jason Clay, 2011

This section outlines the theoretical frameworks underpinning the investigation of agri-food related initiatives (AFIs) in this thesis. The first part revolves around the emergence of sustainability transitions research and elaborates on the relevant concepts for investigating how AFIs aim to contribute to agri-food system sustainability transitions. To this end, frameworks are selected that allow for positioning the AFIs within broader transformation processes and for analysing, understanding and capturing the dynamics surrounding their activities and functions. The second part outlines and discusses key system understandings, agri-food system characteristics, the role of actors in transitions, and existing research on initiatives, thereby providing a further conceptual layer for the investigation pursued in this thesis.

2.1 Sustainability transitions: emergence and research concepts

In the course of the 20th century, research on sustainability and sustainable development received increasing attention across distinct scientific strands. Especially the publication of “The Limits to Growth” by Meadows et al. (1972), that models different scenarios on the interconnected global challenges in relation to earth’s finite resources, and the Brundtland report (1987), defining a sustainable development, amplified the scientific (and public) attention to the topic. Before delving deeper into transition theory and the relevant concepts and frameworks for this thesis (i.e., the multi-level-perspective on socio technical transitions (MLP), protective space, intermediary space, anchoring and social innovations), the development of transition research as a research branch is briefly outlined.

2.1.1 Emergence and outreach of transition research

During the 1990s, the field of transition research developed as a branch of science in its own right. Loorbach et al. (2017) describe the influence of at least two major research clusters that have significantly shaped the field in its present configuration. These comprised innovation research on the one hand (including science, policy and technology studies, history of technology, innovation policy and evolutionary economics) and the field of environmental studies and

sustainability sciences on the other (including environmental and integrated assessment, sustainability governance and environmental policy) (Arthur 1994, Kemp 1994, Van Asselt and Rotmans 1996, Rotmans 1998, Van Den Bergh and Gowdy 2000, Rotmans et al. 2001, Loorbach et al. 2017). Thus, a great number of disciplines feeds into sustainability transition research as a research area. From the outset, the link between scholars from different fields, especially governance scholars, led to the formulation of policy implications (Loorbach et al. 2017). In the further course, the concept of sustainability transitions made its entry into policy (e.g., the 2030 Agenda for Sustainable Development by United Nations, OECD Green Growth Strategy (2011)) but also into practice (e.g., the Transition Network – a ‘grassroots’ movement). In 2011, the sustainability transition research community (i.e., “Sustainability Transition Research Network” (STRN)) introduced a new journal, “Environmental Innovation and Societal Transition” (Elsevier), inviting eclectic methodological approaches to research socio-technical transitions to an environmentally sustainable economy across different sectors (Van Den Bergh et al. 2011). Thereby, the editors called for research on, among others, the understanding of sustainability transition and its dynamics; the role of power, politics and governance; the role of civil society, culture and social movements, firms and industries; or the geographies of transitions (Smith and Stirling 2010, Van Den Bergh et al. 2011, Markard et al. 2012). With around ten new articles on sustainability transitions in peer reviewed journals in 2000, the number of publications on sustainability transitions increased significantly to more than 500 new articles in 2018 (Köhler et al. 2019).

Thus far, transition scholars widened the field applying and elaborating on distinct frameworks that led to more nuanced understandings of transitions (e.g., frameworks such as Technological Innovation Systems approach, Transition Management, Strategic Niche Management, Multi-Level-Perspective) (Köhler et al. 2019). Moreover, the following areas were in focus (without claiming to be exhaustive): spatial dimensions (e.g., cities, neighbourhoods), power, politics, grassroots initiatives, transitions in the global south, transition governance, incumbency, digitalisation, transformative learning, just transitions, transition intermediaries and social innovations (Coenen et al. 2012, Avelino 2017, Köhler et al. 2017, Kivimaa et al. 2019a, Köhler et al. 2019, Van Den Bergh et al. 2021, Truffer et al. 2022).

In the meantime, the sustainability transition community released updated viewpoints on future research needs in transition studies. These future avenues address, among others, the complexity of transitions but also its urgency. For instance, transition scholars call for research on multi-

system transitions (i.e., transitions across multiple sectors such as energy together with mobility and housing) or elaborations on the inherent complexity and contestation of sustainability as a concept. A prominent discourse concerns whether researchers can and should perform participatory research, engaging with “real-world actors, systems and transitions” (Köhler et al. 2019, p. 22), as this comes with challenges.

Above that, scope for future research is expressed, for instance, on the governance of transitions and especially the role of intermediary actors interacting in the niche-regime interface. While there is still a great focus on technological innovations, further research is needed on social innovations and the role of civil society and social organisations in sustainability transition policies, how niche innovations are enabled or how cultural change is brought about and public opinion and policy preferences are affected (Köhler et al. 2017, 2019, Van Den Bergh et al. 2021). Although transition research is increasingly applied by researchers globally and the concepts adapted to other countries, cultures and systems (e.g., water, food, buildings, cities), the transition research field is notably influenced by Western European sustainability challenges, researchers and societies (Loorbach et al. 2017, Köhler et al. 2019) and the (prominent) concepts and frameworks are considerably shaped by studies on energy, mobility and housing systems, alongside contributions from other sectors (Truffer et al. 2022). Above that, though the transition research field has evolved into one that is empirically broad, draws on various theoretical traditions, and reflects diverse research objectives, the field may profit from a broader range of methodological perspectives and approaches (Köhler et al. 2019, Truffer et al. 2022).

In summary, the research field has significantly evolved since the 1990s, gaining both breadth and depth. However, it could benefit from a broader range of methodological approaches as well as greater diversity in the countries and sectors studied. Further research has been called for in areas such as social innovations, intermediation, and the influence of policy preferences. Given this thesis strong foundation in sustainability transition research, the following section provides a more detailed examination of this field, its concepts and terms.

2.1.2 Sustainability transitions of socio-technical systems

The term *transition* is used across different scientific branches to describes dynamic shifts from one state or condition to another (Loorbach et al. 2017). In research on socio-technical transitions, transitions are defined as long-term, fundamental societal changes (Rotmans et al. 2001, Grin et al. 2010). A transition occurs as a result of developments in different areas. Transitions

can be seen as connected changes across different domains that are reinforcing each other (e.g., technology, economy, culture, rules). In transition research, systems such as energy, agri-food, housing or mobility are largely classified as ‘socio-technical’ “since the fulfilment of societal functions involves not only technologies, but also situated consumer practices, cultural meanings, public policies, business models, markets, and infrastructures” (Geels 2019, p. 1). Thus, those systems include user practices and institutional structures instead of the technological dimension only (Markard et al. 2012). The transition of socio-technical systems is therefore a broad-based change process, entailing shifts and adaptations in numerous domains (Rotmans et al. 2001, Raven et al. 2010, Markard et al. 2012). However, the widespread use of the “socio-technical” is questioned, with a call for greater differentiations based on the research and system in focus. For instance, in the context of development or governance studies, Swilling et al. (2016) propose the use of “socio-political” systems and Mat et al. (2016) employ the term “socio-ecological” system to focus on interactions between human societies and ecosystems.

In the study of fundamental societal changes, the terms transition and transformation are often used interchangeably (Olsson et al. 2014, Hölscher et al. 2018, Poulain 2021). At first glance, they mostly differ regarding their etymological origin, with ‘going across’ as the core meaning of transition and ‘change in shape’ or ‘reshape’ of transformation (Brand 2014, Hölscher et al. 2018). At a closer look, their utilisation depends on the different research communities that coined the terms in each case. Transition research focuses more on the process and dynamics of change from one form to another (i.e., ‘how’ the shift from one state to another is supported) (Brand 2014, Hölscher et al. 2018). Whereas transformations concentrate on the act, on showing ‘what’ changes through emerging patterns of change, including the results on a systemic level (Brand 2014, Hölscher et al. 2018, Hendriks and Wesche 2024). In recent literature, the two terms moved closer together, complementing each other through their slightly different but overlapping interpretations (Hölscher et al. 2018).

In the sustainability transition literature, a very prominent and often cited understanding of the concept of sustainability transition is provided by Markard et al. (2012) who describe sustainability transitions as “long-term, multi-dimensional, and fundamental transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption” (p. 956). Sustainability transitions are characterised as multi-actor processes where uncertainty prevails and phases of stability and change overlap and/ or occur consecutively. They are open-ended and are characterised by divergent values with contestations

and disagreements between involved actors (Markard et al. 2012, Köhler et al. 2017). The concept of sustainability has a normative orientation, meaning that societal values, ethics or desired outcomes shape the understanding and orientation of sustainability transitions. Therefore, sustainability transition configurations and handling (e.g., in science or practice) are subject to individual interpretation but also to societal agreements (Susur and Karakaya 2021), such as the Brundtland definition for sustainable development or the Agenda 2030 with the 17 Sustainable Development Goals (SDGs) by the United Nations (UN 2015). For instance, in 1987, the United Nations Brundtland Commission laid the foundation for a common understanding of sustainable development as “meeting the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations 1987, p. 6). The definition gives a normative orientation on what sustainable development should deliver. Similarly, for the agri-food system, the Food and Agriculture Organization (FAO) (2018b) defines a sustainable food system as a food system that “delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised” (p. 1). However, both definitions come with challenges concerning the practical implementation and the measurement of progress, which still allows for varying individual interpretations. Adopted by the United Nations in 2015, the 17 SDGs of the 2030 Agenda define targets for governments, businesses, civil society, and the scientific community, forming a plan of action for a global sustainable development (UN 2015). Nevertheless, the implementation of the SDGs faces ongoing uncertainties, such as the lack of legally binding commitments, misalignment of visions, financing challenges and the slow pace of implementation (Wu et al. 2022). Thus, the just mentioned agreements leave room not only for individual interpretations but also for diverse approaches and varying levels of ambition.

To support the analysis and structuring of efforts towards sustainable development, analytical tools and frameworks are provided. In transition research, these tools and frameworks can support the understanding of transitions but also the development of interventions to influence transitions (Hölscher et al. 2018). Markard et al. (2012) distinguish between four main perspectives in the field of transition studies, including strategic niche management, transition management, technological innovation system (TIS), and the multi-level-perspective on socio-technical transitions (MLP). As its name suggests, strategic niche management focuses on niches as protected spaces for socio-technical experiments. The concept deals with learning processes and the structured development of innovations to facilitate their entry into mainstream markets (Caniëls and Romijn 2008, Schot and Geels 2008). Transition management is a governance

concept that tries to manage transformative change on three levels: strategic, tactical, and operational (Rotmans et al. 2001, Lachman 2013). TIS literature is concerned with the development of novel technologies and the performance of this innovation system (Bergek et al. 2008, Markard et al. 2012). Above that, TIS literature provides insights into the functions necessary for technological innovations to diffuse. In TIS literature, the emergence of a new technology is seen as a result of the effective completion a number of functions (Hekkert et al. 2007, Bergek et al. 2008, Hekkert and Negro 2009, Köhler et al. 2019): entrepreneurial activities (i.e., existence of entrepreneurs important for innovation generation and implementation) (1), knowledge development (i.e., learning processes) and diffusion through networks (i.e., knowledge exchange) (2), guidance of the search (3), market formation (e.g., temporary niche markets as protected spaces) (4), resource mobilisation (e.g., financial, human) (5), and creation of legitimacy (e.g., through creation of advocacy coalitions to create legitimacy for the new technology) (6). The MLP offers a structured framework to analyse the dynamics of socio-technical system transitions and to situate specific elements within the broader context of transition processes. Furthermore, it serves as an approach to analyse the interactions between different system components (i.e., niche, regime, landscape), allowing for a nuanced understanding of the complexity and dynamics of transitions (Geels 2004, 2011, Averbuch et al. 2021, Elsner et al. 2025a).

As the MLP enables the analysis across niches, regimes, and landscapes, making it well-suited to capture interactions between actors and broader societal structures, the framework is particularly relevant in the context of this thesis to explore how initiatives engage with other system elements and how they aim to influence system-level change. Thus, the concept will be further elaborated upon in the following section.

2.1.3 The multi-level-perspective on socio-technical transitions

The MLP on socio-technical transitions is one of the more prominent frameworks in transition literature (Köhler et al. 2019). Developed by Rip and Kemp (1998) and further refined by Geels (2005a) and Geels and Schot (2007, 2010), the MLP states that transitions arise through interaction processes and dynamics between three levels. These comprise, first, the landscape on the macro level, second, the incumbent regime on the meso level, and lastly, niches on the micro level (Geels 2002, 2019, Geels and Schot 2010, Lachman 2013, El Bilali 2019) (cf., Figure 1).

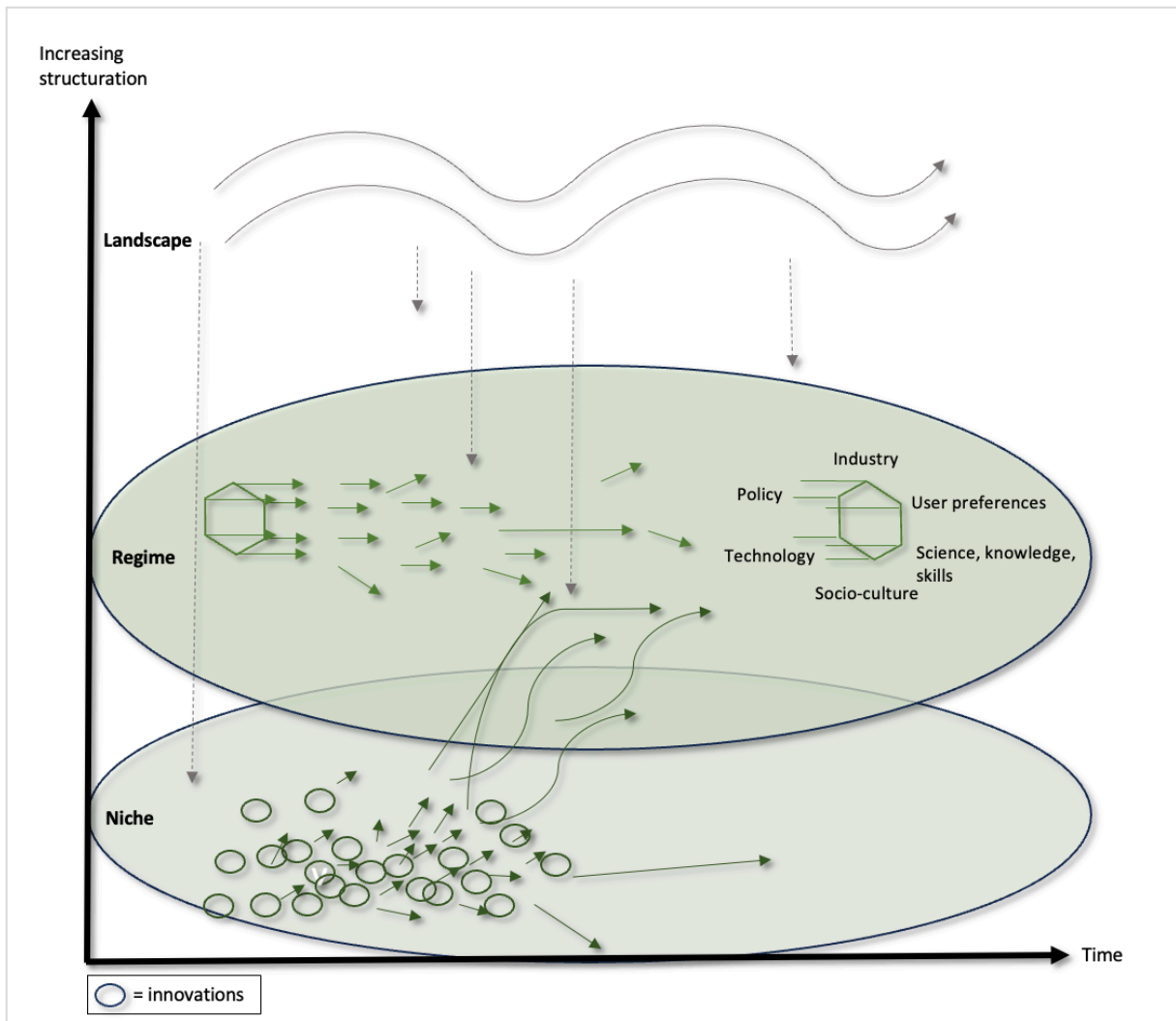


Figure 1: The multi-level-perspective on socio-technical transitions. Own illustration based on (Geels 2002, 2004, Bui 2021).

Notes: The circles and arrows in dark green show niche innovations and their development; the lighter green arrows and hexagons show the regime domains and developments. The waves and arrows in grey visualise landscape developments and potential pressures.

These levels are further defined as follows:

- *Macro-level:* The landscape represents external trends and challenges which influence meso- and micro-level. Regimes and niches have little to no impact on events on the landscape-level (Lachman 2013). As Geels (2019) states, the landscape level includes slow-changing developments, such as demographics, societal concerns or macro-economic trends, and external shocks, such as wars, financial crises or oil price shocks. Furthermore, El Bilali (2019) adds deeply inherited cultural and societal values and climate change. These external trends and challenges are exerting pressure on niches and regimes (Lachman 2013, El Bilali 2018, 2019).
- *Meso-level:* The socio-technical regime incorporates the network of actors and social groups as well as the formal and informal rules, norms, material and technical elements

in order to maintain the existing socio-technical system (Lachman 2013, El Bilali 2018). Based on research on technological innovations, Geels (2004) identified six key dimensions of the socio-technical regime (industries, user preferences, scientific knowledge, culture, policy, technology) that account for its dynamic stability. As one of their main features, those key dimensions function as selection environments for innovations, influencing which novelties succeed and become embedded in society (Smith and Raven 2012, Mylan et al. 2019). According to the literature, regimes rarely attempt to transform themselves. Instead, regimes tend to stabilise and reinforce the status quo and are more likely to change incrementally (Lachman 2013, Göpel 2016, El Bilali 2018). The rules and practices around the current conventional industrial food system or the present energy supply system can be seen as examples for socio-technical regimes.

- *Micro-level*: In the literature, niches are defined as protected spaces where radical innovations and novelties are generated. Protection is offered against dominant rules (Geels 2002, Lachman 2013, El Bilali 2019) although scholars note that this protection should be of a temporary nature to avoid dependence and overprotection (Leeuwis et al. 2021). In niches, patterns of behaviour and action diverging from the incumbent regime come together. Niches provide learning spaces or possibilities to build alternative social networks (Geels 2002, Göpel 2016). They can adapt much more agilely to landscape pressures than regimes. In fact, innovations or novelties developed in niches can replace the incumbent regime (Geels 2002, Lachman 2013, El Bilali 2018). Alternative food networks, community supported agriculture (CSA) or alternative farming systems (e.g., organic, permaculture) are only few of the manifold examples for niche innovations in the agri-food sector (Geels 2019, Elsner et al. 2023).

The MLP describes a transition as a shift from one socio-technical regime to another (Geels 2002, 2019). In the ideal scenario, niche-innovations and/or landscape changes pressure the regime, leading to destabilisations of the existing regime. The arising window of opportunity provides a chance for (well developed) niche-innovations to diffuse and disrupt the incumbent regime (Göpel 2016, Geels 2019). However, the circumstances leading to transitions are individual in each case and different interactions can lead to regime changes. The internal forces of niche-innovations are as “seeds” important for transitions (Grin et al. 2010, Smith et al. 2010). Nevertheless, niches’ success and influence depend on evolutions at the other levels (Rotmans and Loorbach 2010, Van Poeck and Östman 2021), for instance, regime’s structure that needs to be overcome (Smith et al. 2010). With a lack of interaction with the other levels, niches won’t

turn into regimes (Bauknecht et al. 2015). Besides, Elzen et al. (2012) stress that niches often only link up to specific regime elements (technical, social) and usually do not occupy it entirely. Similarities between niches and regimes exist regarding their kind of structure, although to different degrees in size and stability. At both levels, networks of actors exist that share specific sets of rules. However, niche networks are smaller, less stable and uncertain with vague and imprecise rules. The loose structuration demands actors' dedication to sustain them (Grin et al. 2010) which is why niche expansion and long-term survival represents a challenge (Smith et al. 2010, Özatağan and Karakaya Ayalp 2021).

Criticism on the MLP is raised regarding a lack of attention to agency, the hierarchical, clear-cut distinction between the three levels (e.g., how to proceed with overlapping areas between the three levels), giving limited attention to politics and power or the specific focus on market actors while neglecting civil society ones, as well as the vague role of the landscape (Geels and Schot 2007, Vivero-Pol 2017, El Bilali 2018, 2019, Gernert et al. 2018, Geels 2019). Geels (2011, 2019) addressed some of these criticisms on the MLP and highlights that the MLP is a middle-range theory instead of “an all-inclusive systematic [...] unified theory” (Geels 2011, p. 26)) that needs to be adapted to the system in focus. For instance, regarding the hierarchical, clear-cut distinction between the three levels, Geels (2011) acknowledges that the word ‘hierarchy’ may be misleading and suggests to rather refer to different degrees of structuration and stability, dropping the ‘hierarchy’ notion in the MLP. Above that, combinations of MLP with other frameworks or theories could address other criticisms and/or open up new perspectives and possibilities. For instance, combinations of MLP with cultural sociology or discourse theory may allow to better elaborate on actors' agency in transition processes (Geels 2011, 2019).

Recent elaborations on the MLP include, among others, more nuanced interactions between the MLP levels such as the role of intermediary actors or political struggles between regime and niche actors (Hess 2014, Kivimaa et al. 2019a, Köhler et al. 2019), but also incumbency and incumbent regime actors are focused, including the institutional processes forming regime rules (Fuenfschilling and Truffer 2014, Geels 2014, Köhler et al. 2019). Recent studies show the existence of alignments and tensions within the niche but also within the regime (cf. Kuokkanen et al. 2018, Bui 2021). The stable and coherent regime understanding is broadened by a much more vividly evolving view where disagreements and uncertainty between actors may exist which highlights the fluidity of levels of the MLP concept (Elsner et al. 2023).

In summary, the MLP provides a framework to structure and analyse transitions, for instance, the activities of actors with respect to sustainability transitions of agri-food systems. Drawing on research on the MLP, further theories and concepts have been identified that engage more specifically with processes and dynamics in the context of sustainability transitions. In the following and relevant for this thesis, the protected space, anchoring mechanisms and the intermediary space will be discussed to dive deeper into the processes and interactions with other system elements that may enable system-level changes.

2.1.4 The concept of the protected space

Transition literature suggests that niches develop in protected spaces where the innovations are shielded against competition from the respective selection environment (selection environment as the surrounding influences determining which innovations break through). For instance, in the literature, protection for agri-food niches is offered through external funding, favouring policies or by municipalities (Elsner et al. 2023).

Generally, Smith and Raven (2012) define three functional properties of the protected space: (i) shielding, (ii) nurturing and (iii) empowerment. First (i), shielding, is understood as a process where dominant selection pressures are kept at bay and which evolves over time. Second (ii), nurturing, involves the assistance in learning processes, clearly articulated expectations and support in networking activities until the innovation becomes competitive. At that stage, protection becomes redundant as the niche is, third, “empowered” (iii) enough to compete with the incumbent regime to either *fit-and-conform* into the unchanged selection environment or *stretch-and-transform* through re-structuring the selection environment by suggesting, for instance, new norms (Smith and Raven 2012). For the investigation of agri-food transitions, Mylan et al. (2019) suggest the possibility of hybrid patterns of these empowerment processes where, for instance, fit-and-conform could appear in some domains (e.g., innovations suitable for current food chain stages) whereas in others, stretch-and-transform patterns are present (e.g., cultural meanings fundamentally change). In their analysis on a local movement to ban pesticides in Tirol, Italy, Holtkamp and van Mierlo (2022) refer to a process of *paving*, *networking* (e.g., cooperating with different groups from private, public realm) and *meaning-making* (e.g., framing a collective identity that motivates current and new participants) that they compare to Smith and Raven’s (2012) shielding, nurturing and empowerment. With *paving* they describe a pattern where civil society actors enhance their claims through the creation of political

opportunities (e.g., holding a local referendum, shifting local elites via elections and implementing citizens votes) (Holtkamp and van Mierlo 2022).

2.1.5 Niches linking to regimes: anchoring processes

Overall, the section above showed that protection can be offered by various actors or institutions that are investing time, effort or money to enable innovations to grow and compete with the incumbent regime. Beyond the concept of the protected space, anchoring mechanisms seem to play an important role for innovations' success where niches connect to regimes to shift dynamics towards system innovation (Elzen et al. 2012).

From a case study on energy consumption and inspired by Geels (2004) and Smith (2007), Elzen et al. (2012) developed the concept of anchoring that has been widely applied in research covering sustainability transitions in general but also in the agri-food sector (e.g. López-García et al. 2019, De Herde et al. 2020, Schiller et al. 2020, Seifu et al. 2020, Polita and Madureira 2021a). The concept of anchoring describes the unstable situation where niches interact with parts of the regime to create durable linkages. The authors explain this concept by referring to a fluid MLP framework where niche and regime overlap. Hybrid actors seem to play an important role in bridging these levels (Elzen et al. 2012). Niches anchor to regimes through three dimensions: first, network anchoring (e.g., building new social networks or groups around the novelty, inclusion of regime actors), second, institutional anchoring (e.g., new rules developed in relation to the novelty), and third, technological anchoring (e.g., technologies are further defined and thus, are becoming more specific). The first dimension refers to the actors that anchor (i.e., the *whom*) whereas the latter two address the object that anchors (i.e., the *what*) (Elzen et al. 2012). Indicators for network anchoring are the expansion of the network, an intensified exchange among actors, increasing interdependency and stronger coalitions (Leeuwis and Aarts 2011a, Elzen et al. 2012, Elsner et al. 2025a). Institutional anchoring may take place in three fields: economic institutions (i.e., market rules and arrangements governing economic activity (e.g., value chains, contracts)), interpretative institutions (i.e., people's sensemaking of themselves (e.g., identity) and the world, their beliefs or visions influencing their behaviour) and normative institutions (i.e., social values translated into normative rules (e.g., formally or informally desired by society) (Elzen et al. 2012, Schiller et al. 2020, Elsner et al. 2025a). During these linking attempts, uncertainty outweighs as innovations leave their protection behind (Elsner et al. 2025a). According to the founders, successful anchoring creating durable links takes place once all three forms of anchoring are present (Elzen et al. 2012, Bui et al. 2016).

Depending on the nature of the novelty (e.g., social movements), scholars might need to depart from that concept and adjust it towards the innovative activity in focus. For instance, Polita and Madureira (2021a) investigated short food supply chain initiatives (e.g., farmer's direct supply to consumers) and neglected technological anchoring. Moreover, scholars notion that anchoring processes can also occur between different niches, as mutual attempts for network formation or as answers towards the respective activities (Ingram 2015, Ingram et al. 2015, Polita and Madureira 2021a). While analysing an agricultural research for development project, Seifu et al. (2020) adapted the concept of anchoring and replaced technological with *methodological* anchoring which describes a process where regime actors are supported to learn or try the rules for application from new products or principles. Methodological anchoring strategies comprise training, workshops, sharing experiences or cooperative experiments. (Elsner et al. 2025a)

To summarise, anchoring mechanisms seem to play an important role for various actors and their contributions to sustainability transitions, also in the agri-food system. However, the types of anchoring mechanisms may be subject to the innovation or system in focus.

2.1.6 Transition intermediaries as bridgers between different structural levels

Thus far, the MLP has been presented with its three levels: niche, regime and landscape. The preceding section, describing the concept of anchoring, already hinted at the presence of *hybrid actors* who are bridging the niche and regime levels. Through their functions (i.e., the broader purpose an actor fulfils, achieved through the actor's activities) hybrid actors can play a supportive role in sustainability transitions.

Existing literature has pointed out that boundaries between the MLP levels are rather fluid than clear-cut (Geels 2011, Kivimaa et al. 2019a, Elsner et al. 2023). Different niches co-exist and roles of niche and regime actors can overlap. Thus, studies elaborate on an overlapping space between niche and regime and describe the respective actors as hybrid actors (Elzen et al. 2012), system orchestrators (Gomes and Barros 2022), change agents (Van Poeck et al. 2017), boundary spanners (Smink et al. 2015) or innovation intermediaries (Howells 2006, Klerkx and Leeuwis 2009). These actors have in common that they are brokering or bridging between different entities (e.g., producers and consumers; civil society and politicians), mediating and moderating interactions, facilitating networks and exchanges between different actors (Kivimaa 2014, Kivimaa et al. 2019a, Elsner et al. 2025b). In the sustainability transition literature, the term 'transition intermediary' seems to prevail and constitutes a rather recent research focus

(Martiskainen and Kivimaa 2018, Mignon and Kanda 2018, Kivimaa et al. 2019a, 2019b, 2020b). In distinction to other concepts in the literature, transition intermediaries are defined by their in-betweenness between two or more actors, their actions and the resultant scope of their activities (Kanda et al. 2020, Elsner et al. 2025b). Transition intermediary research deals with the role of those intermediary actors in advancing sustainability transitions as mediators, disseminators of information or connectors between different levels, in the sense of multilevel models such as the MLP (Kivimaa et al. 2019a, Kanda et al. 2020, Elsner et al. 2023, Elsner et al. 2025b). Conceptually, transition intermediaries bear on research on systems of innovation, niche intermediation, urban transitions or research and technology organisations (Nelson 1993, van Lente et al. 2003, Geels and Deuten 2006, Howells 2006, Klerkx and Leeuwis 2009, Kivimaa et al. 2019a, Elsner et al. 2025b).

Research on transition intermediaries elaborates on these intermediaries as key catalysts for sustainability transitions, addressing communicational challenges between actors due to, for instance, information asymmetries or lack of knowledge (Martiskainen and Kivimaa 2018, Kivimaa et al. 2019a, Elsner et al. 2025b). In the context of the MLP, research on transition intermediaries has thus far focused on the space between niche and regime levels. Scholars contributed to conceptualisations and understandings of intermediary typologies and levels (Mignon and Kanda 2018, Kivimaa et al. 2019a, Kanda et al. 2020), types in transition phases (Hyysalo et al. 2018, Kivimaa and Martiskainen 2018, Kivimaa et al. 2019b), functions of government-affiliated intermediaries (Kivimaa 2014) or the ecology of intermediation (Barrie and Kanda 2020, Soberón et al. 2022). Thus far, a large number of studies on intermediation have focused on the energy and housing sectors, with a primary concern for technological innovations and a focus on a single region or country (Hodson et al. 2013, Bush et al. 2017, Hyysalo et al. 2018, 2022, Martiskainen and Kivimaa 2018, Bergek 2020, Elsner et al. 2025b).

By examining the functions that actors perform, insights can be gained into their roles but also into the dynamics and interrelations involved in transition processes. Sustainability transition literature identified intermediary functions (around policy processes) from case studies in housing or energy systems, often inspired by strategic niche management literature (Kemp et al. 1998). Thereby, the studies focused on, for instance, government-affiliated intermediaries in energy in Finland (Kivimaa 2014), policy processes on energy efficiency in buildings in Finland (Kivimaa et al. 2020b), car-clubs in the Netherlands, heat pumps in Finland and low-energy homes in United Kingdom (Kivimaa et al. 2019b) intermediary organisations in wooden multi-

storey construction in Finland (Vihemaeki et al. 2020) or district heating projects in United Kingdom (Bush et al. 2017). Based on innovation and transition literature, Kivimaa (2014) differentiates between four intermediary functions: articulation of expectations and visions (1), building of social networks (2), learning processes and exploration at multiple dimensions (3) and other (4) (e.g. project design, management and evaluation, accreditation and standard setting). These functions have been further refined and extended with: mediating between actors, interests and contexts (5), innovation process management (e.g., project design, management, evaluation, mediation, resource procurement) (6), institutional support (e.g., advocacy and lobbying support) (7), and configuration of local technological assemblages (8) (van Lente et al. 2003, Stewart and Hyysalo 2008, Klerkx and Leeuwis 2009, Kilelu et al. 2011, Kivimaa 2014, Kivimaa et al. 2019b, Moreno-Serna et al. 2024).

In the field of policy work, three studies found the following intermediary functions, elaborating on zero carbon buildings in the United Kingdom (Martiskainen and Kivimaa 2018), wooden multi-storey construction in Finland (Vihemaeki et al. 2020) and policy processes on energy efficiency in buildings in Finland (Kivimaa et al. 2020b): advocating for new visions and new policy options (a), influencing political vision building, new legislation, standard setting (b), creating and managing networks lobbying for policies in favour of transitions or creating and managing public-private networks informing the government (c), policy design, translation, support and implementation (d), facilitating experimentation (e), aggregating expectations and learning, and translating knowledge to policymakers or stakeholders (f), aligning niche innovation with policy implementation (g), and resolving conflicts and building trust (h) (Martiskainen and Kivimaa 2018, Kivimaa et al. 2020b, Vihemaeki et al. 2020). Current insights into intermediary functions largely derive from research on the diffusion and development of a specific technological innovation and are based on a narrow set of cases (Martiskainen and Kivimaa 2018, Kivimaa et al. 2020b, Vihemaeki et al. 2020). Whether intermediary functions differ across other contexts, such as various sectors or geographical regions, remains to be explored.

In summary, MLP levels are rather fluid than clear-cut and intermediary actors perform different functions between the niche and regime levels, facilitating change. Differentiating the role of actors is important for the understanding of transition dynamics, uncovering enabling or constraining roles. As some global or supra-national agreements to sustainable development (e.g., Paris agreement on climate change, European Green Deal) are set in place and sustainability transitions of agri-food systems are ongoing transition processes, agri-food related initiatives

contributing to sustainability transitions of agri-food systems may not only be limited to the niche but may also be actors from other MLP levels, for instance, actors involved in intermediation of sustainability transitions. However, the current transition intermediary literature appears to predominantly focus on intermediation around technological innovations, leaving open the question of whether such intermediation activities are also present in other domains of innovations, such as social innovation processes.

2.1.7 Social innovations in sustainability transitions

In recent years, social innovations have received rising research interest among the scientific community, for instance, in empirical works on social enterprises or living labs, but also among policymakers who are incorporating social innovations into policy design, legislative frameworks, and funding structures (Engels et al. 2019, Pel et al. 2020, Rogge et al. 2023). However, attention has been drawn to the “conceptual ambiguity” (Van Der Have and Rubalcaba 2016, p. 1) of the term social innovation and the lack of “generic insights into the mechanisms and processes underlying SI [*author’s note: social innovations*] dynamics” (Pel et al. 2020, p. 2). As previously noted, the sustainability transition literature investigates the dynamics and processes underlying transitions of *socio-technical* systems. However, transition researchers also raised concerns that in transition research, the objects of study are often technological innovations with the *social* being merely secondary or unconsidered (Avelino et al. 2019, Wittmayer et al. 2022). In their systematic literature review, Elsner et al. (2023) show that agri-food niche innovations often seem to be socially driven novelties than solely of a technological nature. Thus, turning to the agri-food literature may offer valuable insights for social innovations.

In agri-food studies, the terms *alternative food networks*, *grassroots initiatives*, *civic food networks*, *short food supply chains*, or *local food networks* embody civil society initiatives and non-technological efforts that seek to challenge established social practices, social relations or structures (Michel-Villarreal et al. 2025, Simoens et al. 2025). For instance, Rossi and Bocci (2018) find that grassroots initiatives involved in the wheat-bread value chain in Tuscany (Italy) focus on meeting socially shared needs and achieving social advantages and thus, may enable deep system change. Juárez et al. (2018) discover that the movement “La Vía Campesina” has a transformative potential which is in empowering people globally through networking and knowledge circulation. Alberio and Moralli (2021) find that the alternative food network in focus intervenes at the level of social practices and social relations, between consumers and producers by opening up spaces for cooperation, exchange and experimentation.

However, the understandings of these civil society initiatives and their social efforts differ, and the terms such as *alternative food networks*, *grassroots initiatives* or *civic food networks* remain fuzzy in the literature, often adapted to the respective context (Zoll et al. 2021, Michel-Villarreal et al. 2025). Generally, the term *alternative food network* seems to describe (more sustainable) alternatives to the mainstream, such as alternative networks of production, consumption or distribution, deviating from the incumbent structures (i.e., the incumbent structures mostly understood as the conventional ways of producing, distributing, consuming food, characterised, e.g., by long supply chains, highly industrialised agriculture, use of monocultures, fertilisers or pesticides) (Alberio and Moralli 2021, Zoll et al. 2021, Michel-Villarreal et al. 2025). The use of the terms *civic food networks*, *short food supply chains*, or *local food networks* seem to reflect an intention to highlight particular aspects more explicitly, for instance, *civic* for civic actions, *short* in contrast to longer (incumbent) supply chains or *local* for a geographical distinction (Michel-Villarreal et al. 2025). As with the aforementioned terms, *grassroots initiative* is not sharply defined and seems to be understood as groups of people tackling perceived challenges through value-driven practices and alternative principles, deviating from the mainstream (Gernert et al. 2018, Kump and Fikar 2021). While these terms suggest a rethinking or reorganisation of dominant structures, practices, or ways in which food is produced, distributed, or consumed, the literature seems to fall short in conceptually capturing the nature of social alternatives (Alberio and Moralli 2021, Zoll et al. 2024, Simoens et al. 2025). Conceptualising terms and phenomena are essential for enabling a shared understanding and robust analysis, particularly when dealing with complex and contested issues. Terms can carry multiple meanings and can be applied differently depending on the context. Conceptual work helps to clarify and theoretically ground such terms, making them comparable and open to debate, and thereby laying the foundation for the scientific advancement of concepts (Glaser 2002). Above that, the *alternative food network* literature risks narrowing the understanding of social transformative approaches to those that are inherently bottom-up (e.g., civil society organised) (Simoens et al. 2025).

Within the sustainability transition research field, recent research has engaged with the criticism regarding the lack of conceptual clarity and generic insights on social innovations (Haxeltine et al. 2016, Avelino et al. 2019, Wittmayer et al. 2019, Pel et al. 2020, Wittmayer et al. 2022, Pel et al. 2023a). As a result, social innovation conceptualisations have been developed that draw largely on energy studies (Wittmayer et al. 2022). The authors understand social innovations as

innovations that deviate from the incumbent regime and involve changes in practices and social relations (Haxeltine et al. 2016, Pel et al. 2020). Social innovations are defined as new ways of doing (e.g., practices, habits), framing (e.g., visions, meanings), knowing (e.g., thinking, cognitive resources, learning) and organising (e.g., rules, value chains) that challenge dominant institutions (Pel et al. 2020, Wittmayer et al. 2022). *Transformative* social innovations are understood to contribute to transformative changes if they challenge, alter or replace dominant rules and institutions in the social context (Haxeltine et al. 2016, Avelino et al. 2019, Pel et al. 2020, Pel et al. 2023a, Elsner et al. 2025a). In the past, transition scholars analysed social innovations in energy systems and developed a typology of social innovations in energy, addressed the ‘dark sides’ of social innovations or theorised transformative social innovations (Haxeltine et al. 2016, Avelino et al. 2019, Wittmayer et al. 2019, Pel et al. 2020, Wittmayer et al. 2022, Pel et al. 2023a, 2023b). For the typology of social innovations in energy, Wittmayer et al. (2022) analysed the activities of energy initiatives across European countries. Thereby, they only considered the initiatives’ core activity instead of all their actions. Their analysis resulted in a matrix of types of social innovations that is divided into two domains: first, the social relations as social interactions inspired by Brinkerhoff et al. (2011) (i.e., cooperation, exchange, competition and conflict) and second, the manifestations (i.e., the new ways of doing, thinking and organising energy) (Wittmayer et al. 2022, Elsner et al. 2025a).

Apart from the opportunities of social innovation as drivers for societal change, they are also unpredictable experiments and by no means inherently “good” (Wittmayer et al. 2022). Social innovations are complex, multi-faceted and not always intentionally oriented towards social benefits (Avelino et al. 2019). Pel et al. (2023b) developed a heuristic that accounts for the “dark sides” of social innovation (e.g., unintended consequences, normative dilemmas, beneficiaries, legitimacy, ends and means). The heuristic is supposed to mediate along the extremes, between naïve optimism and paralysing critique and between intended and unintended consequences of social innovation and intends to counteract extreme viewpoints. (Elsner et al. 2025a)

Subsuming, the findings show that conceptually, social innovations are rarely taken into account in agri-food systems research. Above that, much of the conceptual work on transformative social innovations draws on case studies in the energy sector and recent literature calls for an expansion of social innovation research to a broader range of sectors (Wittmayer et al. 2022). In conclusion, this section 2.1 elaborated on the emergence and outreach of sustainability transition research, the understanding of sustainability transitions and dealt with the MLP as well

as the circumstances (i.e., protection) and strategies (i.e., anchoring mechanisms) for niches diffusion. Above that, it discussed the functions around policy work by intermediary actors as well as conceptualisations of social innovations. The first sections showed that transition research has made significant conceptual and empirical progress, although future research is expressed on the role of intermediary actors as well as social innovations. Above that, transition research could benefit from greater diversity as regards the applied methods, sectors, and geographical areas. Then, the MLP was presented as a useful tool to structure the activities and processes taking place. The concept of protection was introduced as a space where niche innovations are shielded against the unfavourable selection environment whereas anchoring processes were presented as niche's strategies to further develop and link their innovative ideas to the incumbent regime. However, the types of anchoring mechanisms may be dependent on the innovation or system in focus. Thereafter, section 2.1.6 introduced the intermediary actors as facilitators of change by mediating between niche and regime levels. However, it remains unclear whether intermediary functions differ across contexts and sectors. Moreover, the key characteristics that define intermediaries, such as type of organisation or intermediaries' relationship to government, remain to be investigated although this knowledge could enhance the understanding of the characteristics of actors engaged in transition processes. In the last parts, the concept of social innovation was introduced, together with a typology of social innovations in energy, which calls for an expansion of the typology to other realms. Here, it was presented that although agri-food literature provides insights into social innovations, the literature falls short in conceptualising their nature. Moreover, this literature seems to be limited to bottom-up approaches.

Given the focus of this research on agri-food systems, the subsequent chapter delves deeper into the characteristics of agri-food systems as well as system understandings in general.

2.2 Systems: the agri-food system

2.2.1 System theory and system understandings

The prominent phrase *the whole is greater than the sum of its parts* is inspired by the ancient Greek philosopher and polymath Aristotle. The exact choice of words does not directly originate from one of Aristotle's works. It is rather an interpretation of his thoughts, where Aristotle discusses wholeness and relationships between the whole and its parts (Aristotle BC350). The saying describes the idea that a system or organisation (i.e., the whole) is comprised of interconnected elements that, taken together in a specific way, show a specific property or result. For instance, the parts of a car such as engine, wheel or chairs (etc.) put together result in a system that drives from A to B (i.e., car) (Leeuwis et al. 2021). The word system seems to be borrowed from the Greek word *sýstēma* and the Late Latin word *systema*, meaning “whole assembled and structured from individual parts, union, group [...]” (DWDS n.d.). Meadows (2009) defines a system as “an interconnected set of elements that is coherently organized in a way that it achieves something” (p. 13). She further specifies that “a system must consist of three kinds of things: *elements*, *interconnections*, and a *function* or *purpose*” (p. 13) whereby Meadows (2009) highlights that the function or purpose seems to be the most crucial part. Thus, a system comprises of at least two elements that are in relationship to one another. This interconnection (and how it is organised/arranged) leads to a purpose that would not have been achieved by a single element alone (Leeuwis and Wigboldus 2017, Strassner and Kahl 2020, Leeuwis et al. 2021). The concept system theory is widely used for approaches to analyse or explain system structures or dynamics. However, there is no unified understanding of system theory or system approaches, not even within one research area, and different definitions, conceptualisations and methods exist to approach “systems”. Furthermore, even though researchers may talk about similar systems, they may hold different views and conceptualisations about how these systems evolve, function or how they can be influenced or intervened which complicates research, interpretations and outcomes (Leeuwis and Wigboldus 2017).

Fields such as natural sciences, information technology, organisational management or psychology use systemic approaches and ideas to explain system structures, system dynamics or system behaviours (over time). Thereby, scholars coined the development of system research within their respective field and beyond. For instance, the biologist Bertalanffy (1972, 2009) became interested in systems approaches by analysing (energy) metabolisms of organisms and inspired other scientific disciplines (Wuketits 1979). The sociologist Luhmann (1997) influenced the sociological system theory by focussing on unravelling the complexity of societal

systems and their sub-systems. The social scientist and futurist Dostal (2005) introduced the “Biomatrix systems theory” as a theory for organisational and societal change management. The concept integrates previous system concepts and theories into one paradigm and proposed ideas for new governance models. By drawing on system theories, the research group around Jay W. Forrester at the Sloan School of Management at Massachusetts Institute of Technology coined the concepts “systems thinking” and “system dynamics” (Meadows 2009). Richmond (1994), as part of that research group, defines system thinking as the “art and science of making reliable inferences about behavior by developing an increasingly deep understanding of underlying structure” (p. 139). Meadows (2009), similarly part of said group, argues that systems thinking is an approach to identify roots of problems and to manage and adapt to the wide range of choices as well as to address interrelated issues, for instance, the interrelated environmental, social or economic challenges the world faces. Inspired by the work in the group of Forrester, Senge (2006) applied systems thinking to organisational management and published “the fifth discipline”, a well-known work on organisational learning, addressing organisational problems from a systems perspective. Based on engineering and mathematics, the research group used computer models to simulate (and simplify) the consequences and the dynamics (i.e., *system dynamics*) of certain interrelations, functions and elements, for instance, to explore the dynamics of human population and economic growth on a finite planet which was used by the Club of Rome for the report “the Limits to Growth”(Meadows et al. 1972, Meadows 2009, Arnold and Wade 2015).

To understand and research systems, Meadows (2009) suggests, among other things, to simplify the system in focus by setting system boundaries. However, researchers need to be aware that in reality, there are no separate systems and that “the world is a continuum” (Meadows 2009, p. 97), an interrelated web of elements. Where and which boundaries are to be set depends on the research question or the purpose of the discussion (Meadows 2009, Leeuwis et al. 2021). Hence, to research systems, it may be valuable to delineate the system in focus by being aware of the limitations this approach entails (i.e., limitations of derived outcomes). In the past, researchers set system boundaries, for instance, based on geographical boundaries (i.e., delineated area), timeframe (e.g., focus on specific years), sectors (e.g., energy, mobility, agri-food), actors (e.g., government, society) or innovations (e.g., specific technology, social novelty) (e.g., Rossi and Bocci 2018, Alberio and Moralli 2021, Averbuch et al. 2021, Boillat et al. 2022).

2.2.2 System understandings in sustainability transition research

The literature on sustainability transitions suggests that the socio-(ecological-)technical changes are examined from a systems perspective (Rotmans et al. 2001, Planko et al. 2017), for instance, considering interactions between multiple social, political, environmental, economic and cultural aspects (Ben-Eli 2018). Thereby, a sustainable development of a system can only be achieved by transitions of all elements of the system (e.g., services, organisations, policy, value chain). In many transition studies, there is a (more or less) extensive theoretical examination of transition theory and models, whereas system theories or concepts are rarely dealt with. Many transition scholars adopt Geels' (2002) "socio-technical system" (cf., section 2.1.2) to refer to the system in focus (Leeuwis and Wigboldus 2017). Often, sustainability transition researchers assign the system thematically (e.g., mobility system, energy system, agri-food system). Then, they refer to and analyse sustainability transition processes within a domain of that thematic system (e.g., energy from glasshouses, wooden constructions, agroecology) (e.g., Elzen et al. 2012, Vihemaeki et al. 2020, Boillat et al. 2022) and/or within a specific delineated region (e.g., Gaddis and Jeon 2020, Boillat et al. 2022, Soberón et al. 2023) and/or temporally, within a predefined period (e.g., Dannenberg et al. 2020, Averbuch et al. 2021) to elaborate on transition developments, pathways, outcomes or to develop new theories. Thus, sustainability transition researchers seem to set system boundaries by delineating the system in focus thematically and/or temporally and/or spatially. Thereby, the normative direction is predetermined (i.e., sustainable development). However, as mentioned in section 2.1.2, sustainable development is an interpretative normative concept and the pathways to a sustainable system and the ideas of how that sustainable system may look like is dependent on the respective researchers' worldviews, understandings and assumptions (Susur and Karakaya 2021).

2.2.3 The agri-food system

The previous sections (i.e., 2.2.1, 2.2.2) show that systems are complex and composed of different interrelating elements. This has implications for researching systems and it is suggested to simplify the system's analysis by setting system boundaries (e.g., sectoral, geographical). This thesis sets a sectoral boundary, amongst other, and focuses on agri-food systems. Hence, this section dives deeper into previous agri-food system understandings and conceptualisations as well as sustainable agri-food systems. As this thesis considers the actor as a further system boundary, the subsequent sections (i.e., 2.2.4, 2.2.5) elaborate on actor's conceptualisations in research on agri-food related initiatives in greater detail.

Traditionally, agri-food systems were conceptualised as linear models with producers and consumers on opposite ends of a strand (Ericksen 2008, Stefanovic et al. 2020). Nowadays, understandings of and approaches to agri-food systems vary (Ericksen 2008, Leeuwis and Wigboldus 2017, Leeuwis et al. 2021). Circular understandings arose once non-linear interactions were considered (e.g., networks of farmers and consumers), including the multiple environmental, social, political and economic determinants that are influencing the agri-food system. Thus, a vital, multifaceted and interconnected model emerged, including not only the activities and their outcomes within the system but also the determinants influencing the system from the outside (e.g., policies, environment) (Ericksen 2008, Ericksen et al. 2010, HLPE 2014, Nesheim et al. 2015, Niles et al. 2017, Stefanovic et al. 2020).

Due to the aforementioned agri-food systems' multiple determinants, outcomes and activities, agri-food systems are regarded as complex, multilayered and dynamic socio-ecological-technical systems with individual or organisational actors showing competing interests, values and perspectives. These actors are involved and participate in various activities such as production, consumption, education or politics (Ericksen 2008, FAO 2018b, Leeuwis et al. 2021). Inspired by Meadow's (2009) "purpose" of a system, Leeuwis et al. (2021) call the interplay of the various agri-food system elements "emergent properties" and differentiate between desired (e.g., food security, health) and undesired properties (e.g., hunger, poverty, malnutrition). Those emergent properties (i.e., agri-food system outcomes) are strongly influenced by human activity and their interactions since different stakeholders interact with diverse interests, values and views resulting in unintentional effects and self-organisational dynamics (Deviney et al. 2021, Leeuwis et al. 2021). For sustainability transitions of such complex systems, this becomes especially relevant as the performance of the system is determined by those diverse actors (Ericksen 2008, Darnhofer et al. 2019, Köhler et al. 2019, Elsner et al. 2025a).

In the concept of sustainable agri-food systems, a normative dimension is introduced. The term implies that present dominant agri-food systems perform at considerable environmental, economic and social costs and that those dominant systems need to be changed (Ericksen 2008, HLPE 2014, FAO 2018b). The Food and Agriculture Organisation (FAO) and the High Level Panel of Experts on Food Security and Nutrition (HLPE) (2014) both define sustainable agri-food systems as systems that ensure food security and nutrition for all without compromising the economic, social and environmental foundation to achieve food security and nutrition for future generations. The definition includes not only the time perspective but pays also particular

attention to environmental, economic and social aspects. Some researchers expand this understanding by adding another level, the health pillar (Drewnowski 2018, Willett et al. 2019, Graça et al. 2022). However, in line with other sustainability or system conceptualisations, the term sustainable agri-food system is socially constructed in order to make sense of a complex phenomenon. Thus, its conceptualisation depends on researchers' individual assumptions and worldviews (Leeuwis et al. 2021).

As presented in this section, agri-food systems are composed of multiple social, ecological as well as technical elements. Agri-food system actors show competing interests and values, and they interact in different activities which in turn influence a sustainable development of this system. As already noted, this thesis utilises the MLP to analyse the activities of agri-food related initiatives in the context of sustainability transitions of agri-food systems. In order to better understand the concept of actors and their roles, particularly in the context of sustainability transitions, a brief conceptual section follows. Thereafter, research on agri-food related initiatives is presented followed by a summary of section 2.2.

2.2.4 Actors and their role in sustainability transitions

In the literature on sustainability transitions, a variety of actor types exist, with conceptual ambiguity (Farla et al. 2012, Avelino and Wittmayer 2016, Köhler et al. 2019). The term actor can refer to an individual person or a (legal) entity (e.g. firm, organisation, association) (Avelino and Wittmayer 2016). Transition scholars use different categorisations to differentiate the actors (or their activities or roles) in focus. These differentiations seem to be based on first, the structural levels of the MLP or second, sectoral levels (Avelino and Wittmayer 2016, Kivimaa et al. 2019a, Stöhr and Herzog 2022). First, scholars categorise actors to the structural levels of the MLP, i.e., niche, regime, landscape (and intermediary) (Grin et al. 2010, Kivimaa et al. 2019a). Second, actors can be distinguished by sectors (e.g., state, civil society, market) (Farla et al. 2012). For the conceptualisation of (shifting) power relations between actors in sustainability transitions, Avelino and Wittmayer (2016) propose a nuanced sectoral categorisation and differentiate between four sectors: state, market, community (e.g. household, families) and a fourth domain. In addition, the authors distinguish these four sectors along three axes: informal – formal, non-profit – for profit and public – private. They characterise the state as non-profit, formal and public; the market as formal, private and for-profit; and the community as private, informal and non-profit. Avelino and Wittmayer (2016) describe the fourth domain as an in-

between area between the three other sectors, including actors such as, social entrepreneurships, social enterprises or research institutions.

For the analysis of actors (changing) interactions and relations in sustainability transitions, Wittmayer et al. (2017) propose the term “role”. The authors base their suggestion on a review of different role theories in sociology and refer to a conceptual ambiguity of the term *role* in the literature, dependent on the respective ontological perspective (e.g., functionalism, interactionism and constructivism). For sustainability transition research, Wittmayer et al. (2017) propose the definition of roles as “shared understandings, which can be described as a set of recognizable activities and attitudes used by an actor to address recurring situations” (Wittmayer et al. 2017, p. 7). Wittmayer et al. (2017) adopt the view that actors can relate to the role concept as a shared reality or common ground (i.e., reality of presence of roles). However, roles can change, and individuals can use roles to receive access to resources, such as cultural, social, material ones, or individuals can define themselves through the roles they take on. Above that, roles can also be projected onto actors, negotiated by society, implying specific desires, expectations or problems (e.g., societal negotiations on the roles of policymakers). Hence, roles are also socially constructed, i.e., dependent on social interactions or human perceptions (Wittmayer et al. 2017).

For sustainability transition research and from their review of roles in sociology, Wittmayer et al. (2017) derive three key findings: first, a single role is connected to other roles and role changes influence these other roles. From this perspective, the authors derive two objects of analysis: the *single role* and a *role constellation* (i.e., a co-evolving and interacting web of single roles). Second, roles can be analysed at a specific moment (i.e., point in time) or over time. And lastly, the usage of roles can be investigated to derive insights on the purposeful contribution of actors in transitions or their struggles in understanding and using their roles for specific goals.

Generally, it must be noted that the classification of actors into categories or roles simplifies the analysis. One actor can have multiple roles or role-sets (e.g., a person as an individual, working in a company and active in social movements; a politician who is also a citizen, but also a mother) (Merton 1957), meaning that a clear categorisation does not fully reflect reality and represents merely a simplified view of an actor and their role. In their role conceptualisation, Wittmayer et al. (2017) only very briefly touch upon the perspective that an individuum

can have multiple roles, but they do not seem to consider this further for their concept. This might be explained by their focus on proposing a role conceptualisation for interactions of and relations between roles in transitions. It remains open whether the concept of *role constellation* could also be transferred to an individual and its multiple roles in society.

In summary, in transition research, actors are understood as individual or organisational entities and can be categorised into structural or sectoral levels. An actor's role is the summary of an actor's activities and attitudes in relation to recurring situations and influenced by the respective social and structural setting. The analysis of actors' roles provides insights on actors' (intended) contribution to sustainability transitions, for instance, through their activities and the circumstances shaping these activities such as drivers or barriers. The remainder of the theory chapter deals with research on initiatives active in the agri-food system, in preparation for this thesis' research object: agri-food related initiatives (cf., section 3.2).

2.2.5 Initiatives in agri-food systems: activities, barriers and supportive conditions

The term *initiative* stands for “a new plan or action to improve something or solve a problem” (Cambridge Business-English Dictionary 2014a). Hence, the term describes alternative approaches, ideas or activities, deviating from something that needs to be improved. In agri-food research, the term is often used to describe groups of human actors that are engaging in alternative activities, deviating from the incumbent practices or rather from the mainstream (e.g., the conventional ways how food is produced, governed, regulated, consumed) (e.g., Anderson et al. 2019, Boillat et al. 2022). The researched agri-food related initiatives and their activities are particularly oriented to contributing to a more sustainable agri-food system, or elements of it, by challenging and replacing non-sustainable practices and structures with alternative approaches (e.g., Anderson et al. 2019, De Herde et al. 2020, Sarabia et al. 2021, Boillat et al. 2022).

In the literature, the initiatives work on, e.g., alternative agricultural practices, for instance, agroecology, organic agriculture, sustainable pest management or high tech urban agriculture (e.g., Anderson et al. 2019, Heyen and Wolff 2019, Hosseinifarhangi et al. 2019, Schiller et al. 2020, Bui 2021, Contesse et al. 2021, Salavisa et al. 2021, Boillat et al. 2022); alternatives to dominant food supply chains, such as food purchasing groups, farmers markets, collective for community gardens, community supported agriculture or alternative food networks (e.g., Nost 2014, Rut and Davies 2018, Long et al. 2019, McInnes 2019, Belda-Miquel et al. 2020, Kump

and Fikar 2021, Polita and Madureira 2021a, Van Poeck and Östman 2021); changing food consumption patterns, for instance, eco-friendly free school lunches (Gaddis and Jeon 2020); local agri-food policies (Giambartolomei et al. 2021, Range et al. 2023); or organisational matters such as developing a participatory certification for organic agriculture (Anselmi and Vignola 2022). The agri-food research on initiatives primarily relies on qualitative case studies carried out in one specific region, investigating a small number of initiatives within a particular agri-food domain (e.g., agriculture) (Elsner et al. 2023).

The section 2.1.7 on social innovations in sustainability transitions already indicated that the view on agri-food related initiatives engaged in sustainable development is often limited to bottom-up initiatives or civil society movements. In the analysis using multi-level models such as the MLP, the role of these initiatives is primarily understood as that of niche actors. They are situated at the niche level and described accordingly as niche initiatives (Rut and Davies 2018, Anderson et al. 2019, De Herde et al. 2020, Gugerell and Penker 2020, Sarabia et al. 2021). However, as mentioned in section 2.1.6, sustainability transitions of agri-food systems are ongoing transition processes (in contrast to past and concluded transitions such as the transition from horse-drawn carriages to cars (cf., Geels 2005b)) and some global or supra-national agreements to sustainable development are set in place (e.g., Paris agreement on climate change, European Green Deal). Thus, it is worth questioning whether all of those initiatives and activities can still be limited to the niche. Hence, it may be valuable to assign the initiatives and their actions to structural levels based on the empirical data and the analysis and to refrain from designating actors' actions *ex ante*, i.e., prior to the analysis, for instance, to the niche or regime (as proposed by Geels (2011), Bui (2021)).

As described in the previous section, the roles actors take are shaped by social interactions or the respective surroundings. The challenges and drivers actors face influence actor's activities and thus, their (potential) contribution to their envisioned goals, e.g., to sustainability development of agri-food systems (Wittmayer et al. 2017). The agri-food literature identified diverse barriers but also favourable conditions for initiatives actions. The barriers can be assigned to two levels, i.e., first, within the niche, and second, outside of the niche. First, niche level barriers can be further divided into internal (within the group) and external (other niche actors) aspects. For instance, Anselmi and Vignola (2022) investigated participatory guarantee system initiatives in Costa Rica and found that the underlying motivations between members within the initiative highly differed, leading to disagreements on the group's organisation and

management issues, hindering a further progress. Other internal challenges identified by scholars comprise a lack of professionalisation and business experience, members opting out due to emotional and physical overexertion, but also a lack of different resources, such as lack of time or personal resources (Henfrey and Ford 2018, Salavisa et al. 2021, 2021, Anselmi and Vignola 2022). As external barriers, Salavisa et al. (2021) found a certain kind of rivalry among similar groups engaged in sustainable development while analysing organic farming initiatives in Lisbon metropolitan area. Second, barriers outside of the niche comprise, among other things, bureaucracy, institutional and legal frameworks or policies (e.g. Schaffer et al. 2019, De Herde et al. 2020, Gugerell and Penker 2020, Salavisa et al. 2021, Sarabia et al. 2021, Anselmi and Vignola 2022). For instance, a challenge constitutes the demanding requirements regarding organic certification (Salavisa et al. 2021) or the existing infrastructures (De Herde et al. 2020, Deviney et al. 2021, Salavisa et al. 2021).

Conditions that are perceived as conducive by agri-food related initiatives engaged in sustainable development come again from, first, the niche level, and second, outside of the niche. First, on the niche level, sharing visions and narratives of the transition process among niche actors are identified as relevant in order to expand niche's ideas and mobilise alliances (Belda-Miquel et al. 2020). Furthermore, networking activities and partnerships between different niche initiatives comprise an often-reported driver for initiatives' development, for instance, as regards to knowledge exchange, creating a sense of belonging or sharing practical experiences (Anderson et al. 2019, Belda-Miquel et al. 2020, Farhangi et al. 2020, Gugerell and Penker 2020, Salavisa et al. 2021, Özatağan and Karakaya Ayalp 2021). Second, outside of the niche, multi-actors exchanges and networks with actors from different domains (e.g., politics, research, private realm) are perceived as conducive by niche actors (Farhangi et al. 2020, Gugerell and Penker 2020, Salavisa et al. 2021, Özatağan and Karakaya Ayalp 2021). Specifically, municipal actors are often perceived as favourable to the groups' activities (Rut and Davies 2018, Hosseinifarhangi et al. 2019, López-García et al. 2019, Gaddis and Jeon 2020, Özatağan and Karakaya Ayalp 2021, Giagnocavo et al. 2022) as they seem to be closer connected to the population and the specific spatial area (López-García et al. 2019) and are therefore supportive to niches' development. Then, crisis like the financial crisis or climate change are identified as stimulators to niche developments (Hosseinifarhangi et al. 2019, Salavisa et al. 2021) as they, for instance, encouraged farmers to enter organic agriculture or raised interest in food growing due to environmental concerns (Salavisa et al. 2021).

In conclusion, section 2.2. presented different system theories, understandings and conceptualisations and showed that there is no single, unified understanding. Nevertheless, the presented concepts suggest that systems are complex and composed of different interrelating elements which has implications for the research of systems. Here, it is recommended to simplify the system's analysis by setting system boundaries (e.g., sectoral, geographical). As this thesis sets a sectoral boundary (i.e., agri-food), amongst other, and as this work focuses on agri-food related initiatives as an actor, agri-food system understandings and conceptualisations were presented as well as actors and their roles in sustainability transitions and research on agri-food initiatives. Section 2.2.3 showed that agri-food systems are composed of multiple social, ecological as well as technical elements, with actors showing competing interests and values, interacting in different activities. These circumstances influence sustainability transitions of agri-food systems. Section 2.2.4 elaborated on the concept of the actor in sustainability transitions and its role. The section showed that an actor's role is the summary of the actor's activities, attitudes in relation to recurring situations but also influenced by social relations or surrounding factors, such as challenges and drivers. The last section presented agri-food research on initiatives and demonstrated that initiatives are understood as alternative approaches, ideas or activities, deviating from the incumbent practices or mainstream, aiming to contribute to a sustainable development of the agri-food system. However, drivers and barriers influence the initiatives' activities, their roles and thus, the intended contribution to agri-food system change. In agri-food research on initiatives involved in sustainability transitions, the role of the initiatives appears to be primarily situated within the niche, between developing alternative approaches to the dominant regime and implementing them. However, as some transformation processes towards sustainable agri-food systems are also initiated at other levels (e.g., through political frameworks), it raises the question of whether the role of initiatives is truly limited to the niche.

Chapter 3. Research objectives and research design

“What we observe is not nature itself, but nature exposed to our method of questioning”

– Werner Heisenberg

3.1 The underlying ontology and epistemology of this thesis

A researcher’s beliefs and assumptions influence how the nature of social reality is perceived and account for the respective world view (Healy and Perry 2000, Johnson and Onwuegbuzie 2004). Hence, a researcher’s beliefs and assumptions shape the respective research and thus, the chosen methodology. This thesis’ underlying assumptions are grounded in the belief that ontologically, socially constructed realities but also “mind-independent realities” exist. *Id est*, a positivistic worldview (and its variants) and a constructivist worldview (and its variants) have both their ‘raison d’être’ and are not mutually exclusive (Shan 2022). Thus, knowledge can be both socially constructed and rooted in mind-independent realities (cf., Johnson et al. 2007, Johnson 2017, Shan 2022). Thereby, dialogue and synthesis between different theories and methods may lead to gaining deeper knowledge about complex phenomena. Consequently, different ways of gaining knowledge should be carefully considered and chosen based on the respective research needs (Johnson 2017). The described position and assumptions may relate best to “dialectical pluralism”, a philosophical foundation incorporating multiple paradigms where tensions between multiple ontologies are regarded as strengths as no single perspective and resultant method is capable of capturing a complex phenomenon as a whole (Johnson 2017, Shan 2022). Due to the resultant versatility of ways of gaining knowledge, these combinations may allow to approach especially complex, uncertain and normative phenomena, i.e., sustainability transitions. Johnson (2017) highlights that the use (or outcome) of dialectical pluralism differs among researchers, based on team or project specificities and needs. To support this process, guiding principles are provided that give structure and offer impulses for reflection. These impulses comprise: identifying the (individual’s, project’s) ontological commitments (ontology), consulting multiple epistemologies to determine what is epistemically relevant and important for each specific research project (epistemology), stating individual’s explicit and implicit values (ethics) and lastly, “dialectically listen and consider multiple methodological concepts, issues, inquiry logics, and particular research methods and construct the appropriate mix for each research study” (methods) (Johnson 2017, p. 12).

For this research, this thesis author assumes an objective reality that is independent of subjective views on the one hand (i.e., climate change resulting from human activities and the resultant need for sustainability transitions; sustainability transitions as real processes). On the other hand and at the same time, it is acknowledged that there are deeper, structural mechanisms and forces behind real phenomena that are yet to be known of which some may remain socially constructed, e.g., due to multi-actor involvement and diverging perceptions; humans making choices that defy clear logic; knowledge mediated by (power) positions of people in social systems (cf. Belda-Miquel et al. 2020, Shan 2022). These deeper structural mechanisms and forces result from complex, dynamic interdependencies of social, political, economic or ecological elements that come into play, for instance, in sustainability transitions. Interdependencies can occur between different entities, such as actors, but also between other elements existing within the system, including political requirements, societal expectations, and available resources, which may be perceived as either enabling or constraining. Thus, unravelling these structures and interdependencies is of crucial importance (i.e., to receive a better understanding of the dynamics and processes in sustainability transitions).

Accordingly, the epistemic interest of this thesis is to gain a deeper understanding of how actors aim to solve sustainability dilemmas. As noted in section 2.2.1, system analysis is complex, and it is suggested to simplify the analysis by setting system boundaries (at the same time being aware of the limitations of this approach). Hence, this thesis sets a system boundary at the actor level (amongst other) and focuses on unravelling the role of agri-food related initiatives (AFI) and their envisioned contribution to sustainability transitions. Thereby, the analysis draws on the initiatives' activities and functions and the interdependencies with other system elements, here understood as the factors influencing their actions (i.e., enabling or constraining conditions, relationships to other actors such as governments).

Given the normative orientation of the concept of sustainability, the approach of this thesis to sustainable agri-food systems will be clarified. The starting point of this investigation is the widely accepted view that there is a need to shift away from unsustainable practices. Sustainable development represents a normative, interpretative, open-ended process (Ramsey 2015, Köhler et al. 2019). In that regard, this thesis author is interested in how AFIs see this reality and construct their answers accordingly, i.e., which activities the initiatives propose and the functions they exercise to bring about change. The AFIs' activities are considered as 'activities towards a sustainable development' if they propose new ways within the dimensions of a sustainable

food system (environment, social/cultural, economic, health/nutrition). This is pragmatically approached by taking agri-food related initiatives' expressed willingness of changing dominant local practices or structures within these dimensions as a starting point for the selection and analysis. However, the analysed activities and functions of AFIs are considered as *intended* or *envisioned* within the context of this thesis, as the analysis is based on data collected at a specific moment in time and therefore does not allow for conclusions about the eventual outcomes of the transition process, or how the AFIs actually contributed in retrospect.

3.2 Research objectives and research question of this thesis

Transition theory, transformative social innovation research and the developed frameworks are considerably shaped by studies on energy or mobility systems, alongside contributions from other systems (Geels 2002, Wittmayer et al. 2022). Against this backdrop, this thesis expands especially transformative social innovation conceptualisations and intermediary research to the agri-food system. Although the agri-food system experienced an upswing in transition research, it remains a central field of study due to its considerable potential for its contribution to a sustainable development and the wide range of actors involved. Research on actors who actively seek to contribute to sustainability transformations provides insights into strategically relevant entry points for fostering engagement, as well as into the tensions, goal conflicts, collaborations, and resource conditions under which these actors operate. The research focus of this work is on initiatives engaged in agri-food system sustainability transitions: *agri-food related initiatives (AFIs)*. For this work, AFIs are understood as “a new plan or action to improve something or solve a problem” (Cambridge Business-English Dictionary 2014a) (cf., section 2.2.5) active within the agri-food system and exerting regular activities towards sustainable development. In doing so, the AFIs expressed willingness of changing dominant local practices or structures is taken as an entry point for the selection of initiatives. Thus, a ‘case-lens’ is applied where the *sustainability in activities towards sustainable development* is approached through initiatives' own sustainability understanding and perceptions within the dimensions of a sustainable agri-food system (cf., section above, 3.1). Through this case-lens, this work aims to unravel the role of AFIs through initiatives' activities and functions as well as the factors influencing AFIs actions, here understood as the interdependencies with other system elements (i.e., enabling or constraining conditions, relationships to governments). To derive diverse insights on the role of AFIs, several geographical areas are selected. These geographical areas are chosen based on contacts to research institutions on-site that facilitated access to the respective AFIs.

Similar to other sustainability transitions researchers, this work sets system boundaries thematically (i.e., agri-food), spatially, (i.e., the geographical areas in focus), temporally (i.e., a specific moment in time as the moment of data collection) and on an actor level (i.e., agri-food related initiatives) (cf., section 3.3).

In conclusion, the aim of this thesis is to elaborate on how AFIs engage in changing their agri-food system, the functions they perform as well as the influences that affect their activities. Hence, the main research question guiding this thesis is:

How do agri-food related initiatives aim to contribute to sustainability transitions of agri-food systems?

To address the primary research question and consistent with the cumulative design of this thesis, the aim of this work is threefold: first, this thesis aims to provide a systematic overview of the state of the art of recent uses of MLP in research on agri-food system sustainability transitions (cf., Chapter 4 – first publication). This systematic review paves the way for this thesis further empirical research and thus, lays a first groundwork for the investigation of the research object: AFIs. Thus, the first sub-question comprises:

1. How is the MLP framework applied in recent research on agri-food system transitions?
(see Chapter 4, first peer-reviewed publication, published in 2023 in Journal *Frontiers in Sustainable Food Systems* (Elsner et al. 2023))

In a second phase, this work empirically elaborates on the patterns through which socially innovative AFIs engage in changing social relations (i.e., the activities AFIs perform to engage in change). Inspired by the typology of social innovation in energy by Wittmayer et al. (2022), the analysis focuses on the mechanisms through which these innovative activities are implemented. Beyond that, the anchoring mechanisms (to find out how they engage with incumbent structures) as well as drivers and barriers (i.e., influencing factors) these AFIs are facing are investigated (cf., Chapter 5 – second publication). Consequently, the second sub-question is as follows:

2. *How do socially innovative agri-food initiatives aim to transform the incumbent local regime, and which challenges and opportunities do they face?*

(see Chapter 5, second peer-reviewed publication, published in 2025 in *Journal Agriculture and Human Values*, Springer Nature (Elsner et al. 2025a))

Lastly, this thesis focus' shifts to a specific group of AFIs: Food Policy Groups (FPGs). The findings from the second sub-question (cf., Chapter 5) reveal that while some AFIs and their activities can be assigned to the niche, others already take on intermediary functions, facilitating coordination and exchanges between niche and regime levels. Building on these insights, this thesis zooms in on FPGs as intermediary actors. FPGs are multi-actor platforms and place-based approaches to resolve agri-food policies and practices and thus, contribute to the governance of agri-food systems. FPGs act at the interface between civil society, science, policy and practice and bridge between those diverse actors, aiming for sustainability transitions of agri-food systems. Hence, they can be seen as intermediary actors, mediating between different actors (den Boer et al. 2023).

FPGs are well-suited for a further investigation of intermediary actors in agri-food sustainability transitions as they are internationally widespread and operate under a relatively shared understanding, despite exhibiting internal diversity (e.g., bottom-up but also top-down initiated and organised) (cf., Santo and Moragues-Faus 2019, Sieveking 2019, Schiff et al. 2022, den Boer et al. 2023, Godrich et al. 2023). Thus, FPGs offer the opportunity to examine intermediary practices around the governance of agri-food system transitions across different geographical contexts, allowing for an identification of recurring patterns and contextual nuances. Hence, the empirical investigation aims to provide insights on agri-food related intermediaries' functions around policy work, their policy priorities, their organisational structures and their relationships to government across three geographical areas. Then, the aim is to elaborate whether organisational forms or relationships to government determine the agri-food related policies an FPG focuses on (i.e., do specific types or relationships increase the likelihood to focus on a specific agri-food related policy domain). This can further contribute to deepening the understanding of the role of AFIs (e.g., as niches, as intermediaries), particularly their functions and activities, as well as the factors that shape or influence these functions and activities under investigation (cf., organisational forms, relationships to government). Accordingly, the following third sub-question emerges:

3. *How are the policy-related functions, organisational forms and relationships to government of FPGs across three geographical contexts distributed, and is there an association between the organisational form or relationship to government and the policy priorities an agri-food related intermediary focuses on?*

(see Chapter 6, in review process in *Environmental Science and Policy*, Elsevier (July 2025))

By intermediary functions, this researcher understands the roles (around policy work) intermediaries play in sustainability transitions (e.g., influencing political vision building, facilitating collaborations among diverse actors in agri-food policy development) which are pursued through different activities. By organisational form, this researcher refers to the type of organisation (e.g., grassroots coalition, non-profit, FPG embedded in government). By relationship to government, the nature of the connection is understood (e.g., FPG supported by government, FPG members appointed by government, government seeking advice from FPGs). (Elsner et al. 2025b)

To address the main research question (including its three sub-questions), this thesis draws on transition research and transformative social innovation conceptualisations. Specifically, this thesis relies on first, the MLP, second, the concept of the protective space as well as anchoring mechanisms, third, on transformative social innovation conceptualisations and lastly, on intermediary research. First, as the MLP proved useful as a middle range framework to delineate the processes and dynamics involved in transitions (Geels 2011, 2019, 2020, Lachman 2013, Köhler et al. 2019), the framework is used to structure the AFIs' functions and activities taking place. Second, the concept of the protective space as well as anchoring mechanisms serve as concepts to elaborate on the AFIs strategies to develop and link their innovations to the dominant regime (Elzen et al. 2012, Smith and Raven 2012). Third, during the iterative research process, the AFIs were initially approached exploratively, meaning that there was no focus on social innovations from the outset. However, during the analysis, it became apparent that the AFIs' activities can largely be classified as socially innovative which is why the scheme of analysis was reconsulted and adapted accordingly. For this, this thesis draws on the concept of transformative social innovations (Pel et al. 2020, Wittmayer et al. 2022) that defines social innovations as transformative if they challenge, alter or replace dominant rules and institutions in the social context. However, it must be noted that this thesis does not elaborate on the actual impact the initiatives have and can thus not derive any conclusions about their actual

transformative potential. Lastly, this thesis draws on transition intermediary research (Kivimaa et al. 2019a, Kanda et al. 2020) to further differentiate between the AFIs' functions and activities within the MLP.

Subsuming, this thesis focuses on the functions of AFIs in sustainability transitions of agri-food systems and the activities they perform to realise their goals as well as the influencing factors in this endeavour. For this, the terms *functions*, *roles* and *activities* need further explanations and to be distinguished from each other. In the context of this thesis, the *activities* refer to the specific actions that an AFI carries out, for instance, farming according to agroecological principles, organising an organic farmers market or collecting food surpluses from farms. The *functions* refer to the broader purpose an initiative fulfils. This purpose is achieved through the activities or actions that are carried out by the initiative. For instance, an AFI organises a local farmers market (i.e., *activity*). By doing so, the AFI enhances local food accessibility, shortens food supply chains and connects farmers with consumers (i.e., *function*). In many cases, the activities have the function to contribute to an overarching goal (cf., Hekkert et al. 2007), e.g., sustainable development or sustainability transitions of agri-food systems. The *role* refers to one AFI and is defined by the AFI's activities and functions towards sustainable development that are being undertaken at a specific moment in time (cf., time of data collection) (cf., Wittmayer et al. 2017). Beyond that and in the context of this thesis, the concept of role also includes the influencing factors (e.g., drivers, barriers, an AFI's structure) an AFI is exposed to or experiences. Thus, it is assumed that actors can actively shape and influence their role but are at the same time influenced by their surroundings (e.g., culture, society, norms, values) (cf., Turner 1990, Wittmayer et al. 2017). The concept of role extends that of function by also encompassing the influencing factors.

For this thesis, the focus is on the role of AFIs. Here, an AFI is understood as an entity which allows for an analysis of the AFI's strategic or institutional role in sustainability transitions, such as the function an AFI takes in the context of transitions or its positioning to other actors and institutions. The focus of an AFI as an entity further allows to situate the AFI and its activities within broader conceptual frameworks, for instance, within multi-level models such as the MLP. However, it is acknowledged that an AFI (and its role) is influenced by its composition of individuals (and the role(s) these individuals represent). Though the constellation of individuals and their roles within the AFIs is not in focus of this research, it comprises a future research avenue.

3.3 Research design

As outlined in section 2.1.1 and in Chapter 4 (Elsner et al. 2023), in-depth case studies are frequently conducted in transition as well as agri-food research and offer rich insights into a small number of actors. However, research that includes multiple cases provides the benefit of enabling the identification of recurring patterns as well as contextual nuances across a broader set of cases and thus, addresses the breadth of cases across, for instance, geographical areas. This corresponds to an analysis of multiple cases on a *higher level of abstraction*, in contrast to in-depth research on individual cases and their specific contexts. Accordingly, a methodology is chosen that allows for an investigation of this broader level.

Based on the above-described research question (including its sub-questions), a mainly explorative research design with descriptive and explanatory elements is chosen. Due to the *how*-nature of the primary research question, this thesis follows a mainly explorative approach as it aims to explore *how* AFIs engage in changing their local food system, adapting, for instance, previously developed frameworks from research on energy systems to the agri-food system. Some research phases are rather descriptive, i.e., the analysis of the organisational forms or relationships to government whereas other parts are explanative, i.e., analysing relationships between initiatives' organisational forms or relationships to government and policy focus. Research designs containing explorative elements pose challenges in formulating a detailed and precise research plan prior to conducting the research. Due to the mainly explorative approach of this thesis, a flexible research design is chosen which is continuously adapted throughout the research process (cf., Figure 2). Hence, this thesis follows an iterative process where each step informs the next, allowing for continuous refinement of the research questions and methods. An example from the research process serves to illustrate this approach: from the outset, the AFIs were approached exploratively, meaning that initially, there was no focus on social innovations. During the analysis, it became apparent that the AFIs' activities can largely be classified as socially innovative which is why the scheme of analysis was reconsulted and adapted accordingly.

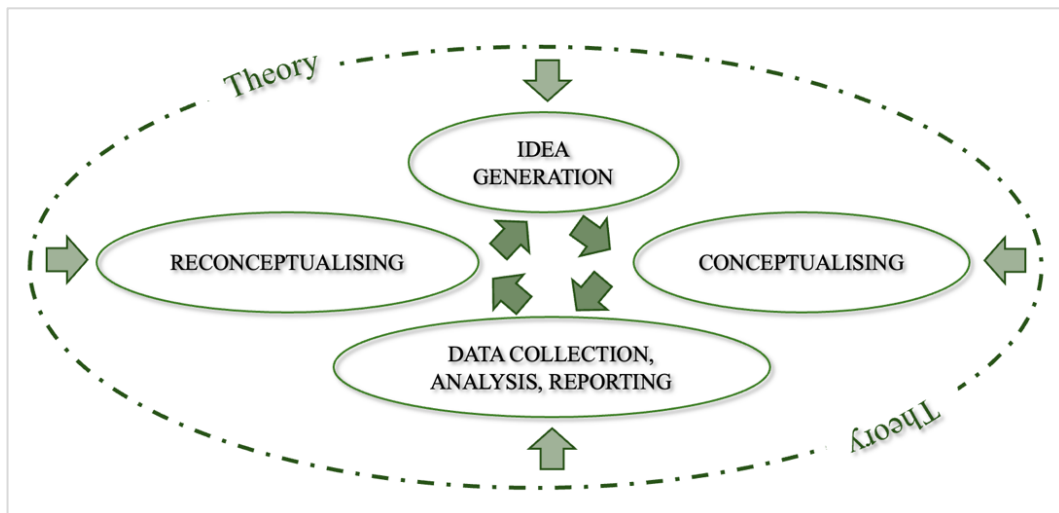


Figure 2: Overview of this thesis's iterative research process.

In order to answer the selected research question(s) applying an explorative research design containing descriptive and explanative elements, this thesis draws on a mixed-methods approach meaning that methodologically, both qualitative and quantitative elements (i.e., methods, data, analysis) are employed. Due to the versatility of mixed methods approaches and a lack of a consensual definition (Creswell and Plano Clark 2018, Shan 2022), the chosen approach will be further specified. In the literature, mixed-methods research is described as a third research paradigm, next to quantitative and qualitative research, connecting the strengths and minimising the weaknesses of both approaches. A central characteristic of mixed-methods research is its methodological pluralism where quantitative and qualitative research methods can be combined (Johnson and Onwuegbuzie 2004). Qualitative elements are chosen as they are useful to study complex phenomena (i.e., sustainability transitions and involved actors) and as they allow to receive an understanding of the research objective's experiences and how this research object constructs its answers to complex phenomena (i.e., how AFIs approach sustainability problem and which solutions they propose). The quantitative elements are chosen to analyse relationships between certain aspects (e.g., if the organisational forms or relationships to government influence the domain of policy work an FPG focuses on).

The actual methodological steps taken for this thesis are outlined in Figure 3. The consecutive and partly parallel research steps are divided into four domains: conceptual steps, research methods, analytical steps and dissemination activities. Chronologically, three consecutive phases follow one another that resulted in this thesis's three publications (cf., Elsner et al. 2023, 2025a, 2025b). Phase one was characterised by the design and conceptual development of the research, including comprehensive and systematic literature reviews. Based on this, a research

design was developed and conducted that included data collection and analysis (Phase 2: empirical implementation). Building on the findings, a re-conceptualisation was undertaken, that is, the insights gained led to a sharpening and adjustment of the research focus (in this case, towards the study of intermediaries). The revised research design was then implemented in a second round (Phase 3: empirical implementation (refined)). As illustrated in Figure 3, the phases are interlinked and overlap, due to the exploratory nature of the study and its iterative approach.

Next to the three peer-reviewed publications (cf., Elsner et al. 2023, 2025a, 2025b), further research results and research ideas were presented at different conferences that are related to this doctoral thesis and contributed to the dissemination activities (cf., Figure 3 column “conference contributions” and Appendix I-IV).

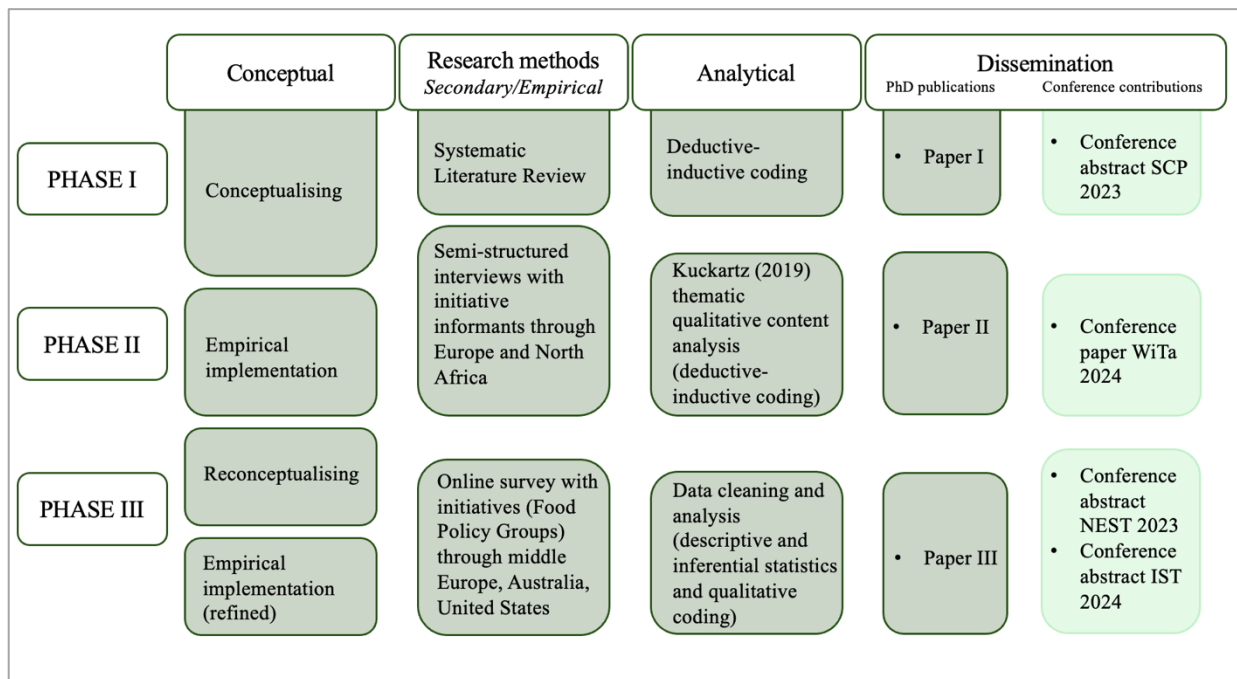


Figure 3: Overview of consecutive and parallel stages in the context of this cumulative thesis.

Notes: The last column shows the conference contributions related to this PhD which can be found in the Appendix. *SCP 2023= SCORAI-ERSCP-WUR Sustainable Consumption and Production in Wageningen, Netherlands; WiTa=Wissenschaftstagung ökologischer Landbau in Gießen, Germany; NEST 2023= Network of Early Career Researchers in Sustainability Transitions in Dresden, Germany; IST= International Sustainability Conference by STRN (Sustainability Transition Research Network) in Oslo, Norway.

As visualised in Figure 3, the analyses rely on different data sets. For the first phase, the systematic literature review, 58 articles inform the analysis. The empirical data within the second phase comprise 22 semi-structured interview transcripts with 17 AFIs engaged in making the local food system more sustainable from five territorial cases in Europe (Denmark, Germany,

Italy, Poland) and Northern Africa (Morocco). Elaborations within the third phase are based on survey data (closed and open questions) of FPGs (n = 260) across the United States of America, middle Europe (mainly Germany) and Australia.

In the following section, a brief synthesis of the aims, methodology and main results of these three parts is presented (cf., sections 3.4.1-3.4.3), followed by the actual three peer-reviewed publications (cf., chapter 4-6). Section 3.4.4 presents an aggregated overview on AFIs functions, derived from the empirical results. Then, in section 7, this thesis's results are related to each other to address this thesis's main research question (cf., section 7.1). From the results, implications and recommendations for policymakers and governors of transitions are derived (cf., section 7.2), as well as future research avenues (cf., section 7.3). Lastly, the strengths and limitations of this thesis are discussed, including recommendations and lessons learned for future research undertakings (cf., section 7.4 and 7.5).

3.4 Synthesis of main findings

3.4.1 Summary of Chapter 4

This thesis draws on the MLP to structure the AFIs' activities and functions as well as influencing factors. Thus, a systematic literature review was conducted, asking how the MLP framework is applied in recent research on agri-food system transitions, laying the groundwork for a later use of the MLP in the empirical analysis (cf., Figure 3, Phase 1). For this, the systematic review draws on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and is based on a search in Scopus database, covering the years 2018-2022. A total of 58 articles were included. Data was extracted based on a combination of concept-driven and data driven coding process. The review presents and discusses the results on, first, research methods, agri-food system sectors and the sustainability approach, second, the conceptualisation of MLP levels, and third, criticisms on the framework as well as conceptual refinements.

First, the review highlights a dominance of qualitative research approaches in agri-food system transition studies, often using in-depth case studies to explore specific transition dynamics. The majority of articles cover ongoing transitions and focus on the agricultural sector, although policies, food consumption patterns and diets are also addressed. The included articles elaborate on why a sustainable development is needed and analyse how it can be achieved (e.g., transition pathways). However, an understanding of sustainability is rarely presented. Some authors

approach the concept of sustainability through the “case-lens”, i.e., how the respective object of study understands and tackles sustainability (problems).

Second, from the three MLP levels, the niche receives the most attention. Agri-food scholars seem to focus on rather socially innovative activities instead of technological innovations, though without giving greater conceptual consideration to *the social*. Protection of niche initiatives is offered by political actors, non-governmental organisations (NGOs) and organisations through funding or favourable policies although some authors express concerns that such protection may create dependencies. Cooperations and building alliances seems to be an often-followed strategy to gain influence. The regime is characterised by stability, lock-ins, and path-dependencies. It is either conceptualised as the dominant rules, regulations and practices that keep the incumbent conventional agri-food system alive or as the dominant materials, incumbents and actors. However, some studies challenge the perception of regimes as entirely rigid, instead illustrating degrees of contestation, adaptation, and incremental innovation. There is also an emerging focus on intermediary actors who operate between niche and regime levels, facilitating transition processes by mediating between the levels, forming networks and advancing exchanges. However, these intermediary actors are at times framed through differing concepts and terminologies. The landscape level, while theoretically as central as the other levels, receives least attention in agri-food system research. The agri-food authors mainly characterise the landscape as an external force, exerting pressure on regimes and niches through socio-cultural, environmental, demographic, or political changes (e.g., climate change, policy shifts on higher levels of governance, or market disruptions). However, its conceptualisation and role in transitions remain mainly unexplored.

Lastly, authors combine the MLP with other frameworks or theories, for instance, MLP with actor-network theory, shedding light on the landscape level as an actant in the transition process. However, there remains conceptual ambiguity regarding the boundaries of and interactions between MLP levels, particularly concerning the intermediary space between niche and regime.

This systematic literature review (Elsner et al. 2023) showed that agri-food niches often seem to focus on social innovations rather than technological novelties, conducting qualitative in-depth case studies. However, conceptual engagement with social innovations appears to be limited. While the intermediary space is increasingly recognised and researched, there appear to be different interpretations and assumptions regarding its functions.

3.4.2 Summary of Chapter 5

Although chapter 4 showed that niche innovations within the agri-food system are not only of a technological but also of a social nature, it seems that little conceptual consideration has been given to social innovations (cf., section 2.1.7, chapter 4). Above that, social innovations seem to be less prominently addressed in existing sustainability transition research (Avelino et al. 2019, Wittmayer et al. 2022). Based on the results of the systematic literature review (cf., chapter 4) and on further literature on social innovations (cf., section 2.1.7), the empirical research for chapter 5 was conceptualised and empirically implemented (cf., Figure 3, Phase 1 and 2).

The recently developed social innovation conceptualisations draw largely on energy studies and authors call for expanding social innovation research to other realms (Wittmayer et al. 2022). Amid these developments, chapter 5 aims to explore how socially innovative AFIs aim to transform the incumbent local agri-food regime, as well as the challenges and opportunities these AFIs face (cf., Figure 3, Phase 2). For this empirical research, 17 AFIs engaged in change from five territorial cases in Europe (Denmark, Germany, Italy, Poland) and Northern Africa (Morocco) were selected. With those 17 AFIs, 22 semi-structured interviews were conducted and qualitatively analysed through thematic qualitative content analysis (Kuckartz 2019).

Resultant from the analysis and inspired by the typology of social innovation in energy by Wittmayer et al. (2022), a cluster system was developed, structuring the socially innovative activities according to first, four social (interaction) processes and second, nine agri-food fields. The four social (interaction) processes comprise: cooperation, exchange, enabling, knowledge generation. Thematically, the socially innovative AFIs are active in the following (mainly) agri-food fields: food access and availability (a), reorganisation of food value chain (b), (organic) agriculture (c), sustainable, healthy diets, organic food and food culture (d), food waste (e), food policy and regulation (f), regional development (g) and climate impact (h). The cluster presents the variety of social innovations, proposed by the AFIs, as regards the new ways of doing (e.g., agroecology, changing habits by including less animal and more plant-based food in their meals), framing (e.g., making sustainability explorable), knowing (e.g., educating, developing new understandings) and organising (e.g., shortening value chains, policy development and implementation).

An MLP-based structuring of initiatives activities revealed that most AFIs' activities seem to be positioned within the niche level, though some initiatives' activities transcend the niche, indicating that these initiatives function as intermediaries, facilitating exchanges within the niche but also between niche actors and policymakers. Further, the MLP-based analysis showed that the AFIs anchor their social innovations to the incumbent regime through first, network anchoring, second, anchoring through different practices and materials and last, institutional anchoring. Thereby, the AFIs link to six agri-food regime domains, i.e., practices (e.g., agricultural practices and methods) (i), materials, technologies, policies, regulations, institutions (ii), socio-culture (e.g., consumer preferences, social relations, habits) (iii), science, knowledge, skills (iv), food supply chain (v), and nutrition and health (vi).

The drivers and barriers the AFIs are facing are assigned to three levels, inspired by the MLP: landscape, regime and initiative level. Barriers and drivers on the initiative level come from the niche and intermediary space. On the initiative level, barriers comprise, for instance, lack of resources such as employees or time, but also competition with similar initiatives. Drivers are for instance, initiatives' members, networks and cooperations with other niche actors. Municipalities and local political actors and policies are perceived as conducive to the AFIs. On the regime level, bureaucracy, market infrastructure or dominant practices (e.g., agriculture) are perceived as barriers whereas civil society, research results or volunteers are perceived as conducive. On the landscape level, European regulations, external trends, shocks or developments (e.g., migration, climate change, COVID-19 pandemic) are perceived as conducive by some AFIs and as restrictive by others. For instance, the COVID-19 pandemic raised consumers' awareness as regards health and environment, but stricter regulations hampered AFIs' activities.

Subsuming, this section presented the socially innovative activities the AFIs perform as well as the mechanisms through which the AFIs pursue these activities. The analysis showed that while some AFIs are active on a niche level, others are acting between niche and regime, facilitating networks and mediating exchanges. This part thus provided a first (of two, see subsequent part) empirical insight(s) into the activities of initiatives and the factors that influence them.

3.4.3 Summary of Chapter 6

Chapter 6 presents a mixed-methods study of a specific form of AFIs, i.e., Food Policy Groups (FPGs), that can be seen as intermediaries in agri-food system transitions due to their role as multi-actor platforms, acting at the interface between civil society, science, policy and practice, moderating and mediating between actors from these domains (Bassarab et al. 2019, Leitheiser et al. 2022, den Boer et al. 2023). First and foremost, FPGs act at the local or communal level, though they are also increasingly organised on national and global levels (Bassarab et al. 2019, Leitheiser et al. 2022, Birnbaum and Lütke 2023).

As presented in section 2.1.6, intermediary research could benefit from insights on the functions around policy work intermediaries perform as well as on the organisational structures of intermediaries and the nature of their relationship to government as this knowledge could enhance the understanding of the key characteristics of the actors (and their functions) involved in transitions. Moreover, the field may gain from greater inclusion of agri-food system studies and insights from different geographical contexts to derive findings that are either generalisable across sectors and contexts or specific to geographic areas.

In light of this, chapter 6 asks how the policy-related functions, organisational forms and relationships to government of FPGs across three geographical areas are distributed, and whether an association exists between the organisational forms or relationships to government and the policy priorities an agri-food related intermediary focuses on. Through a mixed-methods analysis of surveys distributed among FPGs across United States, middle Europe and Australia, chapter 6 analyses first, qualitatively the functions and second, quantitatively the organisational forms, relationships to government and policy priorities of FPGs (n=260) (cf., Figure 3, Phase 3).

First, the results show that FPGs' policy intermediation focuses on practices and social relations instead of intermediating for new products or technologies. The following intermediary functions of FPGs around policy work were identified: policy development and implementation (1), building of social networks (2), managing situations prone to conflict (3), (niche) support, empowerment and reshaping power relations (4), advocating for marginalised actors (5), gaining legitimacy (6), knowledge exchange, education as well as research and learning (7), organisational matters (8), and lastly, developing niche innovations (9). While the functions do not differ across the three geographical areas, the functions differ in parts from those typically associated

with intermediation around technological innovations. The analysis of the functions shows that, for instance, FPGs are conflict-ridden and arbitrate between distinct agri-food actors (within their organisation between members and externally, between different AFS actors). Beyond that, FPGs engage in empowerment processes, building networks and acting in concert to achieve collective goals. Some FPGs act on higher scales (e.g., federal state or state level). Thereby, those FPGs are aggregating the activities of more localised FPGs, creating, coordinating and managing localised activities.

Second, the policy priorities, organisational forms and relationships to government differ across the three geographical areas and thus seem to be context dependent. Compared across the three geographical areas, a substantial percentage of US-FPGs is coordinated by government or members are appointed by government, pointing to a more pronounced linkage to the government compared to the middle European or Australian FPGs. Above that, the middle European and Australian FPGs are organised as non-profit organisations or grassroots coalitions whereas the US FPGs are also substantially organised as organisations embedded in government. However, the statistical analysis suggests that a stronger linkage to government does not appear to be associated with the policy priorities an FPG focuses on, suggesting that even FPGs with strong connections to government retain their independence.

In summary, FPGs present functions that seem to be context-independent but partly different from those typically associated with intermediation around technological innovations. In contrast, the organisational forms, relationships to government or policy priorities of FPGs differ across the three geographical areas and thus, seem to be context dependent.

3.4.4 Agri-food related initiatives' functions – aggregated overview

From the analysis of Chapters 5 and 6, an aggregated overview of AFIs niche and intermediary functions can be derived. In Chapter 5, a differentiation and allocation of AFIs to MLP levels was performed, based on the respective reported activities. Chapter 6 starts with the assumption, based on previous literature, that FPGs act as intermediary actors. This is confirmed through the empirical investigation and analysis of results. However, a classification of their activities to MLP levels shows that some FPGs conduct both intermediary and niche activities. Table 1 presents the derived AFIs' functions. The functions are inferred from the cluster and analysis of AFIs' activities and social innovations (cf., Chapter 5, Appendix Tables A and B) and taken from the AFIs' intermediary functions (i.e., here from FPGs as one group of AFIs; cf., Chapter

6, Appendix Table A). The left-hand side of the table shows that niche and intermediary functions overlap. The right-hand side presents the functions that are fulfilled by intermediaries only.

Table 1: Aggregated agri-food related initiatives' (AFIs') functions.

| Niche and intermediary functions | Intermediary functions only |
|---|--|
| Raising awareness on various agri-food system malfunctions | Supporting, advising, empowering transformative actors |
| Influencing/changing food culture | Building of social networks |
| Exchanging knowledge | Knowledge circulation |
| Knowledge generation | Managing situations prone to conflict |
| Education | Advocating for marginalised actors |
| Implementation of healthy and sustainable diets | |
| Saving food | |
| Improving food access and availability | |
| Shortening value chains (e.g., through organisation of farmers markets) | |
| Reducing climate impact | |
| Supporting regional development | |
| Supporting nature (e.g., through alternative farming practices) | |
| Policy development and implementation | |
| Adapting the initiative in response to changing conditions | |
| Gaining legitimacy | |
| Development of (mainly) social innovations | |

Notes: The functions are derived from the analysis of AFIs activities (Chapters 5 and 6). The functions are understood as the broader purpose an AFI fulfils which are achieved by the activities carried out. These functions are categorised into first, functions pursued by niche and intermediary initiatives and second, functions by intermediaries only.

Chapter 4. Agri-food systems in sustainability transition: a systematic literature review on recent developments on the use of the multi-level perspective



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Agri-food systems in sustainability transition: a systematic literature review on recent developments on the use of the multi-level perspective

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A sustainability transition (ST) of the agri-food system (AFS) is necessary due to manifold environmental and social exigencies. Scholars widely refer to the multi-level perspective (MLP) in the analysis of those transitions. The fast pace of articles covering AFS transitions, the evolving research on spaces between the three levels, and the consisting unclear conceptualization of MLP levels call for a systematic update on literature utilizing MLP in AFS articles covering ST. As a basis for reporting, this systematic literature review uses the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The search was conducted on the database Scopus encompassing the period from 2018 to 2022. After the selection procedure, 58 articles were included in the review. We extracted data based on a combination of a concept-driven and data-driven coding scheme. Qualitative research approaches outweigh and interrelated activities within the AFS are being analyzed, predominantly in the agricultural sectors. The focus lays on ongoing transitions. The concept of sustainability and its direction is considered as given (e.g., through the case lens), without further elaborations. The niche constitutes the most prominent object of study and scholars refer to rather socially innovative activities than technological innovations, providing distinct views on radicality and strategies to breakthrough. A space between niche and regime is being presented, with slightly distinct conceptualisations. Actors from both levels collaborate and exert transformative power. The regime is presented as static but also more vividly evolving views on the regime are demonstrated. The landscape receives the least attention and the focus lays on immaterial characteristics. Combinations of MLP with other frameworks have proven useful, for instance, regarding elaborations on the agency on the landscape level. Generally, an unclear conceptualization of regime and landscape persists, lacking a theoretical elaboration. Further research applying MLP should aim for a deeper examination of its theoretical construct, especially in terms of regime and landscape. More quantitative or mixed-methods research could supplement the current dominating qualitative approaches by testing and validating qualitatively constructed theories and phenomena.

KEYWORDS

multi-level perspective (MLP), food system, agriculture, sustainability, transition, transformation

1. Introduction

Agri-food systems (AFS) are pressured by current environmental degradation and climate change. Weather extremes, soil degradation, loss of biodiversity, food availability, and scarcity represent only some of those manifold effects (IPCC, 2019). Efforts toward sustainable development of AFS are thus inevitable (FAO, 2018a; IPCC, 2019). Agri-food systems are complex and diverse socio-ecological systems (Ericksen, 2008; Leeuwis et al., 2021). They incorporate the whole range of actors, activities, and outcomes, as well as multiple environmental, social, political, and economic determinants, including external elements influencing this system (Ericksen, 2008; Ericksen et al., 2010; FAO, 2018a; Stefanovic et al., 2020). A sustainable AFS should balance food systems outcomes: food security, environmental security, and social welfare, for current and future generations (Ericksen, 2008; Eakin et al., 2017; FAO, 2018a). To achieve this, a transition toward the sustainable development of AFS is necessary.

The multi-level perspective (MLP) represents a framework widely used in the literature to analyse transitions from one socio-technical system to another (Geels, 2004, 2010). Originally developed for the elaboration of historical, concluded transitions, and technological innovations, the MLP is increasingly used to study ongoing socio-technical transitions (Köhler et al., 2019). Socio-technical systems comprise societal elements next to technological elements (Geels, 2004). The MLP is a so-called “middle-range theory” that contributes to the understanding of long-term and complex socio-technical changes, especially their dynamics. The originators perceive it as “middle-range” in the sense that the MLP combines elements from distinct theories with similar ontological assumptions and does not claim to be a theory of everything (Grin et al., 2010). The MLP is informed by science and technology studies, evolutionary economics, structuration theory, and neo-institutional theory that, according to the founders, complement each other by compensating the shortcomings of one with the strengths of the other (Rip and Kemp, 1998; Geels, 2002, 2004, 2011; Grin et al., 2010). By doing so, these theories offer assumptions that are reconciled within and account for the MLP. The main premises of these theories can be found in the cited literature.

The MLP argues that transitions evolve through interaction processes between three levels: niche (1), socio-technical regime (2), and socio-technical landscape (3). In short, niches develop their own dynamics, diverging from the regime. Changes at the landscape-level pressure regimes that may destabilize and thus create a window of opportunity for niches to breakthrough. The framework implies the existence of co-evolutionary processes between these levels at multiple dimensions simultaneously. During transitions, these processes couple and reinforce each other (Grin et al., 2010). Niches (1) comprise the space for experimentation and radical novelty generation where protection is offered by, for instance, subsidies, public authorities, or company

investments (Geels, 2004). Niches provide learning spaces and possibilities to deviate from incumbent regime rules (Geels, 2004; Smith et al., 2010). Three niche-internal processes are described in transition literature: network building, heterogeneous learning processes, and vision articulation (Grin et al., 2010; Geels, 2020). Niches compete with the dominant regimes to scale out their radical innovations and bring about “revolutionary” change. Innovations can remain within the niche for a longer period as they encounter discrepancies with the dominant regime (e.g., unsuitable infrastructures and policies) or face headwinds from regime actors. For wider scale influence, regime actors need to be persuaded and become involved in niche activities (Grin et al., 2010).

Socio-technical regimes (2) comprise the semi-coherent prevailing rule-set that coordinates and structures social groups. It encompasses the aligned rules of distinct sub-regimes (e.g., user and market regime, socio-cultural regime, policy regime, science regime, and technological regime; Geels, 2004, 2011). This rule-set develops through a co-evolutionary process of accumulation and alignment. Informed by neo-institutional theory, these rules can be divided into three types: first, cognitive (a), such as shared beliefs, lifestyles, or user practices; second, normative (b), for instance, values, norms, roles rights, and responsibilities; or last, regulative (c), the explicit formal rules (Geels, 2004, 2011; Grin et al., 2010; Smith et al., 2010). Geels (2011) states that these rules have a 2-fold nature. They are both “medium and outcome of action” (p. 27), accounting for the socio-technical regime’s reproduction. These rules (i.e., the socio-technical regime) guide the progression of the more material socio-technical systems. The demarcation between the socio-technical regime and a socio-technical system is important to grasp the concept of the first-mentioned, although still ambiguous in the literature and a matter of deliberation (Holtz et al., 2008; Geels, 2011). Geels (2011) acknowledges the critiques that the regime is partly equalized with the system. He clarifies that the socio-technical regime refers to the intangible “deep-structure” (see above, e.g., beliefs, heuristics, routines, visions, and norms), ensuring the stability of an existing socio-technical system. Whereas, socio-technical systems represent the more tangible elements (e.g., artifacts, market shares, and infrastructure). Nevertheless, the tension and incoherence between the more institutional understanding of the regime and more material understandings which include actors or artifacts that develop the rules persist (Markard and Truffer, 2008; Smith et al., 2010; Geels, 2011; Fuenfschilling and Truffer, 2014).

Due to regimes prevailing structures and alignments, regimes are “dynamically stable.” Thus, they are characterized by lock-ins, where change processes run path-dependent and incremental (Grin et al., 2010; Smith et al., 2010; Geels, 2011). Instability evolves in regimes whose actors start to disagree and diverge on incumbent rules (Geels, 2002; Grin et al., 2010).

The socio-technical landscape (3) represents the structural, exogenous, and broader context for niches and regimes (Smith et al., 2010; Geels, 2020). The landscape includes a material and an immaterial domain. The material side of society comprises, for instance, infrastructures, factories, or spatial arrangements of cities. The immaterial domain consists of demographical trends,

Abbreviations: ST, Sustainability Transition; AFS, Agri-Food System; MLP, Multi-Level Perspective; SLR, Systematic Literature Review; ANT, Actor-Network Theory.

political ideologies, societal values, and macro-economic patterns (Geels, 2004, 2011). Three types of landscape dynamics are present in the literature: first, factors that do not change or if at all, only at a slow pace (e.g., physical climate); second, trend-like patterns that change in the long term toward a certain direction; and third, rapid external shocks (e.g., wars and pandemics; Driel and Schot, 2005; Geels, 2011). In the short run, niche or regime actors do not influence landscape developments, although, through multiple actions, developments occur with the human agency (e.g., urbanization and globalization; Grin et al., 2010). The landscape may exert enhancing and restraining forces (by reinforcing regime trajectories) for change processes. In the first case, this may lead to supportive windows of opportunity for niches to scale out. For instance, user preferences may change due to negative externalities or cultural changes, leading to regime tensions (Grin et al., 2010; Smith et al., 2010).

A former review on the use of the MLP in AFS transformations revealed insights into AFS authors' conceptualisations and understandings (El Bilali, 2019). An increasing amount of AFS research on sustainability transitions (ST) was predicted and a call for a deeper investigation of MLP levels and dynamics within AFS articles was pronounced. The article comprised AFS studies until the beginning of 2018. As outlined previously, different theoretical notions of MLP levels (esp. regime) exist. It seems that these theoretical notions were not considered in this former review. Furthermore, recent MLP literature dived deeper into the fluency of MLP levels, elaborating on the space between those MLP levels (Fischer and Newig, 2016; Bush et al., 2017; Kivimaa et al., 2019). Thus, from the fast pace of articles on AFS ST using MLP evolving in recent years, we expect significant new insights. These reasons were taken up to conduct a systematic literature review (SLR) to present an overview of the current use and recent elaborations as well as conceptualisations of MLP in AFS articles dealing with ST. Hence, we address the following research question:

How is the MLP framework applied in recent research on AFS transitions?

Compared to El Bilali (2019), we will dive deeper into the MLP levels and provide a more detailed investigation of those. Thus, the aim of this study is neither to elaborate on transition dynamics or outcomes (e.g., transition pathways) nor to present our understanding of sustainable AFS and transitions or how we conceptualize the MLP levels. We rather aim to provide an overview of recent AFS authors' approaches and understandings of the MLP and its levels in the course of ST of AFS.

2. Methodology

This systematic literature review on research on the use of the MLP in ST of AFS refers to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Page et al., 2021) as a basis for reporting. As a first step in the process, a protocol was developed containing the rationale, research question, eligibility criteria, search strategy, study records, as well as data synthesis

plan according to PRISMA Protocols (PRISMA-P; Moher et al., 2015).¹

2.1. Search strategy and quality assessments

We searched the database *Scopus* on 23rd February 2022, the same database where the aforementioned systematic literature review (El Bilali, 2019) was conducted. We searched the string *Transition AND (MLP OR "multi-level perspective" OR "multilevel perspective" OR niche) AND (agri* OR agro OR food)*.² Only publications from 2018 onwards were included. As the focus is on peer-reviewed research articles, we excluded systematic literature reviews, book chapters, notes, and editorials. Peer-reviewed conference proceedings were included. Whether studies applied qualitative, quantitative, or mixed-methods research was no exclusion criteria. For the selection of publications, a two-step procedure was followed. First, a coarse sieving process through articles for inclusion was performed, based on the inspection of titles and abstracts. In case of doubts, articles were carried along. Second, a fine sieve was utilized for the refined quality assessment based on the full-text study. As a last step in the process, backward and forward citation searches were applied on 31st March 2022 to identify further relevant publications. The latter was solely applied to articles identified after the fine-sieving process in the *Scopus* database. Eligibility criteria comprised the following: first, the focus on the human agri-food sector; second, the usage of the MLP as the main framework or a combination of MLP with other frameworks; third, publications of English and German language only; and finally, a content concerning an ST, whereby the term transition should be utilized in the sense of "transformative change." Studies that did not meet the eligibility criteria were excluded from the review as well as publications from 2018 that were already part of El Bilali's (2019) review. Figure 1 depicts the articles' review and exclusion process. For the documentation of the review process, search results from the *Scopus* database were imported into a Microsoft Excel sheet. Reasons for the exclusion of articles were recorded.

For this review's research question, all findings (interpretations and conceptualisations) can make valuable contributions. Therefore, all resultant identified articles were included. Thus, poor reporting within an article does not necessarily implicate poor study quality (Boland et al., 2017), yet constitutes a limitation of this systematic review. To obtain an impression of each article's quality, we carried out a quality assessment during data extraction based on Cochrane Handbook version 6.3, 2022 (Higgins et al., 2022), Boland et al. (2017), and the critical appraisal checklist for qualitative studies by the Critical Appraisal Skills Programme (CASP, 2022).³

¹ The protocol can be requested from the authors.

² Compared to El Bilali (2019), this systematic review focusses on a deeper investigation of the MLP levels and their characteristics. However, a similar search string was applied as major additions did not add value.

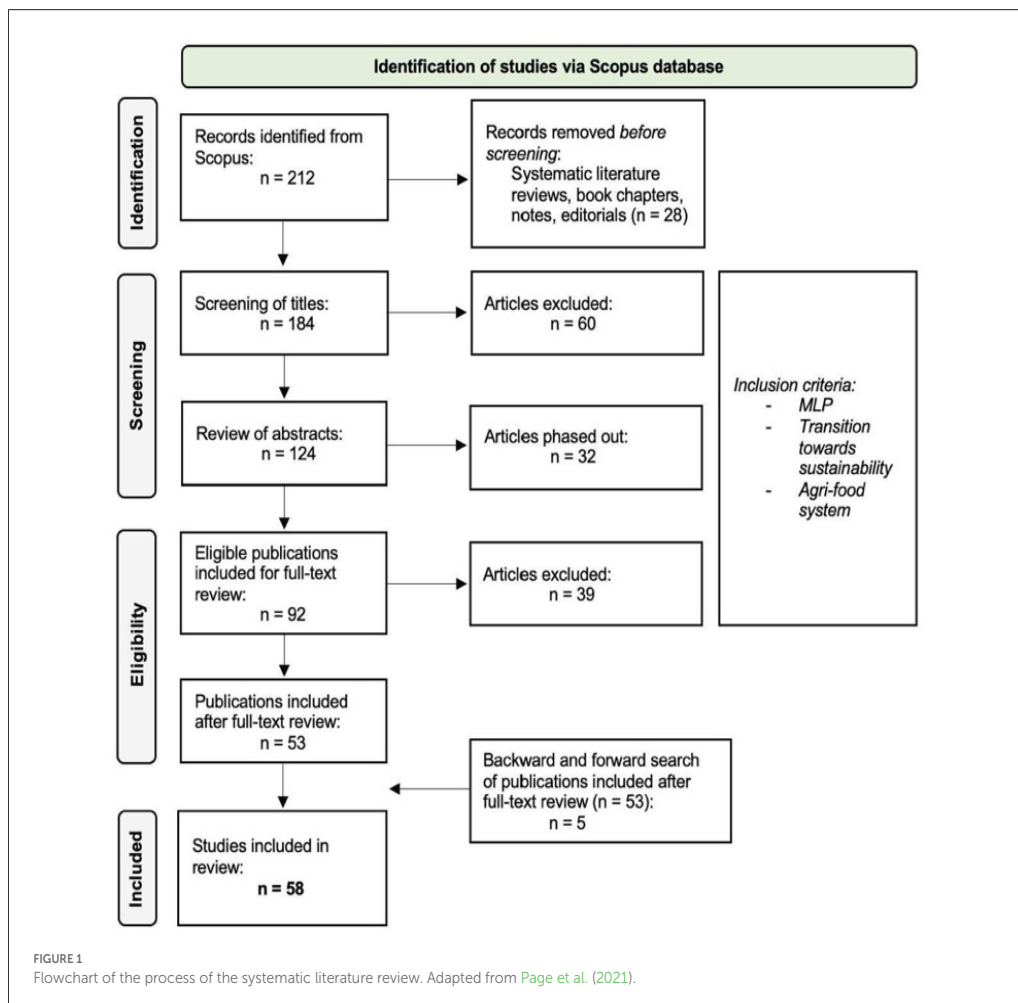
³ The guiding questions for quality assessment are listed in the protocol which can be requested from the authors.

2.2. Evidence synthesis plan and data extraction

The use of the MLP (on transitions of the AFS) is not limited to a specific type of data. Similarly, this review's research question is independent of the research design applied in articles on transitions of the AFS. Therefore, this systematic literature review included qualitative, quantitative, and mixed-methods evidence and aggregated the findings into a single synthesis. For the synthesis, we chose a convergent integrative approach that allows a combination of quantitative, qualitative, and mixed-methods evidence during data processing (Lizarondo et al., 2020). Data were extracted based on a coding scheme that combined concept-driven and data-driven categories. An *a priori* framework of concepts and themes inspired by the research question and literature was developed. The focus laid on: bibliometrics (1), the thematic focus related to the AFS (2), the desired outcome of the transition and sustainability implication (3), the conceptualization

and application of MLP and its elements (4), criticisms on MLP (5), enhancement or combination with other frameworks and theories or scientific stances (6), and finally, the research design (7). The coding process followed a three-step procedure. In the first round, we tested the coding scheme on the first 15 articles. Adaptations were undertaken as well as data-driven codes derived as authors' conceptualization of the MLP levels was captured exploratively. In the second step, the coding framework was applied to all identified articles. During the final monitoring, the first 10 articles were coded again to check whether codes were applied consistently throughout the process. Coding, data extraction, and synthesis were performed with the software programme MAXQDA (VERBI Software. Consult. Sozialforschung. GmbH, Berlin, Germany). The reference management software Zotero was used to keep track of references.⁴

⁴ The coding scheme can be requested from the authors.



3. Results and discussion

3.1. Records identified for the review

The search in Scopus initially yielded 212 articles; 184 publications remained after the removal of systematic literature reviews ($n = 16$), book chapters ($n = 8$), notes ($n = 3$), and editorials ($n = 1$). Following title and abstract screening, 92 documents were excluded, and a further 39 articles were removed after the full-text review. The reasons were the unavailability of the English or German version ($n = 1$) or articles from the year 2018 that were already included in a former review ($n = 7$; e.g., Hassink et al., 2018; Järnberg et al., 2018; Punt et al., 2018). Further publications were excluded as they neither covered the human AFS ($n = 52$; instead zoology, botany, energy, and mobility (e.g., Andrade-Díaz et al., 2019; Vihotogbé et al., 2019; Paterson et al., 2020; Rivera et al., 2020)), nor applied the transition framework MLP ($n = 51$; instead MLP in the sense of “multi-layer perceptron” (e.g., Babaeian Diva et al., 2019; Alburshaid and Mangoud, 2020)), nor contained a focus on a transition toward sustainable development of AFS ($n = 20$). Ensuing cited and citing reference search (i.e., backward and forward citation searching), five more articles were included (i.e., Boillat et al., 2022; Costa et al., 2022; Hundscheid et al., 2022; Ortiz and Peris, 2022; Sobratee et al., 2022). The flowchart in Figure 1 gives an overview of the selection process.

3.2. Bibliometrics and research methods

Sustainability transitions in AFS receive increasing attention (cf. Tables 1, 2). The journal *Sustainability* stands out, with 19 out of the 58 identified articles (cf. Table 1). The authors’ institutional background lies predominantly in European countries and the United States. Countries from the Global South are underrepresented. This aspect has not changed since the aforementioned former review. The countries where case studies took place show a more diversified picture, covering the continents Asia, Africa, Oceania, North and South America, and Europe. With this lens (and without being able to estimate the cultural origin of the authors), it seems that most research is done on the Global South rather than with local research institutions. The latter could address the issue of “decolonising” transition research raised in the literature (Ghosh et al., 2021). Qualitative research approaches outweigh (cf. Table 2). This aspect leads to a dominance of studies deriving deeper understandings of certain aspects (e.g., niche–regime relationship in a certain case study) but represents a limitation of research on more pervasive causal links. Therefore, the need for more quantitative or mixed-methods research becomes apparent. Partly, there is poor reporting on the methods used and the methodological approach (e.g., Henfrey and Ford, 2018; Wigboldus et al., 2019; Passos Medaets et al., 2020; Jia, 2021). This results in a lack of transparency in how the authors derived their findings. Similarly, this aspect also constitutes a limitation of this SLR as the articles’ quality in this regard could not be assessed in all cases. The nature of qualitative data analysis is more interpretative which is why it is even more important to clearly elaborate on the research design to ensure reliability.

TABLE 1 Overview of bibliometrics of publications focusing on sustainability transitions of the agri-food system applying multi-level perspective (MLP) from 2018 onwards.

| Journal | | Country | |
|---|----|-------------|----|
| Sustainability | 19 | Netherlands | 11 |
| Agriculture and Human Values | 3 | Spain | 8 |
| Agroecology and Sustainable Food Systems | 3 | UK | 8 |
| Environmental Innovation and Societal Transitions | 3 | Austria | 6 |
| Journal of Cleaner Production | 3 | Italy | 6 |
| Agriculture | 2 | US | 6 |
| Geoforum | 2 | France | 5 |
| Journal of Rural Studies | 2 | Belgium | 4 |
| Sustainable Production and Consumption | 2 | Portugal | 4 |
| Technological Forecasting and Social Change | 2 | Sweden | 4 |

The number of publications in the top 10 journals and countries of all authors is indicated based on the database Scopus.

3.3. Agri-food system sectors

The identified articles can broadly be assigned to four different AFS sectors: agriculture, aquatic environment, policies, and food consumption and diets. The majority of articles focus on the agricultural sector (cf. Table 2). Within this domain, three areas are apparent: first and the most prominent area, alternative practices and cultivation methods [e.g., manure management, agroecology, organic agriculture, or climate-smart agriculture (e.g., Anderson et al., 2019; Long et al., 2019; López-García et al., 2019; Schiller et al., 2020; Bui, 2021; Salavisa et al., 2021; Anselmi and Vignola, 2022)]; second, animal husbandry (cf. De Herde et al., 2020; Deviney et al., 2020; Averbuch et al., 2021); and third, innovations (technological; e.g., cf. Contesse et al., 2021; Jia, 2021; de Boon et al., 2022). Especially within alternative practices, research on agroecology is prominent ($n = 8$, cf. Table 2) and enjoys increasing interest. It can be assumed that the Food and Agriculture Organization (FAO) has contributed to this by emphasizing agroecology’s role to achieve sustainable agricultural systems (FAO, 2018b). Gudbrandsdottir et al. (2021), Wöhler et al. (2020), and Sanon et al. (2021) laid focus on the aquatic environment, concentrating on fishery and pharmaceutical exposure. Policies were a matter of interest on EU and national levels (cf. McInnes, 2019; Wieliczko et al., 2021). Furthermore, MLP was utilized in the analysis of transformations of consumers’ habits and diets (Fogarassy et al., 2018; Dannenberg et al., 2020; Gaddis and Jeon, 2020; Hundscheid et al., 2022; Sobratee et al., 2022).

Broadening the lens toward a systems perspective, the majority of studies focus on more interrelated activities within the AFS. Power relations and structures of governance or politics are the

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TABLE 2 Overview of resultant articles of the systematic literature review.

| Year | Publications per year | References | Unit of study—country | Focused agri-food system's sector/topic | Reported data collection and evaluation methods of articles |
|------|-----------------------|--------------------------------|-----------------------|---|---|
| 2022 | 10* | Anselmi and Vignola (2022) | Costa Rica | Organic agriculture (participatory guarantee systems) | Literature review, semi-structured interviews, observations, and content analysis |
| | | Boillat et al. (2022) | Senegal | Agroecology | Semi-structured interviews, review of documents, and social network analysis |
| | | Costa et al. (2022) | Belgium | Local-product network | Semi-structured interviews, codification, field observation, and documentary analysis |
| | | de Boon et al. (2022) | - | Agricultural innovations | Literature review |
| | | Giagnocavo et al. (2022) | Spain | Agriculture and agroecology | Mixed methods (N/S), triangulating desk research, and experimental and project results (N/S) |
| | | Holtkamp and van Mierlo (2022) | Italy | Agriculture (pesticide ban) | Participatory observation, semi-structured interviews, focus group discussion, qualitative content analysis, and triangulation of methods |
| | | Hundscheid et al. (2022) | Austria | Consumption (meat) | Quantitative and qualitative content analysis of media data |
| | | Mehrabi et al. (2022) | - | Connecting consumers and farmers ("consumer/citizens"), agroecology | Literature review |
| | | Ortiz and Peris (2022) | Guatemala | Agriculture (farmer organizations) | Interviews (qualitative), focus group discussions, and triangulating document analysis |
| | | Sobratee et al. (2022) | South Africa | Sustainable diets | Stakeholder workshop, causal loop analysis, bibliometric analysis, and scoping review (triangulation) |
| 2021 | 20 | Averbuch et al. (2021) | Denmark | Agriculture (dairy sector) | Literature review (interpretive synthesis), cross-check with articles and primary data (e.g., government documents, records, and statistics), and longue durée approach |
| | | Bui (2021) | France | Agroecology | Interviews (qualitative), codification, observations, archival work (triangulation), and "flat" longitudinal analysis |
| | | Contesse et al. (2021) | Chile | Agriculture (integrated pest management) | Semi-structured interviews, deductive-inductive codification, observations, and document analysis |
| | | Deviney et al. (2020) | North Carolina | Agriculture (swine manure management) | Semi-structured interviews, codification, and online searches (data triangulation) |
| | | Goulet (2021) | Brazil | Agriculture (pesticide alternatives) | Semi-structured interviews, observations, and content analysis of institutional documents |
| | | Gudbrandsdottir et al. (2021) | Norway and Iceland | Salmon value chain | Semi-structured interviews, focus group discussions, codification, and constant comparative analysis |
| | | Jia (2021) | - | Agricultural innovation system | Not specified |
| | | Kaweesa et al. (2021) | Uganda | Conservation agriculture | Semi-structured interviews, focus group discussions, and workshop discussions |

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TABLE 2 (Continued)

| Year | Publications per year | References | Unit of study—country | Focused agri-food system's sector/topic | Reported data collection and evaluation methods of articles |
|------|-----------------------|----------------------------------|--|--|---|
| | | Leeuwis et al. (2021) | - | Food system, poverty | Not specified |
| | | Long and Blok (2021) | Netherlands | Agri-food tech start-up sector | Qualitative and inductive approach: Interviews (qualitative), codification, triangulation with gray literature, and internet searches |
| | | Nemes et al. (2021) | Argentina, Australia, Austria, Canada, France, Hungary, Italy, Japan, Luxembourg, Norway, South Korea, Spain, and UK | Alternative and local food systems (production, consumption) | Different methods applied in country case studies (qualitative research design), incl. interviews, inductive codification, expert questionnaire, expert workshop, report analysis, and press reviews |
| | | Özatan and Karakaya Ayalp (2021) | Turkey | Urban agri-food system | Exploratory research design, document analysis, semi-structured interviews, and observations |
| | | Polita and Madureira (2021a) | Portugal | Short food supply chain | Qualitative research design, interviews (qualitative), review of contextual data, and content analysis |
| | | Polita and Madureira (2021b) | Portugal | Agroecology | Literature review, semi-structured interviews (explorative), structured interviews, and qualitative and quantitative content analysis |
| | | Ribeiro and Turner (2021) | New Zealand | Egg sector, honey sector | Literature review and qualitative insights from a former study (interviews) |
| | | Salavisa et al. (2021) | Portugal | Organic agriculture | Literature review, analysis of secondary sources (e.g., reports and websites), and semi-structured interviews |
| | | Sanon et al. (2021) | Burkina Faso | Fishery | Mixed methods: literature search, semi-structured interviews, focus group discussions, qualitative data analysis (codification), quantitative household survey, statistical analysis, and triangulation |
| | | Sarabia et al. (2021) | Spain | Urban food system | Interpretative research: document analysis, literature review, semi-structured interviews, codification, and participatory observations |
| | | Van Poeck and Östman (2021) | Belgium | Short food supply chain | Practical epistemology analysis of workshops (observation transcripts) and contextual interviews and document analysis |
| | | Wieliczko et al. (2021) | EU rural areas | Agriculture (policy) | Analysis of EU regulations and policies and literature review |
| 2020 | 12 | Belda-Miquel et al. (2020) | Spain | Alternative model of production, distribution, and consumption (food purchasing group) | Document analysis, participant observation, semi-structured interviews, and qualitative content analysis (deductive-inductive codification) |
| | | Cembalo et al. (2020) | - | Circular economy | Literature review (N/S) |
| | | Dannenberg et al. (2020) | Germany | Online retail | Mixed methods: analysis of secondary data and statistics (newspaper articles, media, and official national statistics), semi-structured interviews, and qualitative content analysis |

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TABLE 2 (Continued)

| Year | Publications per year | References | Unit of study—country | Focused agri-food system's sector/topic | Reported data collection and evaluation methods of articles |
|------|-----------------------|--------------------------------|-----------------------|---|--|
| | | De Herde et al. (2020) | Belgium | Dairy sector | Semi-structured interviews, qualitative analysis, and secondary sources (e.g., conference talks and discussions), |
| | | Dumont et al. (2020) | Belgium | Vegetable production | Open-ended interviews, review of the literature and online information, semi-structured interviews, quantitative technical and economic appraisal (N/S) of interview transcripts, and cross-check of data with further interviews with agri-food system actors |
| | | Farhangi et al. (2020) | Netherlands | Urban agriculture | Exploratory case study research: semi-structured interviews, document reviews, site visits, observations, and quantitative data of actants' agency (betweenness, closeness, and centrality degree) through experts' opinions |
| | | Gaddis and Jeon (2020) | South Korea | School lunch program | Literature review and content analysis of primary and secondary sources |
| | | Giombelli and Triches (2019) | Brazil | Short-chain university food procurement | Explorative and qualitative approach: online survey, semi-structured interviews, descriptive and qualitative analysis, and secondary data analysis (e.g., websites and government documents) |
| | | Gugerell and Penker (2020) | Austria | Agri-food sector (community-supported agriculture, zero-waste supermarket, and edible insect company) | Online content analysis (websites, blogs, journals, and newspapers), semi-structured interviews, focus group discussion, and deductive-inductive codification |
| | | Passos Medaets et al. (2020) | Brazil | Agriculture | Not specified |
| | | Schiller et al. (2020) | Nicaragua | Agroecology | Semi-structured interviews, workshops, secondary sources (e.g., scientific and gray literature, government policies), and construction of innovation history timeline throughout the process |
| | | Wöhler et al. (2020) | Germany, Netherlands | Pharmaceuticals in aquatic environment | Literature search, semi-structured interviews, and qualitative analysis (codification) |
| 2019 | 10 | Anderson et al. (2019) | - | Agroecology | Literature review |
| | | Heyen and Wolff (2019) | Germany | Organic agriculture | Literature search and expert interviews (project Trafo 3.0) |
| | | Hosseinifarhangi et al. (2019) | China | Urban agriculture | Qualitative research approach: literature review, secondary sources (reports, documents), observations, site visits, participation in meetings, events, activities, semi-structured interviews, and discussions (analysis of betweenness, centrality, closeness throughout the process, and verified by experts) |

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TABLE 2 (Continued)

| Year | Publications per year | References | Unit of study—country | Focused agri-food system's sector/topic | Reported data collection and evaluation methods of articles |
|------|-----------------------|--------------------------------|--|---|---|
| | | Jakku et al. (2019) | Australia | Grains industry | Semi-structured interviews and qualitative analysis (deductive-inductive codification) |
| | | Long et al. (2019) | Western and middle Europe (Netherlands, Spain, Denmark, Sweden, Italy, Finland, Ireland, France, Hungary, UK, and Switzerland) | Climate-smart agriculture | Qualitative research design: secondary data, semi-structured interviews, and deductive-inductive codification |
| | | López-García et al. (2019) | Spain | Agroecology | Quantitative survey, qualitative in-depth interviews, and codification |
| | | McInnes (2019) | Canada | Food policymaking | Expert witness statements and discourse analysis (qualitative) |
| | | Roberts and Geels (2019) | UK | Agriculture | Quantitative information from statistical databases, secondary historical sources (qualitative), and narrative analysis |
| | | Schaffer et al. (2019) | Sweden | Agroforestry (agriculture) | Participatory action research and workshops |
| | | Wigboldus et al. (2019) | Peru, Ethiopia, and Bangladesh | Urban food system, agriculture | Not specified |
| 2018 | 6** | Fogarassy et al. (2018) | Switzerland and Hungary | Consumption (attitudes) | Quantitative questionnaires and personal interviews |
| | | Henfrey and Ford (2018) | - | Ecovillage movement, permaculture | Not specified |
| | | Jedelhauser et al. (2018) | Switzerland | Circular economy of phosphorus system | Desk research (e.g., policy initiatives, research projects, academic papers), expert interviews, scenario analysis, and substance flow analysis from a former publication |
| | | Kuokkanen et al. (2018) | Finland | Nutrient system | Content-focused analysis of discourses (qualitative), in-depth interviews, and inductive data-driven analysis |
| | | Rut and Davies (2018) | Singapore | Urban agriculture (local food production) | Secondary sources (e.g., policy reports), semi-structured interviews, codification, and observations |
| | | van der Windt and Swart (2018) | Netherlands | Agriculture (land sharing approach) | Participatory observation (meetings, documents, and interviews) |

The table covers the publications per year, country of case study, focused agri-food system area as well as data collection, and evaluation methods.

*Only articles included published by the search date (23rd February 2022).

**Only articles published after 21st April 2018 were considered. The seven articles included in a former review on the use of MLP in agri-food system transformation (El Bilali, 2019) were left aside.

most prominent (cf. Rut and Davies, 2018; Anderson et al., 2019; De Herde et al., 2020; Gudbrandsdottir et al., 2021; Leeuwis et al., 2021; Wieliczko et al., 2021; Boillat et al., 2022). For instance, Deviney et al. (2020) focus on manure management impacting the health of people and the planet, and on decision-making processes in general. Next to the agricultural sector, social relations and policies are analyzed. Gaddis and Jeon (2020) analyse school lunch programs, their implications on human health, and eco-friendliness with

special attention to the role of women and small-scale producers. In this sense, the authors consider the health effects of certain diets as well as the environmental and social domains.

Predominantly, articles cover ongoing transitions. Solely, Roberts and Geels (2019) analyse a past and concluded transition. They derive an understanding of political defection from the analysis of a transition from mixed to specialized agriculture. From the findings, they draw more generalizable conclusions that they,

among other things, relate to today's sustainability debate. The overrepresentation of articles covering ongoing transitions can be explained because sustainable development of the AFS is far away from being reached.

3.4. The sustainability approach in agri-food articles

A precise direction and understanding of the ST are rarely presented in detail (e.g., van der Windt and Swart, 2018; Schaffer et al., 2019; Sobratee et al., 2022). The authors give a cursory glance at the *what* (i.e., what future is desired), for instance, more just and sustainable societies (cf. Belda-Miquel et al., 2020), usually without elaborating on the sustainability concept. The researchers put more emphasis on the *how* (i.e., how the ST can be achieved) and outline possible ways and recommendations toward the sustainable development of AFS. The illustration of transition pathways (i.e., the *how*) constitutes one intention of transition research (Köhler et al., 2019; Ribeiro and Turner, 2021). Therefore, it is not surprising that these pathways are analyzed and shown. A variety of reasons for the necessity of an ST is given (i.e., the *why*). For instance, ecological crisis, resource depletion, food security and access, severe and inequitable environment, biodiversity loss, or climate change are only a few of the manifold reported reasons (e.g., Anderson et al., 2019; Averbuch et al., 2021; Kaweesa et al., 2021; Giagnocavo et al., 2022; Mehrabi et al., 2022). Some authors approach sustainability through the analysis of their object of study, for instance, a project that aims for "more sustainable urban food systems" (Van Poeck and Östman, 2021, p. 156) or initiatives aiming for alternative food production (Farhangi et al., 2020). Through this "case-lens," the direction of the ST is already illustrated from the outset, presented from the case studies.

Some authors take up Markard et al. (2012) popular definition of ST (which was largely informed by studies focussing on energy transitions), without further elaboration (Anderson et al., 2019; Gaddis and Jeon, 2020; Gugereil and Penker, 2020). Ribeiro and Turner (2021), however, elaborate on weak and strong sustainability and review current sustainability narratives. They conclude that their "article welcomes the impermanence of the term sustainability" and identify it as a "fluid analytical concept" (p. 6). Nevertheless, it is the reflection on *sustainability* in *sustainability transitions* that is lacking a substantial examination in most of the articles (e.g., Fogarassy et al., 2018; Heyen and Wolff, 2019; Anselmi and Vignola, 2022; Costa et al., 2022). The answers researchers derive from their data on sustainability problems are essentially informed by their ontological perspectives (Geels, 2010). Thus, sustainability issues are essentially context-dependent (Jia, 2021; Susur and Karakaya, 2021) and AFS comprise a multiplicity of interrelated activities and actors, again dependent on each individual's assumptions (Leeuwis et al., 2021). For instance, assumptions about causal agents or causal mechanisms differ between distinct social theory traditions (Geels, 2010). This is why authors should aim for a more reflective elaboration on ST in their cases which may benefit the scientific discourse.

3.5. Application of MLP in AFS articles

Across all authors, manifold ways are being presented to utilize MLP in AFS ST. The ways can broadly be assigned to six different areas. First, for the development of future scenarios (Jedelhauser et al., 2018); second, for the enrichment of newly developed models, frameworks, or concepts (Cembalo et al., 2020; Ribeiro and Turner, 2021; de Boon et al., 2022); third, in the analysis of transition dynamics or as an explanatory approach of how change happens (Jedelhauser et al., 2018; Wöhler et al., 2020; Sanon et al., 2021; Hundscheid et al., 2022); fourth, for elaboration on alignment processes within and between levels (Goulet, 2021; Kaweesa et al., 2021); fifth, in the study of interactions, positions, and influence of human and non-human actants and agency (Kuokkanen et al., 2018; Giombelli and Triches, 2019; López-García et al., 2019; Deviney et al., 2020; Farhangi et al., 2020; Contesse et al., 2021; Polita and Madureira, 2021a; Ribeiro and Turner, 2021); and finally, for the identification of barriers in transitions (Hosseinifarhangi et al., 2019; Long et al., 2019; McInnes, 2019; Deviney et al., 2020; Anselmi and Vignola, 2022). In some articles, the authors remain rather vague on how they utilized MLP (Fogarassy et al., 2018; Schaffer et al., 2019; Cembalo et al., 2020). Regarding the three MLP levels, the niche represents the most prominent object of study (e.g., Rut and Davies, 2018; Belda-Miquel et al., 2020; Gugereil and Penker, 2020; Boillat et al., 2022) as will be discussed in the following section.

3.6. Niche: understanding and conception in AFS articles

3.6.1. Definitions and thematic classification

The authors present a wide range of characteristics in the description of niches on the micro level. Size (1), innovative capacity (2), organizational form (3), actors and activities (4), and radicality (5) stand out in different ways. The variables place specificity, power, and politics of the respective cases exert influence on the characteristics ascribed to the niches but also on niche-building processes (Rut and Davies, 2018; Gugereil and Penker, 2020). For instance, a strong government presence or authoritarian control causes significant challenges in the development of radical socio-technical regime divergences (Rut and Davies, 2018). If reference is given to the size (1) of the niche, the authors refer to a rather small network of actors without specifying concrete numbers (Bui, 2021; Gudbrandsdottir et al., 2021; Salavisa et al., 2021; Costa et al., 2022). For instance, Bui (2021) underscores that niches are smaller than the regime and Özatagan and Karakaya Ayalp (2021) pertain to "individual and isolated practices" (p. 283), probably in the sense of individual initiatives whereas other authors see the possibility of multiple initiatives within the niche (e.g., Gugereil and Penker, 2020). Amongst others, Gugereil and Penker (2020) and Giagnocavo et al. (2022) refer to niches as safe spaces in need of funding (Long et al., 2019; Gudbrandsdottir et al., 2021; Leeuwis et al., 2021), where protection (e.g., Jakku et al., 2019; Boillat et al., 2022) or even shielding (van der Windt and Swart, 2018) is offered from the dominant regime.

The authors refer to the innovation development (2) on the micro level (e.g., van der Windt and Swart, 2018; Long et al., 2019; López-García et al., 2019; Cembalo et al., 2020; Wöhler et al., 2020) and describe niches as “pioneering innovators” (Cembalo et al., 2020, p. 203; see also Stöhr and Herzig, 2022). Emphasis is laid on experimentation, testing, new ideas and practices (Henfrey and Ford, 2018; Bui, 2021), and on proposing structural answers to lock-ins (De Herde et al., 2020). van der Windt and Swart (2018) bring up the temporal dimension and describe niches as “temporary social spaces” (p. 2). Regarding the organizational form (3), niches seem to be predominantly self-organized (Belda-Miquel et al., 2020; Polita and Madureira, 2021b) and Nemes et al. (2021) characterize niches as “bottom-up participatory initiatives” (p. 592) composed of a range of heterogeneous actors, institutions, networks, and infrastructures (Schiller et al., 2020). Collaboration and networking activities (4) are presented as important practices at the niche level (e.g., van der Windt and Swart, 2018; Anderson et al., 2019; Belda-Miquel et al., 2020; Farhangi et al., 2020; Leeuwis et al., 2021), creating a “sense of belonging” (Belda-Miquel et al., 2020, p. 13). Polita and Madureira (2021b) go even further by attributing niches to the role of “articulators” (p. 20) that must manage to link different innovations between various niches to provide collaborative responses to regimes and landscapes. Belda-Miquel et al. (2020) underscore the social features of the niche as democratic spaces, with human flourishing and even participation.

The radicalness (5) of niches as well as the divergence from or opponent to the incumbent regime is emphasized (e.g., Rut and Davies, 2018; Bui, 2021; Özatagan and Karakaya Ayalp, 2021; Anselmi and Vignola, 2022; Boillat et al., 2022; Holtkamp and van Mierlo, 2022). On the other hand, some authors bring out that more moderate activities have their right to exist on the niche level (Rut and Davies, 2018; Farhangi et al., 2020; Contesse et al., 2021; Nemes et al., 2021). Rut and Davies (2018) discover niche projects as “consensual attempts to incorporate alternatives within existing regimes” (p. 285) that refrain from re-configuring the regime and rather seek to become competitive in line with regime criteria. For the development of technological innovations, some authors report collaborations from niche and regime actors that pursue similar goals (Hosseinfarhangi et al., 2019; Farhangi et al., 2020). In this sense, Bui (2021) expresses concerns that empirical usage of MLP levels (here niches) demands reflexivity, e.g., in attributing incremental innovations that do not diverge from the incumbent regime, a niche status. For instance, in the case of the transition to integrated pest management (IPM) in Chile (Contesse et al., 2021), IPM innovations were demanded from within the regime (due to sudden landscape pressures, i.e., a pest). Whether these occurring innovations can be seen as a niche or rather as a regime-initiated innovation can be discussed. Similar findings were reported by El Bilali (2019). Caution and reflexivity in the allocation of niche-level activities are required.

Thematic fields within the niche range from alternative practices, for instance, agroecology (e.g., Anderson et al., 2019; Dumont et al., 2020; Bui, 2021; Boillat et al., 2022), participatory guarantee systems (Anselmi and Vignola, 2022), organic agriculture (e.g., Heyen and Wolff, 2019; Averbuch et al., 2021; Salavisa et al., 2021), conservation agriculture (Kaweesa et al., 2021), integrated pest management (Contesse et al., 2021), food purchasing

groups (Belda-Miquel et al., 2020), or farmers markets (McInnes, 2019) through more technological innovations (e.g., for manure management, in fisheries, pesticide application, and alternatives; Hosseinfarhangi et al., 2019; Jakku et al., 2019; Farhangi et al., 2020; Goulet, 2021) to community concepts, such as ecovillages (Henfrey and Ford, 2018) or eco-friendly school lunch programs (Gaddis and Jeon, 2020). However, different interpretations exist. Dumont et al. (2020), for instance, assign organic agriculture already to the regime level and see agroecology as the niche in the analysis of vegetable production in Belgium. Some authors view agroecology, organic agriculture, or alternative food systems as such as the niche (e.g., Anderson et al., 2019; Nemes et al., 2021), others explicitly refer to the activities that drive these concepts or paradigms forward as the micro-level. Examples thereof comprise (grassroots) initiatives, producers, or a network of actors dedicated toward an alternative paradigm (e.g., Rut and Davies, 2018; Gaddis and Jeon, 2020; Gugerell and Penker, 2020; Bui, 2021; Boillat et al., 2022) but also management approaches, such as integrated pest management or innovative management practices in fisheries are seen as niches (Contesse et al., 2021; Sanon et al., 2021).

3.6.2. Social innovations vs. technological novelties

In line with the MLP literature (e.g., Geels, 2020), the development of innovations and novelties, diverging from the regime, are niche’s natural mission (e.g., van der Windt and Swart, 2018; Wöhler et al., 2020; Bui, 2021; Gudbrandsdottir et al., 2021; Nemes et al., 2021; Anselmi and Vignola, 2022; Boillat et al., 2022). Niche novelties within the AFS seem to be disproportionately socially driven innovations than solely technological novelties (Kuokkanen et al., 2018), addressing “social issues overlooked by the agro-industrial regime” (Nemes et al., 2021, p. 292). For instance, Wöhler et al. (2020) identify “awareness raising, involving education and knowledge transfer” (p. 5) as a niche innovation. Radical visions of new forms of coordination and governance are being developed, rules, power relations, and prevailing structures are being challenged, or social networks are being constructed within the niche level (Henfrey and Ford, 2018; van der Windt and Swart, 2018; Gugerell and Penker, 2020; Averbuch et al., 2021; Bui, 2021). Alternative models and structures, e.g., for production and consumption or value chains, are evolving (Belda-Miquel et al., 2020; De Herde et al., 2020; Polita and Madureira, 2021b). Rut and Davies (2018) voice that socially driven innovations challenge traditional transition thinking (i.e., technological). Those innovations evolve and follow no strategic or manageable path. Thus, they require more support and awareness of the socio-political context for scaling up and out. However, some authors refer to niche innovations solely in the sense of technological novelties (e.g., specific integrated pest management practices (fungi and pheromones) instead of heavy use of pesticides, technological innovations in manure management, and technological innovations in high-tech urban agriculture; Deviney et al., 2020; Farhangi et al., 2020; Goulet, 2021; Gudbrandsdottir et al., 2021).

3.6.3. Niche motivations

Distinct motivations of actors for niche-level activities are reported. These can broadly be divided into intrinsic motivations (e.g., social values, empowerment of marginalized groups, and food sovereignty), environmental aspects (e.g., as a response to pressure (e.g., pests) or more preventive in the sense of nature conservation), dissatisfaction with the current system (e.g., reliance on food imports), and economic motives (e.g., market gap and profit expectations; Henfrey and Ford, 2018; Rut and Davies, 2018; van der Windt and Swart, 2018; Salavisa et al., 2021; Anselmi and Vignola, 2022; Costa et al., 2022). Anselmi and Vignola (2022) consider that different motives lead to conflicts and diverging engagement, challenging the level of trust between the members within the niche. Because of these distinct motives, Bui (2021) recommends refraining from designating actors ex-ante as niche actors, solely based on whether “they do or do not use an alternative technology or contribute to its development” (p. 4). Instead, the author proposes to infer this interpretation from the empirical results.

From the presented findings, the distinction between niche-level *actions* and niche-level *actors* for past transitions and ongoing transitions comes to the fore. Defining niche-level actors in past transitions seems more straightforward as (if data is available) the entirety of activities can be taken into consideration. For ongoing transitions, the term niche level actions (e.g., Özatagan and Karakaya Ayalp, 2021) might be more appropriate, as individual beliefs and activities can change throughout the process, even leading to switching between different levels, depending on whether the actor's personal aims have been achieved and interests are addressed.

3.6.4. The concept of the protected space

Leeuwis et al. (2021) argue that temporary protection of niche-level initiatives and innovations is required to become mature and competitive. Particularly, AFS authors elaborate on first, the *who* (i.e., who is providing this protection), and second, the *how* (i.e., how is protection offered). First, as protecting entities for niches, these authors identified non-governmental organizations (NGOs), state actors, governments, municipalities, and cities as guardians (Rut and Davies, 2018; Hosseinifarhangi et al., 2019; Gaddis and Jeon, 2020; Özatagan and Karakaya Ayalp, 2021; Van Poeck and Östman, 2021; Boillat et al., 2022; Giagnocavo et al., 2022). Deviney et al. (2020) identify the landscape level as a source of support that can offer community engagement and funding, as well as favoring policies and incentives. Regime actors (i.e., incumbent firms) can equally serve as patronages for technological innovations (Farhangi et al., 2020). In this sense, Farhangi et al. (2020) relativise the radicalness of the innovation which might indicate that this pairing might not lead to a radical reorganization of the system. Protection can be offered from the niche as well, e.g., alternative cooperatives models acting as protected spaces for innovations (De Herde et al., 2020).

Second, in terms of *how*, Holtkamp and van Mierlo (2022) discover that radical social innovations are providing their

protection and identify the concepts of paving, networking, and meaning-making (see Section “Niche strategies”) what they compare to Smith and Raven (2012) empowering, nurturing, and shielding. Gugerell and Penker (2020) take up Smith and Raven (2012) empowerment strategy and identify another form. Next to “fit and conform” and “stretch and transform”, they describe a “process of staying independent and small” that protects the regime. In that sense, it can be questioned whether “staying independent and small” is contradictory to the concept of empowerment by Smith and Raven (2012), where developing competitiveness and innovation's diffusion are essential characteristics of the empowerment stage. Funding seems to function as a major source of protection and is afforded by municipalities, states, governments, NGOs, and organizations (Hosseinifarhangi et al., 2019; Long et al., 2019; Gaddis and Jeon, 2020; Long and Blok, 2021; Özatagan and Karakaya Ayalp, 2021; Van Poeck and Östman, 2021; Boillat et al., 2022). State support through favorable national policies is also seen as an important lever (Schiller et al., 2020). Although, the protection offered does not seem to be without compromises. Boillat et al. (2022) underscore that the niche protection in Senegal offered by NGOs and organizations from Europe and Northern America is creating transnational ties, dependencies, and holds control mechanisms. Leeuwis et al. (2021) argue that protection should be temporary and forms of “overprotection” (p. 772) need to be prevented as they might lead to a lack of self-sufficiency once protection is lifted.

3.6.5. Niche strategies

The authors identified different strategies that niches are following to strive for influence and contribute to the socio-technical transition: alignment processes (1), anchoring (2), coalition forming, cooperation and alliance building (3), and paving (4). The concept of alignment (1) is still ill-defined in the literature (Goulet, 2021). Alignments can pose obstacles to transitions, for instance, in the incumbent regime, leading to robustness and stability, creating path-dependencies and resistance. On the other hand, favorable alignments can arise within the niche or between niche and regime entities, if former competitors combine their interests (e.g., social groups, rules, and interests; Geels, 2018; Goulet, 2021). Goulet (2021) characterizes these alignment processes as a “matter of linkages between niche and regime components, and of the coherence of these linkages” (p. 8). For coherence, a high degree of commonality between the different entities is of importance, rather than separateness.

Anchoring (2) describes a similar concept of linking niches and socio-technical regimes or niches and other niches (Polita and Madureira, 2021b). The three forms, *technological*, *network*, and *institutional* anchoring (cf. Elzen et al., 2012), were similarly identified in AFS studies (López-García et al., 2019; De Herde et al., 2020; Gaddis and Jeon, 2020; Schiller et al., 2020; Kaweesa et al., 2021; Polita and Madureira, 2021b). Network anchoring is the most prominent form which is not surprising due to the omnipresence of social innovations in AFS studies. Schiller et al. (2020) discover a fourth form of anchoring, *discursive anchoring*. They describe

it as a form of “seeding” alternative thinking (*here* agroecological thoughts) into different sectors (e.g., through research institutes, market-oriented initiatives). Polita and Madureira (2021b) describe a process of a novelty that only marginally “anchored the regime” (p. 16) with low commitment from institutions and stakeholders. It occurs only in some points of the niche–regime interface and remains there due to the mobilization between innovations. They refer to it as a further form of anchoring (*marginal anchoring*), up to now unnoticed in the literature. Although, it can be questioned if the process the authors are depicting rather describes a form of network anchoring (i.e., the mobilization between innovations). Since, anchoring does not yet implicate durable links. It is rather defined as a process where the connections are still vulnerable and can be subverted again (Elzen et al., 2012).

A clear differentiation between alignment processes and anchoring in transition literature in general (Elzen et al., 2012) but also in the identified AFS articles (Goulet, 2021) is lacking. Elzen et al. (2012) suggest that an “alignment of the three forms of anchoring is crucial to transform anchoring into a durable link” (p. 15), without further specifying if the word alignment represents a specific concept or is meant as a kind of harmonization between the three forms. In general, both concepts occupy similar terms, using *linking processes, alliances, coherence, or coalition building* (López-García et al., 2019; Schiller et al., 2020; Kaweesa et al., 2021; Polita and Madureira, 2021b). Future studies could focus on setting both concepts in relation and test whether divergent applications lead to profound findings and improvements.

The third cited strategy, coalition forming, cooperation, and alliance building (3), is part of both the aforementioned concepts but appears also independently. Coalitions among niche actors but also cooperation and collaborations with the regime are identified (Giombelli and Triches, 2019; Gugerell and Penker, 2020; Bui, 2021; Gudbrandsdottir et al., 2021; Long and Blok, 2021; Mehrabi et al., 2022). For instance, “nudging regime actors by providing alternative solutions” (Gugerell and Penker, 2020, p. 9) is one way of exerting influence on the regime. Coalition forming and interaction between niche actors is seen as a strategy that might lead to the decentralization of incumbent power relations within regimes as the pressure can be exerted simultaneously and various capabilities (e.g., practices, infrastructures, and knowledge) can be aggregated (Bui, 2021; Mehrabi et al., 2022). However, dissent on the effectiveness and intensity of niche–regime collaborations exists. Anderson et al. (2019) see the risk of linking up too much with actors empowered by the agri-food regime as this risks softening radical novelties and visions. Holtkamp and van Mierlo (2022) introduce paving (4) as a strategy where civil society (i.e., niche actors) creates favorable political opportunities to strengthen their ideas and visions. The authors identified this concept in combination with networking activities and meaning-making (creating collective identity, legitimacy, and emotional narratives) for a successful implementation of niche agri-food novelties.

Interestingly, although founders of the MLP initially attribute less importance to the niche level for transition processes as a whole (as presented in the introduction), it constitutes the dominant focus of AFS authors when analyzing so-called agri-food *system transitions*.

3.7. Space between MLP levels

Previous transition literature already indicates that boundaries between MLP levels are fluid rather than clear-cut (Holtz et al., 2008; Smith et al., 2010; Geels, 2011). This can similarly be ascertained in recent AFS articles (e.g., Rut and Davies, 2018; Long et al., 2019; López-García et al., 2019; Schiller et al., 2020; Contesse et al., 2021; Polita and Madureira, 2021b). Schiller et al. (2020) remark that the clear-cut distinction of levels only constitutes a heuristic construct and the co-existence of niches and overlapping of niche and regime actors determine the actual reality. In the transitions literature (not limited to AFS), more research is evolving describing the overlapping space and actors between niche and regime (e.g., Diaz et al., 2013; Fischer and Newig, 2016; Kivimaa et al., 2019; Bünger and Schiller, 2022). Naturally, rapprochements are biased by the researcher’s respective theoretical lens which influences the choice of wording and attributions for this space. In the AFS articles, for instance, Actor–Network Theory (i.e., usage of intermediary; Contesse et al., 2021) or innovation systems (i.e., the term technological system; Passos Medaets et al., 2020) are utilized, but often, a clear origin of the wording remains open. Below, different conceptualisations are introduced. Commonalities exist regarding the involvement of actors from both regime and niche as well as the attribution of a certain kind of transformative power, although the multiplicity of terms and the assigned characteristics still indicate ambiguity and distinct understandings in AFS literature but also transitions research in general.

AFS authors label the space where the roles of niche and regime actors overlap as *intermediate level* (Contesse et al., 2021), *hybrid forums* (López-García et al., 2019), *niche–regime interface* (Polita and Madureira, 2021b), or *multi-stakeholder innovation platforms* (Leeuwis et al., 2021). Inspired by Elzen et al. (2012), López-García et al. (2019) describe it as an “*institutional anchoring space*” (p. 9) where niche–regime linking takes place. Anderson et al. (2019) bring in the “*domains of transformation*” as an overlapping and interconnected space between an alternative (*here* agroecology) and the incumbent regime. In these domains (e.g., access to natural ecosystems, knowledge and culture, and networks), niche and regime meet and can confront each other. Henfrey and Ford (2018) complement the MLP with a fourth level, the “*empowered niche*” or “*niche–regime*” (p. 110). They describe it as an “*intermediate form*” (p. 110), incorporating features of both levels. It describes the phase where the niche holds enough power (e.g., support) to present a potential alternative or threat to the regime. Leeuwis et al. (2021) emphasize the opportunity for collaborative research in this space. The potential of involving regime actors in learning processes and the creation of shared visions is underscored (Long et al., 2019). It is characterized as a permeable, dynamic place for exchanges, redefining links, with instability regarding one level toward another (Contesse et al., 2021; Polita and Madureira, 2021b). It can operate as a lever for scaling emergent innovations up and out (López-García et al., 2019). Cities, municipalities, or regions seem to function as initiators, providing and protecting this space (López-García et al., 2019; Gugerell and Penker, 2020; Özatagan and Karakaya Ayalp, 2021). De Herde et al. (2020) see the inclusion of incumbent actors as a focal lever for the niches to

gain more relevance and redefine these actors' role perceptions and power relations.

In the transitions literature beyond an AFS focus, distinct terms for this space and the respective actors are used. For instance, *intermediary* from the innovation system's approach (Fischer and Newig, 2016; Kivimaa et al., 2019) or *hybrid actor* or *change agent* are exclaimed (Diaz et al., 2013; Bünger and Schiller, 2022). In AFS articles, actors' categories within this level comprise *hybrid actor* (López-García et al., 2019; Boillat et al., 2022), *intermediary* (Hosseinfarhangi et al., 2019) or *regime-based niche-regime intermediary* (Contesse et al., 2021), *sustainable entrepreneur* or *front-runners* (Long et al., 2019), or *change agent* (Gugerell and Penker, 2020). Change agents seem to play an important role in introducing, managing, or realizing transitions (Gugerell and Penker, 2020). López-García et al. (2019) see hybrid actors as agents without direct competencies in the specific domain of the novelty (e.g., agriculture and agricultural innovation). For instance, they call administration officers or municipalities hybrid actors and see their role in "catalyzing" (p. 10) niche-regime interactions because of their two-sided nature as both niche and regime actors. Slightly differently, Özatagan and Karakaya Ayalp (2021) deviate from assigning municipalities directly to the niche level. Instead, they rather see municipalities exerting niche-level favorable actions. Caution is proposed in attributing hybrid actors the ability to up- and outscale transformations alone (López-García et al., 2019). Further activities from niche actors and, for instance, food movements are needed. A call for a richer analysis of the roles and functions of these hybrid actors in transitions is exclaimed (Schiller et al., 2020).

The variety of terms and characteristics shows that there is no clear conceptualization for this space in the AFS articles but also in transitions literature beyond AFS, yet. In AFS literature covering ST using MLP, this space between niche and regime seems to be a recent development as it was not considered in El Bilali's (2019) review. So far, research mainly focusses on the overlapping space between niche and regime. The space between the other levels (e.g., regime-landscape) remains rather neglected. Future research could broaden the lens to these domains and explore if this proves useful for transition research.

3.8. Regime: application and conception in AFS publications

3.8.1. Regime construction and understanding

As agri-food regimes, AFS authors refer to the currently dominant conventional and industrial agri-food value chain stages (e.g., Henfrey and Ford, 2018; Belda-Miquel et al., 2020; Goulet, 2021; Polita and Madureira, 2021b; de Boon et al., 2022; Mehrabi et al., 2022). The socio-technical regime is built up by its multiple interrelated domains (i.e., sub-regimes), such as the prevailing laws, policies, knowledge and skills, culture and practices, networks, and discourses that are reinforcing its reproduction (e.g., Belda-Miquel et al., 2020; Wöhler et al., 2020; Contesse et al., 2021; Leeuwis et al., 2021; Salavisa et al., 2021; Anselmi and Vignola, 2022). For instance, denoted regime practices are described as "the way of doing things" (Mehrabi et al., 2022, p. 10), e.g., high use of chemicals in pest

management (Contesse et al., 2021). Regime actors are depicted as the actors and groups involved in and reproducing those practices (e.g., Hosseinfarhangi et al., 2019; Dannenberg et al., 2020; De Herde et al., 2020; Farhangi et al., 2020; Wöhler et al., 2020), such as corporate retailers (Costa et al., 2022), conventional farmers, or those actors who promote agricultural intensification and related conventional food practices (Holtkamp and van Mierlo, 2022) as well as policymakers (Kuokkanen et al., 2018). Regime actors are either viewed as resisting forces to change (Anderson et al., 2019; Heyen and Wolff, 2019; Deviney et al., 2020; Anselmi and Vignola, 2022) or in some cases as actors who accommodate changes toward sustainability in their own best interest (Kuokkanen et al., 2018; Rut and Davies, 2018; Hosseinfarhangi et al., 2019; Farhangi et al., 2020; Contesse et al., 2021).

Differences persist in regimes configuration that may relate to distinct regime foci (and incoherence) in the literature, as outlined in the introduction. On the one hand, informed by institutional theory, the regime is depicted as the rules *structuring* a socio-technical system (Roberts and Geels, 2019; De Herde et al., 2020; Hundscheid et al., 2022). On the other hand, there is a branch that takes the materials, incumbents, actors, and coalitions as a starting point for the analysis (Kuokkanen et al., 2018; Giombelli and Triches, 2019; Farhangi et al., 2020; Costa et al., 2022), whereby the latter approach seems to stand out. This can only be estimated as some regime conceptualisations lack a clear configuration (e.g., Fogarassy et al., 2018; Heyen and Wolff, 2019; de Boon et al., 2022). El Bilali's (2019) review indicates that these inconsistencies might have already been found in previous studies, although he refers to the regime as rules and regulations without elaborating on other theoretical regime perceptions from transition literature.

In this review's AFS articles, further uncertainties exist in the socio-technical regime's demarcation from the socio-technical system. Equation of these two concepts is partly undertaken (e.g., Schiller et al., 2020). Some authors underscore the difference by referring to regimes' intangible deep structure (Bui, 2021; Leeuwis et al., 2021). Geels argues that these uncertainties (most commonly in empirical articles) may stem from a focus on "macro-patterns of transitions" rather than "micro-sociological dynamics" (p. 31). These uncertainties demand more caution in the use of the regime concept and a deeper theoretical analysis of the concept when applying it.

3.8.2. Regime characteristics

In the characterization of the regime level, the scale (1), time (2), stability (3), and lock-ins and path-dependencies (4) stand out. Regarding the scale (1), it is notable that many authors refer to national-level events (e.g., regulations and policies) when they refer to the regime (Farhangi et al., 2020; Schiller et al., 2020; Averbuch et al., 2021; Gudbrandsdottir et al., 2021), such as Dutch food policies (Farhangi et al., 2020) or "national regulatory framework" (Gudbrandsdottir et al., 2021, p. 13). This seems to be independent of the respective territorial focus as Schiller et al. (2020) and Averbuch et al. (2021) concentrate on national transitions (i.e., Nicaragua and Denmark) and Farhangi et al. (2020) on a local scale (i.e., Amsterdam). Dannenberg et al. (2020) offer a more dynamic description. For instance, they refrain from linking particular

objects (e.g., institutions and technologies) or spatial scales (e.g., national policy frameworks) to the regime (but also the other MLP levels) and focus on the time (2) objects or trends survive. In that sense, short- or middle-term phenomena are appointed to the regime level. For instance, *Averbuch et al. (2021)* allocate “short-term national-level socio-cultural phenomena” (p. 3) to the regime. *Dannenberg et al. (2020)* describe the regime as political measures of a particular period (e.g., curfews during the COVID-19 pandemic). How long a phenomenon or object needs to exist until it becomes part of, for instance, the landscape remains unclear. Time is not only used as a characteristic in the differentiation of MLP levels but also utilized in the description of the pace of change happening at the regime level. Authors underscore that generally, systemic regime change occupies a longer period, including preparation, trial, and practice (*Giagnocavo et al., 2022; Hundscheid et al., 2022*). However, if pressure is strong enough, change processes can speed up (e.g., landscape-level pressure during the COVID-19 pandemic or agricultural pests; *Dannenberg et al., 2020; Contesse et al., 2021*).

Regime’s stability (3) ranges from static versions to more vivid and differentiated interpretations. The aforementioned aligned domains of the regime (e.g., policy, market orientation, industry, technology, markets, and culture) ensure this stability and provide the regime’s “deep structure” (*Averbuch et al., 2021; Leeuwis et al., 2021*). The interaction between those areas dictates how it approaches challenges to preserve this structure (*Averbuch et al., 2021*). Incremental innovations occur in a regime that functions as a selection and retention environment (*Kuokkanen et al., 2018*). On the one hand, stable socio-technical regimes are presented. Cognitive convictions and cultural identity, e.g., in the case of meat consumption (*Hundscheid et al., 2022*), strong state control (*Özatagan and Karakaya Ayalp, 2021*), or power relations that foster strong positions of incumbent actors at the expense of other actors (*Anderson et al., 2019; Gudbrandsdottir et al., 2021*) are safeguarding regimes’ stability. Alignment of those regime elements makes regimes robust and stable, impeding changes, characterized by inertia (*Belda-Miquel et al., 2020; Goulet, 2021; Hundscheid et al., 2022*). On the other hand, much more vividly evolving views of the regime level and its stability are being presented that allow space for contestations, disagreements, and uncertainties over certain pathways instead of simply assuming alignment (*Kuokkanen et al., 2018; Farhangi et al., 2020; Passos Medaets et al., 2020; Bui, 2021; Contesse et al., 2021; Hundscheid et al., 2022*). For instance, authors identified alternative paradigms evolving in the regime (*Bui, 2021*), regime actors actively influencing the selection environment (accommodating sustainability change; *Kuokkanen et al., 2018*), or regime actors as drivers for change, initiating networking activities across MLP levels (*Farhangi et al., 2020*). These findings hint at the existence of rather heterogeneous regimes than solely homogeneously aligned regimes which were criticized in transition literature (e.g., *Shove and Walker, 2010*). This seems to be a newer development since *El Bilali’s (2019)* review where lock-ins, path-dependencies, and stability were the main regime characteristics.

Lock-ins and path-dependencies (4) are introduced as reasons for the slow pace of change processes and regimes’ stability. Technological or institutional path-dependencies reinforce

systemic lock-ins (*Kuokkanen et al., 2018*) which are posed by regime actors (*López-García et al., 2019*). In the articles, these lock-ins are exemplified as “the dominant regime’s interrelated market incentives and policies” that are forcing farmers into “high-external input dependent agriculture” (p. 13), international trade, that marginalizes communities in low-income countries (*Anderson et al., 2019*), power of retailers (*Kuokkanen et al., 2018*), or prevailing economic structures (*Wöhler et al., 2020*). In the case of implementing agroecology, *Anderson et al. (2019)* emphasize that lock-ins can only be overcome by shifts in political-economic power. Furthermore, changes at the landscape level or influential niches can open lock-ins (*Rut and Davies, 2018*). Distinct forms of lock-ins are presented: first, organizational (a); second, financial (b); third, cultural (c); and last, structural (d). The first form, organizational lock-in (a), represents the way the mainstream agri-food value chain is organized (*Anderson et al., 2019; De Herde et al., 2020; Passos Medaets et al., 2020; Averbuch et al., 2021; Ortiz and Peris, 2022*). Second, financial lock-ins (b), such as investments in technology, infrastructure, or competencies (i.e., sunk costs), are often undertaken in the long run and cannot be recovered. Cultural lock-ins as a third form (c) reconcile, for instance, shared beliefs, prevailing discourses or consumer preferences, and quality standards that favor certain decisions or products linked to the prevailing (farming) system (e.g., standardized color or size of foods) at the expense of others (*De Herde et al., 2020; Van Poeck and Östman, 2021*). And last, structural lock-ins (d) are related to the prevailing systemic structure, such as structural power that privileges certain actors empowered by the regime or a concentration of resources that structurally inhibits niche actions (*Jedelhauser et al., 2018; Anderson et al., 2019; Belda-Miquel et al., 2020; De Herde et al., 2020; Goulet, 2021*).

In short, the analytical emphasis remains rather on barriers and lock-ins associated with the regime. However, some authors describe a more vividly evolving and diversified agri-food regime.

3.8.3. Regime destabilization and change processes

Transition literature indicates that regime destabilization consists predominantly of a process of external pressure, followed by aligned strategic responses up to decreasing regime dedication (*Turnheim and Geels, 2013; Kuokkanen et al., 2018*). *Kuokkanen et al. (2018)* emphasize that these processes during regime destabilization are rather diffusing and overlapping than straightforward. Due to distinct expectations of the future, the outcome is unpredictable. Partnerships, landscape and niche pressure, activism, development of new roles whilst alteration of existing ones, negative reporting about the regime, or publicly expressed concerns constitute only some of the examples reported in the articles that provoke regime destabilization (*Farhangi et al., 2020; Gaddis and Jeon, 2020; Bui, 2021; Özatagan and Karakaya Ayalp, 2021; Hundscheid et al., 2022*). For instance, public-private partnerships have reduced resistance from regime actors regarding the implementation of agricultural technological innovations (*Farhangi et al., 2020*), and negative reporting about the regime (i.e., environment-related arguments against meat consumption)

led to scrutinizing the regime's beliefs and norms (Hundscheid et al., 2022).

When it comes to regime change, Averbuch et al. (2021) underscore the role of the regime's deep structure and challenge the transformative role of niches as the most important level for innovation and change. From their findings, they underscore that "niches must integrate within the regime's deep structure for a successful transition" (p. 14). In their case of transition to organic agriculture in Denmark, it only began to thrive after its integration within the regime's deep structure (e.g., restructuring through a government-controlled production system). Furthermore, other AFS articles indicate that alternative socio-technical configurations can emerge in regimes as well and simultaneously be sudden rather than incremental, exhibiting a certain degree of radicality (Rut and Davies, 2018; Contesse et al., 2021; Jia, 2021). This is especially the case if landscape pressure is strong and sudden. For instance, Contesse et al. (2021) analyse the case of a pest destroying harvests which lead to an abrupt regime-driven change toward sustainable pest management. This might imply that due to sudden crises, regime changes occur not only incrementally but rapidly, without the presence of strong niche pressure. Although, regarding ST, it can be argued that both cases are not showing inherent actions toward a more sustainable AFS in the first place but rather reacting to external pressures, with sustainability as a side-benefit. Generally, authors emphasize that most regime-initiated changes involve solely adjustments to the incumbent regime instead of radical shifts (e.g., Anderson et al., 2019; Long et al., 2019; Deviney et al., 2020; Averbuch et al., 2021; Bui, 2021).

3.9. Landscape: definitions, descriptions, and influencing factors in AFS studies

3.9.1. Landscape definition and dimensioning

The landscape receives less attention than niche or regime which has not changed much since the aforementioned former review. On the one hand, authors focus solely on niche or niche-regime interactions and tend to overlook this level, refraining from further elaborations. For the sake of completeness, common definitions from transition literature are cited that constitute nearly the only reference to the landscape level (Fogarassy et al., 2018; Heyen and Wolff, 2019; Schaffer et al., 2019; Gugerell and Penker, 2020; Long and Blok, 2021; Van Poeck and Östman, 2021; Boillat et al., 2022). On the other hand, some authors present more detailed elaborations which are listed below (Passos Medaets et al., 2020; Averbuch et al., 2021; Contesse et al., 2021; Gudbrandsdottir et al., 2021; Hundscheid et al., 2022). Thereby, especially influences on the landscape level and landscape as an actant stand out that we will present in the last part of this section.

In line with the transition literature, AFS authors describe the landscape as the exogenous, broader context in which niches and regimes take shape (Anderson et al., 2019; Giombelli and Triches, 2019; Belda-Miquel et al., 2020; Bui, 2021; Goulet, 2021; de Boon et al., 2022). Mostly, the description remains superficial. The landscape is defined as societal, environmental (e.g., crisis and climate change), and political processes, trends, crisis and

TABLE 3 Landscape factors toward sustainable development from agri-food articles and their assignment to topical domains.

| Domains | Landscape-level pressures in the agri-food articles toward sustainable development |
|--|--|
| Economic | <ul style="list-style-type: none"> - discrediting of big food companies, - food speculations, - financial crisis, - globalization, - global value chains, - circular economy visions, - modernization, - fertilizer prices, - digitalisation and e-commerce |
| Environmental | <ul style="list-style-type: none"> - climate change and its implications on resource scarcity, - soil and environmental degradation, - changing weather patterns, - increased environmental awareness |
| Social and cultural | <ul style="list-style-type: none"> - dietary shifts, - consumer preferences (e.g., increasing demand for organics), - income concentration, - societal perceptions (e.g., regarding the use of pharmaceuticals), - academic debates, - social movements, - civil society (e.g., environmental NGOs) |
| Demographic | <ul style="list-style-type: none"> - population growth |
| Political regulations, norms, and policies | <ul style="list-style-type: none"> - international and regional policies and laws - Paris agreement, - Sustainable Development Goals, - Common Agricultural Policy (CAP), - policies on European level, - trade agreements, market access, and political tensions |
| Health | <ul style="list-style-type: none"> - food scandals (e.g., BSE, dioxin, and horse meat), - pandemics (COVID-19), - increased health awareness, - global food crisis |

Own summary based on AFS articles.

Jedelhauser et al., 2018; Kuokkanen et al., 2018; Rut and Davies, 2018; Heyen and Wolff, 2019; Roberts and Geels, 2019; Belda-Miquel et al., 2020; Dannenberg et al., 2020; Farhangi et al., 2020; Gaddis and Jeon, 2020; Passos Medaets et al., 2020; Bui, 2021; Gudbrandsdottir et al., 2021; Kaweesa et al., 2021; Nemes et al., 2021; Salavisa et al., 2021; Sanon et al., 2021; Hundscheid et al., 2022.

changes, values and norms, culture and practices, and macro-economic patterns (van der Windt and Swart, 2018; Giombelli and Triches, 2019; Long et al., 2019; Wigboldus et al., 2019; Belda-Miquel et al., 2020; Deviney et al., 2020; Passos Medaets et al., 2020; Goulet, 2021; Anselmi and Vignola, 2022; de Boon et al., 2022; Mehrabi et al., 2022; Sobratee et al., 2022). It is outlined as the deep social structure, surrounding the regime and niche (Deviney et al., 2020; Dumont et al., 2020; Polita and Madureira, 2021b). More narrow landscape pressures toward sustainability identified by AFS authors are listed in Table 3, assigned to topical domains.

3.9.2. Landscape-level description and elaboration

Further landscape descriptions are offered regarding, first, the immaterial domain (1); second, the scale (2); third, the period (3);

fourth, drivers and constraining forces (4); and last, windows of opportunity (5). Regarding the first aspect, interestingly, authors merely refer to the trends and the immaterial domain of the landscape (cf. Table 3). Reference to the material domain is rarely provided. Hosseinifarhangi et al. (2019) address the decline of arable land per person as a landscape trend that has more infrastructural implications. Jakku et al. (2019) refer to the lack of digital infrastructure that poses a constraint to the transition to smart farming technologies. van der Windt and Swart (2018) reference the material domain as “biophysical conditions such as infrastructures, geographies, and existing urban and nature areas” (p. 2) without further elaborations. The lack of the material domain is especially surprising since, as introduced in the beginning, AFS are not only socio-technical systems but they also comprise the ecological dimension that plays an important role. Therefore, it can be questioned why the material landscape, for instance when looking at agricultural transitions, receives little attention.

Second, the authors refer to regulatory phenomena on a European and international scale (Fogarassy et al., 2018; Long et al., 2019; Belda-Miquel et al., 2020; Averbuch et al., 2021; Bui, 2021). For instance, Averbuch et al. (2021) indicate “international-level rules and regulations” (p. 3) but also regional or national agricultural and rural policies were accounted for the landscape level (Bui, 2021). Third, the time period is focussed. Most authors refer to the long-term structure where changes occur rarely (Rut and Davies, 2018; van der Windt and Swart, 2018; Dannenberg et al., 2020; Goulet, 2021; de Boon et al., 2022) and over decades (Averbuch et al., 2021). Rapid shocks, like COVID-19, can speed up the pace of change (Roberts and Geels, 2019; Dannenberg et al., 2020; Leeuwis et al., 2021). Both periods, the long-term patterns and rapid shocks, are in line with landscape conceptualisations in transition literature as outlined in the introductory section (Driel and Schot, 2005; Geels, 2011).

Fourth, landscape pressure can favor or hinder sustainability changes. Authors describe the macro-level pressure on socio-technical regimes as a necessity for niches to breakthrough (Deviney et al., 2020; Farhangi et al., 2020; Averbuch et al., 2021; Kaweesa et al., 2021; de Boon et al., 2022). In particular, the authors refer to the enhancing forces that can be divided into the six categories, outlined in Table 3. Özatagan and Karakaya Ayalp (2021) report that landscape pressure emerges more forcefully if activists, ecologists, and producers alike voice criticism of incumbent AFS. Then again, landscape forces can also be in favor of the regime, maintaining its dominant status quo. These comprise, for instance, the lack of digital infrastructure in rural areas regarding the introduction of smart farming technologies (Jakku et al., 2019), the gap between awareness of environmental drivers and political actions (Long et al., 2019), distrust toward political institutions (McInnes, 2019), or current European subsidy policy (Salavisa et al., 2021). Finally, certain landscape dynamics can open windows of opportunity for niche construction or reorganization of regime actors (van der Windt and Swart, 2018; López-García et al., 2019; Dannenberg et al., 2020; Ribeiro and Turner, 2021). Although in the case of shocks, these are likely to be more fragile and of a time-limited nature (e.g., COVID-19; Dannenberg et al., 2020).

3.9.3. Influences on potential agency of the landscape level

Some AFS authors argue that niches and regimes can exert influence on the landscape level. Although, consistent with transition literature, not in the short run (Dannenberg et al., 2020; Farhangi et al., 2020; Gaddis and Jeon, 2020; Leeuwis et al., 2021; Sanon et al., 2021). On the one hand, these can produce advantageous landscape developments from a sustainability perspective. Favorable progressions on the macro-level comprise, for instance, the effect of new regimes through advances in technologies and the formation of new social practices (Farhangi et al., 2020) or successful strikes whose concerns will become integrated into rules and regulations impacting the landscape level (Gaddis and Jeon, 2020). On the other hand, an impairment that may limit landscape influence toward sustainable development constitutes the strong involvement of the state and its control over certain developments (Sanon et al., 2021).

The combination of Actor–Network Theory (ANT; e.g., Latour, 2007) and MLP was introduced to analyse human and non-human actants from all levels in terms of change processes (see Section 3.7). Findings suggest that the landscape level is not without agency. The literature produced diverging perspectives on this topic, from a more positivistic notion of the landscape level with almost no agency (Grin et al., 2010; Raven et al., 2012; Fischer and Newig, 2016) to rather constructivist lenses in some of the discussed AFS studies (Farhangi et al., 2020; Contesse et al., 2021). This can be explained by ANT’s ontological assumptions. Based on their case study, Contesse et al. (2021) argue that a non-human actant, the *Bagrada hilaris* (an aggressive pest for several vegetables), provoked the creation of networks from different levels to bring the pest under control, contributing to sustainable pest management. Thus, they continue, if non-human agency is considered, the landscape no longer appears as a level without agency. Bearing the author’s assumption in mind, we can follow this argumentation. Nevertheless, this can only be taken further if Latour’s position that non-humans have agency is taken up. Further research is needed to test whether this perspective benefits ST studies and serves as an approach that turns the focus toward the landscape level.

In this section, we demonstrated that there is still a poor focus on the landscape level. To enhance this focus, Averbuch et al. (2021) call for more *longue durée* approaches that present a more comprehensive understanding of developments and might shift the focus to the landscape level. As the landscape level provides similarities with the concept of *longue durée* by the historian Braudel (Geels, 2011), this approach might constitute an entry point for future studies.

3.10. Criticism of MLP and conceptual refinements

Some of the common critiques of the MLP (e.g., lack of attention to agency, unclear operationalisation of MLP levels, bias toward bottom-up change, and lack of attention to power and politics; Geels, 2011; Lachman, 2013; El Bilali, 2019; Köhler et al., 2019) were equally echoed by recent AFS authors and addressed as an access point. Interestingly, some AFS authors

criticize the prevailing technological focus from the MLP (Jakku et al., 2019; Dumont et al., 2020). This is surprising as social and especially institutional features are conceptually brought along in the MLP (Grin et al., 2010; Geels, 2011). In AFS authors' criticisms, five topics stand out: first, the unclear conceptualization of levels (1) (Dannenbergh et al., 2020; Dumont et al., 2020; Averbuch et al., 2021; Bui, 2021; Contesse et al., 2021; Boillat et al., 2022); second, lack of attention to agency, governance, and power relations (2) (Kuokkanen et al., 2018; Long et al., 2019; Roberts and Geels, 2019; De Herde et al., 2020; Gaddis and Jeon, 2020; Schiller et al., 2020; Contesse et al., 2021; Gudbrandsdottir et al., 2021; Polita and Madureira, 2021a; Ribeiro and Turner, 2021; Boillat et al., 2022; Holtkamp and van Mierlo, 2022); third, the dominance of qualitative methods (3) (Jedelhauser et al., 2018); fourth, lack of ecological theories regarding ST (4) (Henfrey and Ford, 2018; Gaddis and Jeon, 2020); and finally, spatial factors (5) (Rut and Davies, 2018; Gugerell and Penker, 2020; Sarabia et al., 2021). Below, some will be addressed in more detail. For further information, Supplementary Table 1 presents an overview of frameworks, theories, as well as authors' reported benefits of combining those with the MLP. In the table, these frameworks and theories are grouped into main themes, that authors integrated, among others, to address these criticisms and specificities of the AFS.

Regarding the unclear conceptualization of levels (1), authors argue that the threshold between MLP levels is rather fluid which leads to analytical confusion (e.g., Rut and Davies, 2018; Long et al., 2019; López-García et al., 2019; Schiller et al., 2020; Contesse et al., 2021; Polita and Madureira, 2021b). One approach to delineate MLP levels (and simultaneously identify historical influences on transitions) constitutes temporal, longitudinal, or *longue durée* analysis (Rut and Davies, 2018; Gaddis and Jeon, 2020; Averbuch et al., 2021; Bui, 2021; Sarabia et al., 2021; Giagnocavo et al., 2022). Bui (2021) suggests taking a flat empirical approach that allows assigning analytical levels (or social groups) ex-ante from the empirical findings. An unclear differentiation was especially voiced regarding the regime and landscape levels (Averbuch et al., 2021; Contesse et al., 2021). In that sense, a combination of ANT and MLP was utilized, among others, to shift the focus to the landscape level (Hosseinifarhangi et al., 2019; Farhangi et al., 2020; Contesse et al., 2021); although Geels (2010) voiced an ontological contradiction between MLP and ANT, he stresses that ANT's more constructivist approach denies structure and usefulness of analytical levels. Contesse et al. (2021) argue for its suitability in network analysis, describing relations and actions, and in addressing the fluidity of MLP levels. Furthermore, it addresses agency (2), another topic that is still denoted as neglected in the literature, although progress is visible (in this review's articles but also already in the former review by El Bilali's, 2019). Predominantly, AFS authors use qualitative research methods (3) (cf. Table 3). This calls for more quantitative and mixed-methods research in AFS studies focussing on ST.

4. Conclusion

With this systematic literature review, we provided an overview and update of recent elaborations and conceptualization on

the use of MLP in AFS transitions toward sustainability. We focussed especially on a deeper analysis of the MLP levels. The fast pace of articles covering AFS in ST shows that AFS are becoming more established in ST research. To reiterate, we first discussed the targeted AFS sectors. Second, we elaborated on the sustainability approaches within the agri-food articles. Then, we presented the understanding and conceptualization of MLP levels by AFS authors, covering niche, niche–regime interface, regime, and landscape. We concluded with an overview of criticisms raised in the articles as well as elaborations and conceptual refinements (i.e., combination of MLP with other frameworks or theories).

Our findings show that the majority of studies are touching more interrelated activities within the AFS and not solely a single food chain stage. Ongoing transitions are targeted. Rarely, authors elaborate on their sustainability assumptions in sustainability transitions and rather analyse how the transition in the specific case study develops or approach it through the case lens, i.e., their object of study. Niches constitute the most prominent access point when analyzing AFS transitions toward sustainability. Scholars relate to social innovations rather than technological novelties. In AFS, niches seem to be predominantly self-organized entities. In terms of protection, all MLP levels can serve as protecting instances, also niches for other innovations. The temporality of those protections is highlighted as forms of overprotection and dependencies should be prevented to avoid the decrease of self-sufficiency. Refraining from assigning niche actors ex-ante and rather differentiating between niche-level actions and niche-level actors may be considered useful, especially in ongoing transitions, as actors' beliefs can change throughout the transition process. This applies also to regime actors.

Boundaries between MLP levels are rather fluid than sharp. A newer development in AFS research is the existence of an overlapping space between levels. Scholars hint at this space between niche and regime, where actors from both levels actively network and collaborate in favor of transition progress, although this space still lacks a common understanding regarding its characteristics and terminology. The spaces between the other levels are not considered. Uncertainty and incoherence exist regarding the regime and landscape. Scholars cite distinct interpretations from the literature without elaborating why the respective view was taken over. They refer to a regime informed by institutional theory, understood as the incumbent rule-set or to conceptions where materials and actors are considered as regime entities, whereby the latter stands out. Stable regimes are being presented but also more lively views, where contestation and disagreement exist which also seems to be a more recent development. In the case of sudden landscape pressures, regimes can react immediately toward more sustainable options rather than only incrementally, even without niche pressure. The landscape level is the least focussed, predominantly characterized by immaterial features which are surprising as ecology plays an important role in AFS. In combination with Actor–Network Theory, scholars demonstrate the presence of agency on the landscape level. In general, combinations of MLP with other frameworks prove useful to receive a deeper

understanding of, for instance, the role of actors and agency or spatial aspects in ST of AFS. Pathways for future research have been presented in the study. Generally, future research should aim for a clearer theoretical elaboration on MLP and offer more quantitative and mixed-methods approaches. The overlapping space between levels represents a promising field of research.

Data availability statement

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

Author contributions

FE planned the SLR, wrote the research protocol in agreement with CS and CH, conducted systematic research in agreement with CS, and wrote the first draft. CS and FE discussed the coding system. CH, CS, and FE discussed the results of the systematic research and agreed on the structure of the publication. CH and CS reviewed the content. All authors have seen and accepted the final 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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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fsufs.2023.1207476/full#supplementary-material>

Chapter 4. Agri-food systems in sustainability transition: a systematic literature review on recent developments on the use of the multi-level perspective

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Chapter 4. Agri-food systems in sustainability transition: a systematic literature review on recent developments on the use of the multi-level perspective

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Chapter 5. Agri-food related social innovations in sustainability transitions: a multiple case study of initiatives across Europe and Northern Africa engaged in change

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Agri-food related social innovations in sustainability transitions: a multiple case study of initiatives across Europe and Northern Africa engaged in change

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Abstract

Human actions and interactions drive agri-food system outcomes. Sustainability transitions of such systems are shaped by changes in social relations encompassing new ways of doing, framing, knowing, organizing—largely understood as social innovations (SI). Previous SI conceptualizations in transition research draw substantially on energy studies. Hence, we address the recent appeal to expand SI research to other realms and specifically refer to the developed typology of SI in energy that we apply and adapt to the agri-food system. Guided by transition theory and SI research, this paper investigates the manifold activities of socially innovative agri-food initiatives engaged in challenging the dominant regime, the mechanisms through which these activities are realized and the barriers and drivers initiatives face. We conducted 22 semi-structured interviews with 17 initiatives engaged in making the local food system more sustainable from five territorial cases in Europe (Denmark, Germany, Italy, Poland) and Northern Africa (Morocco) in rural and urban areas. We derived a cluster structuring the socially innovative activities according to first, social (interaction) processes and second, agri-food fields. The initiatives assert these agri-food related social innovations (FSI) through four social (interaction) processes: cooperation, sharing, enabling, knowledge generation. We found that the socially innovative initiatives anchor their new ways through networks, practices and materials and institutions to six agri-food regime domains. Local political actors are perceived as conducive to their development. Governance for transition may take this into account as these political actors are better intertwined with the local area, capable of adapting policies to local needs.

Keywords Food system · Social innovation · MLP · Multi-level perspective · SysOrg

Abbreviations

MLP Multi-level-perspective on socio technical transitions
SI Social innovations
FSI Agri-food related social innovations

Introduction

Current agri-food systems are increasingly pressured by the undesired outcomes they produce such as resource scarcity, biodiversity loss or (hidden) hunger and thus, in need

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of change. Agri-food systems are complex and dynamic socio-ecological-technical systems with actors (individual or organizational) showing competing interests, values and perspectives, involved and participating in various activities such as production, consumption, education or politics (Ericksen 2008; FAO 2018; Leeuwis et al. 2021). Human activity and interactions strongly influence food system outcomes since different stakeholders interact with diverse interests, values and views resulting in unintentional effects and dynamics (Deviney et al. 2021; Leeuwis et al. 2021). For sustainability transitions of such complex systems, this becomes especially relevant as the performance of the system is determined by those diverse actors (Ericksen 2008; Darnhofer et al. 2019; Köhler et al. 2019). Furthermore, transitions are driven by changes in social relations and the diversity of roles the actors play as well as the activities taking place (Wittmayer et al. 2022). Rules, regulations and policies are shaped by people and similarly inform human's behavior and choices (Ericksen 2008; Leeuwis et al. 2021). As a result, agri-food sustainability transitions rely on how these different actors recognize sustainability problems and how they tackle them.

Actors' interests as well as the ways and means they try to bring about change (or hinder change processes) are of interest, for instance, for actors involved in governing sustainable developments, such as policymakers. Groups of human actors engaged in the sustainable development of agri-food systems reconcile in (grassroots) initiatives, social movements or organizations but also in private businesses or political parties (Elsner et al. 2023). For instance, farmers markets (McInnes 2019), food purchasing groups (Belda-Miquel et al. 2020), community supported agriculture (Nost 2014) or ecovillages (Henfrey and Ford 2018) have been studied whereby the view was often limited to bottom-up initiatives or civil society movements, using distinct methodologies for their investigation. Scholars identified different barriers and drivers that these bottom-up niche groups are facing. For instance, internal barriers such as a lack of time, personal resources or lack of professionalization and business experience but also a certain kind of rivalry among similar initiatives (Henfrey and Ford 2018; Salavisa et al. 2021; Anselmi and Vignola 2022). As external, mainly regime barriers, various authors reported bureaucracy, institutional and legal frameworks or policies (e.g., Schaffer et al. 2019; Gugerell and Penker 2020; Salavisa et al. 2021; Anselmi and Vignola 2022). On the other side, networks and partnerships constituted an often-reported driver. Thereby, multi-actor networks with actors from different domains (e.g., politics, research, private realm) but also between different niche actors played a major role (Anderson et al. 2019; Belda-Miquel et al. 2020; Gugerell and Penker 2020; Özatağan and Karakaya Ayalp 2021; Salavisa et al. 2021).

However, these studies often limited their focus to bottom-up civil society actors or grassroots initiatives on the niche level. As some global or supra-national agreements to sustainable development (e.g., Paris agreement on climate change, European Green Deal) are set in place, those activities may not only be limited to the niche which calls for a clearer delimitation of those activities within multi-level concepts (e.g., the multi-level perspective (MLP) on socio-technical transitions) for explaining transition processes.

Although the sustainability transition literature focusses on *socio-technical* systems, the object of study are often technological innovations with the social being merely incidental or secondary (Avelino et al. 2019; Wittmayer et al. 2022). Against this backdrop, more recently the concept of *social innovations* (SI) as ways for dealing with societal challenges is enjoying greater research interest in sustainability transition investigations (e.g., Rossi and Bocci 2018; Avelino et al. 2019; Pel et al. 2020, 2023b). So far, SI conceptualizations draw largely on energy studies and scholars call for expanding SI research to other realms and to try and test developed theories and assumptions (Wittmayer et al. 2022). With our multiple case study from Europe and Northern Africa, we seek to address this call and aim to capture the variety of socially innovative activities performed by initiatives engaged in making their local agri-food system more sustainable. The agri-food system especially, with its distinctive social and cultural dimension, provides the opportunity to zoom into the social as a matter of innovation in itself. We aim to focus specifically on the mechanisms through which the agri-food initiatives implement these socially innovative activities, trying to bring about change. Inspired by the typology of social innovation in energy by Wittmayer et al. (2022) we seek to derive the patterns by which socially innovative agri-food initiatives engage in changing social relations and the mechanisms through which these activities are implemented. Moreover, we aim to analyze the drivers and barriers these initiatives are facing. Hence, our study addresses the following research question: *How do socially innovative agri-food initiatives aim to transform the incumbent local regime and which challenges and opportunities do they face?*

We approach this by conducting five territorial case studies [Copenhagen (Denmark), Warsaw (Poland), Cilento Bio-district (Italy), the Organic Farming Model Region North Hesse (Germany) and Kenitra Province (Morocco)] with the aim of diving deeper into the socially innovative initiatives' activities. We draw on transition research [i.e., multi-level perspective (MLP) and anchoring processes] and social innovation research that both address the related conundrum of changing social relations (Rotmans and Loorbach 2010; Avelino and Wittmayer 2016). We use these research strands and frameworks to structure and classify

the activities and linking processes taking place as well as the enhancing and restraining forces the initiatives are facing. As so far, existing agri-food studies on initiatives and sustainability transitions often focus on bottom-up activities (e.g., alternative food networks, grassroots initiatives), this study includes initiatives regardless of their organizational form or initiating process (e.g., we include bottom-up and top-down initiatives alike). SI conceptualizations draw largely on energy studies which is why we aim to address the recent appeal to expand SI research to other realms and try and adapt developed theories and assumptions (Wittmayer et al. 2022) to the agri-food system. By analyzing initiatives' drivers and barriers, we seek to derive implications for planners and governors engaged in sustainable development to create conducive conditions for similar initiatives or desired actions.

Theoretical approach

Transition theory: multi-level perspective (MLP) and anchoring processes

The MLP provides a structured concept for tracing interactions between different system components and thus allows capturing the complex realities and dynamics of transitions (Geels 2004, 2011; Averbuch et al. 2021). Originating from analyzing past and concluded technologically-driven transitions, it is increasingly used for the investigation of ongoing sustainability transitions, for instance in the agri-food sector (e.g. Kuokkanen et al. 2018; Wöhler et al. 2020). Through the MLP, the analysis of the socio-technical system and transition process is organized into three levels: (1) macro (landscape), (2) meso (regime) and (3) micro (niche) (Geels and Schot 2007; Markard and Truffer 2008; Long et al. 2019). In brief, transitions occur in the context of long-term evolutions or as an outcome of a (sudden) crisis where landscape developments pressure the incumbent socio-technical regime and open a window of opportunity for niche innovations that, if sufficiently developed, gain confidence and breakthrough (Geels 2004, 2011; Dumont et al. 2020). In detail, the landscape (1) comprises the exogenous and broader context for niches and regimes (Smith and Stirling 2010; Geels 2020). Landscape dynamics can occur of a no or slow changing, trend-like nature (e.g., physical climate) or as rapid shocks (e.g., COVID-19 pandemic). These dynamics can enhance or restrain sustainability transitions either by pressuring incumbent regime's unsustainable practices and opening a window of opportunity for niches to breakthrough and scale out (i.e., enhancing forces) or by reinforcing regime's structure (i.e., restraining forces) (Grin et al. 2010; Smith et al. 2010).

The socio-technical regime (2) is an analytical concept to investigate the underlying reasons of actors' activities that reproduce system elements (Geels 2011; Leeuwis et al. 2021). It represents the dominant ways of how societal functions are realized and is understood as the aligned semi-coherent rule set (regulative, normative, cognitive) that prevails and thus, structures social groups and their actions. Geels (2011) notes that these rules are twofold as "medium and outcome of action" (p. 27) at the same time. Actors both influence and adopt these rules in concrete activities and, similarly, are shaped by them. Therefore, realignments or changes in regime's structure tend to be path-dependent and incremental (Smith et al. 2010). For wider scale changes, it is vital to overcome this dynamic structure. The third level, the niche (3), describes the lieu for experimentation, learning and innovation development, diverging from the dominant socio-technical regime (Geels 2019). For the development of matureness and competitiveness, niches are protected from adverse selection environments by, for instance, non-governmental organizations (NGOs), city or municipal actors or governments (Geels 2004; Smith and Raven 2012; Rut and Davies 2018; Gaddis and Jeon 2020). To bring about system change, not only one niche innovation but also multiple niche novelties can challenge, transform or replace the regime at the same time (Bui 2021).

Transition literature suggests different concepts and theories to explain niches' emergence and diffusion (cf. Kemp et al. 1998; Schot and Geels 2008; Grin et al. 2010; Elzen et al. 2012; Smith and Raven 2012; Geels 2020). For a niche to receive a certain kind of social legitimacy or embedment, regime actors need to be persuaded or involved (Smith et al. 2010). According to Smith and Raven (2012), niche innovations emerge and develop in spaces where protection is offered from dominant regime's selection pressure, for instance, through public funding or favorable policies (Deviney et al. 2021). Niches anchor to regimes with the attempt to create more durable links through three dimensions: first, network anchoring (e.g., building new social networks or groups around the novelty), second, institutional anchoring (e.g., new rules developed in relation to the novelty), and third, technological anchoring (e.g., technologies are further developed and thus, are becoming more specific) (Elzen et al. 2012). Indicators for network anchoring are the expansion of the network, an intensified exchange among actors, increasing interdependency and stronger coalitions (Leeuwis and Aarts 2011; Elzen et al. 2012). Institutional anchoring may take place in three fields: economic institutions [i.e., market rules and arrangements governing economic activity (e.g., value chains, contracts)], interpretative institutions [i.e., people's own sensemaking (e.g., identity) and the world, their beliefs or visions influencing their behavior] and normative institutions [i.e.,

social values translated into normative rules (e.g., formally or informally desired by society)] (Elzen et al. 2012; Schiller et al. 2020). During these linking attempts, uncertainty prevails as innovations leave their protection behind (Elzen et al. 2012).

Depending on the nature of the novelty (e.g., social movements), scholars might need to depart from that anchoring concept and adjust it towards the innovative activity in focus. For instance Polita and Madureira (2021a) investigated short food supply chain initiatives (farmer's direct supply to consumers) and neglected technological anchoring. Moreover, scholars point out that anchoring processes can also occur between different niches, as mutual attempts for network formation or as answers towards their respective activities (Ingram et al. 2015; Polita and Madureira 2021a). While analyzing an agricultural research for development project, Seifu et al. (2020) adapted the concept of anchoring and replaced technological with *methodological* anchoring which describes a process where regime actors are supported to learn the rules for application of new products or principles through training, workshops, sharing experiences or cooperative experiments.

Theorizing social innovations (SI) in agri-food sustainability transitions

In transition research, SI hint at a predominantly social phenomenon and are used to refer to changes in practices and social relations instead of new products or technologies, diverging from the incumbent regime (Haxeltine et al. 2016; Van Der Have and Rubalcaba 2016; Pel et al. 2020). They involve new ways of doing (e.g., practices, habits), framing (e.g., visions, meanings), knowing (e.g., thinking, cognitive resources, learning) and organizing (e.g., rules, value chains) that challenge dominant institutions (Pel et al. 2020; Wittmayer et al. 2022).¹ Transformative SI are understood to contribute to transformative changes if they challenge, alter or replace dominant rules and institutions in the social context (Haxeltine et al. 2016; Avelino et al. 2019; Pel et al. 2020, 2023a). Transformative SI lie at the intersection between different realms, i.e., sustainability transitions, social innovations, social movements and solidarity economies (Avelino et al. 2019). Very recently, (transformative) SI have experienced an upswing in research and scholars have contributed to a nuanced understanding of SI by addressing the lack of a common conceptual understanding, developing a typology of SI in energy, addressing the “dark sides” of SI, or theorizing transformative SI—mainly informed by research on energy systems (Haxeltine et al. 2016; Avelino et al. 2019; Wittmayer et al. 2019, 2022; Pel et al. 2020,

2023a). For instance, Wittmayer et al. (2022) compiled a typology of social innovation in energy for which they “[.] mainly considered the ‘core’ (rather than all) aims and activities” (p. 10) of energy initiatives across European countries. As a result, they propose a matrix of types of SI in energy, divided into two spheres: first, the social relations as social interactions inspired by Brinkerhoff et al. (2011) (i.e., cooperation, exchange, competition and conflict) and second, the manifestations (i.e., the new ways of doing, thinking and organizing energy”). According to the authors (Wittmayer et al. 2022), such typologies may be useful for policy to create conducive conditions for similar types of SI or lighten public decision-making processes on what types of SI future systems may account for.

Next to the opportunities of SI as drivers for societal change, they are also unpredictable experiments and by no means inherently “good” (Wittmayer et al. 2022). SI are multi-directional and complex and not always intentionally oriented towards social benefits (Avelino et al. 2019). Pel et al. (2023b) developed a heuristic that accounts for the “dark sides” of SI (e.g., unintended consequences, normative dilemmas, beneficiaries, legitimacy, ends and means). The heuristic allows for mediation along the extremes, between naïve optimism and paralyzing critique and between intended and unintended consequences of SI and counteracts extreme viewpoints.

Only few articles covering the agri-food system use SI concepts for their theoretical underpinnings. For instance, informed by SI research Zoll et al. (2024) elaborate on the transformative potential of three initiatives in Germany by investigating participants’ motivations, their changes and challenges and conclude that the activities in these initiatives alone will not suffice for a structural transition of the food system but argue that they offer room for experimentation of new values, skills or practices. Similarly Rossi and Bocci (2018) aim at investigating the transformative potential of SI but in a different setting. They focus on grassroots initiatives involved in the wheat-bread value chain in Tuscany (Italy) and find that the initiatives’ innovation pathways may turn out successful, enabling deep system changes, by focusing on meeting socially shared needs and achieving social advantages. Juárez et al. (2018) analyze the narratives and strategies of transformative change of the social movement “La Vía Campesina”. They discover that the movement’s transformative potential lies in empowering people globally through networking and knowledge circulation. Through a territorial approach and drawing on SI research Alberio and Moralli (2021) find that the alternative food network in focus intervenes at the level of social practices and social relations, between consumers and producers by opening up spaces for cooperation, exchange and experimentation.

¹ For an epistemological reflection on social innovation see Pel et al. (2020).

Approach chosen

Due to the agri-food system particularities (e.g., dominance of the socio-ecological dimension), frameworks explaining niche developments stemming from technological innovation processes may require adaptations when investigating agri-food sustainability transitions (Mylan et al. 2019). The MLP offers this interpretative flexibility with its heuristic character and explicitly invites the researcher to investigate the problems laying underneath complex phenomena such as sustainability transitions (Geels 2011; Polita and Madureira 2021b). Based on Bui's (2021) observations, we assume that for a transition of the agri-food system, not only one niche can breakthrough but expect the co-existence of multiple niches as well as an overlapping between levels. We refrain from seeing the MLP as a hierarchical framework and rather make use of its suitability for structuring different activities to distinct scales (cf. Geels 2011). As conceptual ambiguities regarding especially regime and landscape exist, dependent on the respective scientific stance (e.g., institutional theory) (Markard and Truffer 2008; Smith et al. 2010), we will briefly clarify our understanding of the regime due to its relevance for our analysis. We understand the socio-technical regime as the prevailing and incumbent rules and regulations aligning different sub-regimes. However, rules and regulations only persist because of the actors' activities, networks and (material) practices enacting them (cf. Smith et al. 2010) which is why we follow a pragmatic approach for our empirical study and label those as regime entities as well.

As the definition of SI does not provide any indications about intention or outcome of SI (Avelino et al. 2019) and thus, calls for an elucidation in each specific case, we will clarify our understanding of the phenomenon in relation to sustainability. For our conceptualization of SI, we draw on the work on transformative SI (Haxeltine et al. 2018; Avelino et al. 2019; Pel et al. 2020; Wittmayer et al. 2022) and understand agri-food related social innovations (FSI) as new ways of doing, framing, knowing, organizing that challenge the dominant regime, aiming for a more sustainable agri-food system. The starting point of this investigation is the widely accepted view that there is a need to move away from unsustainable practices. Sustainable development represents a normative, interpretative, open-ended process (Ramsey 2015; Köhler et al. 2019). In that regard, we consider the initiatives' activities as "activities towards a sustainable development" if they propose new ways within the dimensions of a sustainable food system (environment, social/cultural, economic, health/nutrition). For our investigation, we draw on a pragmatic approach and we take initiatives expressed willingness of changing dominant local

practices or structures within these dimensions as a starting point for our selection.

Our research aims to contribute conceptually to transition and SI research by the following: As the social dimension, i.e., the cultural domain including habits and daily practices, plays a major role in the agri-food system, it offers a valuable opportunity to zoom into the socially innovative activities taking place. So far, research on SI is mainly inspired by energy studies. Therefore, we aim to answer the call to expand SI research to other realms (Wittmayer et al. 2022). Based on the above, our research interest is threefold. We are interested, first, in the mechanisms behind the implementation of FSI, their classification (inspired by Wittmayer et al. 2022), and to derive implications for SI in the agri-food system. Second, we aim to ascertain the linking processes socially innovative initiatives exercise to change the incumbent regime, and third, our interest is on the challenges the socially innovative initiatives face. For this endeavor, we use the MLP as a guiding framework that enables us to understand the dimensions, potentials and constraints of socially innovative initiatives engaged in activities related to making the local, territorial food system more sustainable. As the empirical scope will influence the operationalization of MLP levels, scholars recommend inferring those levels *from* the analysis and to refrain from designating actors actions *ex ante*, for instance, to the niche or regime (as proposed by Geels 2011; Bui 2021). We will similarly consider both aspects for our investigation and analysis (e.g., approaching the initiatives as such and not as niches per se). This will be especially useful for our research since our data are based on a snapshot in time and we will not consider the whole developmental path of the initiatives or the space-specificities where they are embedded in. The contextual factors (i.e., space-specificities) are particularly relevant when analyzing, for instance, the impact of the initiatives on the respective region. While this is not the objective of the present study, it could constitute a potential direction for future research.

Case studies and methodology

Since we aim to generate new insights into the mechanisms through which the agri-food initiatives realize their goals and into SI conceptualizations in the agri-food system, this multiple case study draws on a qualitative empirical research design. Our object of interest are initiatives that are engaging in activities related to making the local food system more sustainable. An initiative can be defined as "a new plan or action to improve something or solve a problem" (Cambridge Business-English Dictionary 2014). In the present study, we take up this definition

and narrow our understanding further down to initiatives that must be active within the agri-food system, exerting regular activities towards sustainable development with at least two active members and two years of operation (to ensure the seriousness and continuity of their activities), located or active within the pre-defined case territory (cf. selection criteria in section Data collection (a) to (f)). Before we briefly present the territories and describe our methodology, we need to leave one remark. We approached the initiatives exploratively meaning that we did not focus on SI from the outset. During the analysis, we realized that the agri-food initiatives' activities can largely be classified as socially innovative which is why we went back to our analysis scheme and adapted it accordingly. Thus, the selection and analysis of initiatives followed an iterative procedure.

The case studies: five territories in Europe and Northern Africa

Spatial contexts often play a role in the analysis of sustainability transitions, at least to demarcate the system in change (Coenen et al. 2012; Köhler et al. 2019). For agri-food system transitions, the analysis of smaller territorial areas, e.g., cities, regions, provided useful as, for instance, agricultural practices are largely place-based and embedded in territorial areas (Vermunt et al. 2020). Thus, agri-food system innovations are often dedicated to a delimited geographical area (e.g., agroecological practices, Community Supported Agriculture) (Cohen and Ilieva 2015; Fuenfschilling et al. 2018; Bui 2021; Özatağan and Karakaya Ayalp 2021; Polita and Madureira 2021a). We focused our study on five territorial urban and rural cases in Europe and Northern Africa in varying stages regarding implemented sustainable development strategies. We selected these territorial cases based on contacts to research institutions on-site that facilitated access to the respective initiatives. These cases comprise: Copenhagen municipality (Denmark), Warsaw municipality (Poland), Cilento Bio-district (Italy), the Organic Farming Model Region North Hessia (Germany) and Kenitra Province (Morocco).

Data collection

For the investigation of initiatives in the five case territories, we conducted desk research and semi-structured interviews. The data was collected by local native speaking researchers from respective research institutes and universities within the territories.² For the selection of initiatives in each terri-

tory, we adhered to a filtering process, that was continuously adapted and enhanced throughout the selection process. The final three-stage selection process is visualized in Fig. 1: first, any initiatives dealing with food or agriculture and working towards a sustainability transition (i.e., intentionality) were brainstormed and/or case territory informants were consulted. Selection criteria comprised: (a) a regularity of activity, (b) at least two active committed members, (c) a purpose, intention or aim that has to do with sustainable development and (d) some kind of organizational form. Then, from those initiatives, ten to fifteen were chosen that were (e) active and/or located within the geographical boundary of the respective territory and (f) had at least two years of operation. Third, from these initiatives, preference was given to the larger ones (g) in terms of, e.g., number of consumers or producers involved (i.e. potentially wider range of outcomes and thus, richer insights), and the ones with greater potential impact (h) (e.g., impacted stakeholders). For this study, we aimed for three to five initiatives per case territory.

For data collection, we used a three-step procedure with those three to five initiatives per case territory. First, desk research and/or interviews were conducted to compile a profile of each initiative, containing locality, starting date, main actors, size, the novelty it brings about, the reasons why it can be considered as a transition initiative and the dimensions of the sustainable food system (environment, social/cultural, economic, health/nutrition) the initiative aims to impact. For this, initiatives' official websites, brochures or other related documents were consulted. If needed, further information was gathered through informal interviews. Second, semi-structured interviews with initiative informants were carried out focusing on the favorable and supportive conditions and challenges or barriers to their activities, the understanding of a sustainable food system and how the initiative aims to make transition towards sustainable food systems. Third, one in-depth interview with one initiative per territory was carried out to receive deeper insights into, for instance, the motivations behind the initiative's actions or the main mechanisms used by the initiative to create/stabilize/expand the network of actors. We conducted these in-depth interviews for a future in-depth investigation of the respective initiative which will also be informed by the results of the present investigation. However, as the present investigation does not aim to compare the initiatives with one another, but to infer insights on the socially innovative activities or types of social innovation in agri-food, we applied our coding scheme to these interviews as well to include as much material as possible. Criteria for the selection of the respective initiative comprised (i) a maximum

² Data was collected within the framework of the research project Organic agro-food systems as models for sustainable food systems in

Europe and Northern Africa (SysOrg)

Selection procedure of initiatives:

Initiatives engaged in making the local food system more sustainable

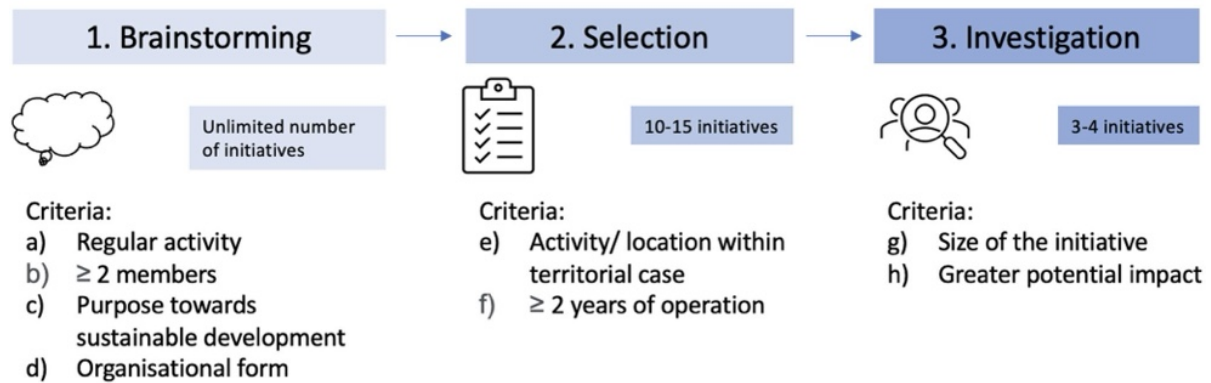


Fig. 1 Overview of selection procedure of initiatives engaged in making the local food system more sustainable. The same procedure was followed in each of the five territorial cases

of food chain stages (e.g., production, distribution) and/ or other food system elements (e.g., politics, law) and (ii) whether it takes a “multi-stakeholder” approach, involving different types of actors from public, politics, civil society or the private realms.

All interviews were carried out in the respective native language, recorded, transcribed according to equal standards and translated into English. The data collection took place between June 2021 and February 2022 in close supervision by the first and last authors of this publication. The interviews with initiative informants lasted on average 50 min and were conducted either online or on-site at interviewees’ workplaces. All interviewees provided their informed consent when participating in the study, consistent with the European General Data Protection Act (GDPA). The interviews were pseudo-anonymized by data collectors and thereupon shared with the first author of this study. The interview questionnaires were developed and validated in the work of Wittenberg et al. (2022) for the analysis of the contribution of initiatives to sustainability transition in the foodshed of Muenster (Germany). The questionnaires contain open questions only (e.g., “what are the main challenges and obstacles faced by the initiative?”) that are useful to guide the semi-structured interviews. These questionnaires can also serve as inspiration for analyzing other actor groups’ contributions in transitions (regardless of their position in the system). Results from all the above-mentioned steps will inform our analysis.

Data analysis

Our analysis is based on a qualitative research approach. We analyzed the interview transcripts according to Kuckartz’

(Kuckartz 2019) thematic qualitative content analysis. Data were extracted based on a deductive-inductive coding scheme (cf. Supplementary material). We derived concept-driven categories from the interview questionnaires, our research question and research on agri-food system transitions [see systematic literature review on the use of MLP in agri-food system studies (Elsner et al. 2023)]. The focus laid on: (1) organizational form, (2) transformative activities, (3) mechanisms through which the activities are being implemented (4) challenges and obstacles and (5) current favorable conditions.³ For the coding process, we followed an iterative four-step procedure. First, the first author of this publication coded the transcripts by applying the concept-driven categories. Second, subcategories were inductively formed on the material. For instance, for the category “transformative activities” we derived thematical groups such as social relations (e.g., collaboration, cooperation, networking), research or politics (e.g., policy or label development, policy implementation). Then, we assigned text passages to those subcategories. If the coding scheme became too complicated, we reorganized those subcategories. Then, this study’s conceptualization team discussed the coding scheme and further adaptations were undertaken. Fourth, for reliability and credibility of the application of the coding scheme, we relied on a consensual coding strategy based on Hopf and Schmidt (1993) and Kuckartz (2019). To ensure a certain degree of inter-coder-consistency, a research assistant who had not been included up to then independently applied the coding scheme to 50% of the material. This was compared to and discussed with the application of the coding scheme by the first author. For the coding procedure and

³ The coding system including the respective definition and rules for application can be requested from the authors.

analysis, we used the software program MAXQDA2022 (VERBI Software. Consult. Sozialforschung. GmbH, Berlin, Germany).

Results

The results section is structured as follows: first, we provide a brief overview of the selected initiatives. Second, we show our developed cluster of FSI. Then, we present the regime domains the initiatives are anchoring and lastly, we show the barriers and drivers initiatives face.

Overview of initiatives engaged in agri-food sustainability transitions

Resultant from the selection procedure (see section Data collection), we focused our analysis on 17 initiatives engaged in making the local food system more sustainable from five territorial cases in Europe and Northern Africa and conducted 22 interviews with initiative informants. The Appendix Table 1 gives an overview of the initiatives, including a brief description of each selected initiative, their founding year, their legal organizational form as well as their mission and/or objective related to making the agri-food system more sustainable.

The selected initiatives represent a wide range of fields within the agri-food realm; from organic or urban farming, organic or agroecological cooperatives (cf. Appendix Table 1; initiatives e, h, k, l, n, o) over foodservices (seasonal organic meal boxes; initiative a), organic farmers markets and shops (initiatives d, i) or raising food waste awareness or food surplus management (initiative c, p) to more structural initiatives covering policy development and implementation or network formations in various areas and between different actors (e.g., municipal strategy to enhance sustainability in public kitchens, urban food policy; initiatives b, f, g, j, m, p, q) (cf. Appendix Table 1). Most initiatives are registered as (non-profit) associations, two of them are part of a municipality, other two are limited liability companies and one is a sectoral organization for the promotion of organic food and agriculture.

Agri-food initiatives' activities: social innovations challenging the incumbent regime

In order to receive a greater understanding of the initiatives' FSI and the mechanisms through which they realize those activities, we derived a cluster system divided into two spheres. For our analysis, we tried to include all the activities that are being exerted by the initiatives without claiming them to be exhaustive. Figure 2 shows the agri-food

categories and the social interaction processes taking place. A detailed tabular overview with the actual FSI of the initiatives can be found in Appendix Table 2.

As Fig. 2 shows, we inferred the following (mainly) agri-food fields from the analysis of the initiatives' activities: first, food access and availability, second, reorganization of food value chain, third, (organic) agriculture, fourth, sustainable, healthy diets, organic food and food culture, fifth, food waste, sixth, food policy and regulation, then, regional development and lastly, climate impact (cf. Fig. 2, Appendix Table 2).

We derived the social (interaction) processes from the agri-food initiatives' activities. These social (interaction) processes are visualized in red in Fig. 2 and comprise: cooperation (A), exchange (B), enabling (C) and knowledge generation (D). Based on our findings (cf. Appendix Table 2, columns A–D), we define them as follows:

- By *cooperation* (A) we refer to the same definition by Wittmayer et al. (2022) and Brinkerhoff et al. (2011) as working together to achieve shared goals. Moreover, that includes the participatory approaches (e.g., the consultation processes during the development of a food policy) or the shared projects that are being followed aiming for democratic and inclusive processes (based on Appendix Table 2, column A).
- By *exchange* (B), we understand the process of sharing knowledge and experiences with other actors, for instance within a network, such as the creation of online platforms to share past innovative projects and make them accessible (e.g., calculator for sustainable meals, more sustainable and healthy recipes), offering spaces for those exchanges. During these processes, all parties usually benefit from the tangible or intangible exchanges (Brinkerhoff et al. 2011) (based on Appendix Table 2, column B).
- With *enabling* (C) we refer to the support and advisory processes that initiatives are exercising towards other actors, to enable them to make, for example, better informed decisions. For instance, there is a strong approach throughout the territorial cases to enable and support (rural) small-scale (family) farmers in their conversion to more sustainable practices (based on Appendix Table 2, column C).
- By *knowledge generation* (D), we understand conducting research or experiments on agri-food related topics, for instance, to test consumers acceptance for more plant-based meals, to improve sustainable farming methods or trying out new ways of decision-making processes (based on Appendix Table 2, column D).



Fig. 2 The agri-food initiatives activities sorted into agri-food categories in relation to social (interaction) processes. The social interaction processes are visualized in red in the inner red circle. The agri-food categories representing initiatives activities are displayed in the outer

corners. The dashed lines show the interconnections between the different categories. An extensive tabular overview of initiatives actual FSI can be found in Appendix Table 2, where the FSI are placed in the middle of the table

In that regard and based on our data, we consider *knowledge generation* to be a social process as knowledge per se influences actors' agency and as it emerges and spreads as and in social relations. Moreover, the creation of new knowledge contributes to meeting societal challenges (cf. Kusch 2002; Carayannis et al. 2012; Williams 2015; McKenna 2022). Thus, we consider these four processes as social (interaction) processes.

The actual FSI, i.e., the new ways of doing, framing, knowing, organizing, challenging the dominant practices, are placed in the middle (cf. Appendix Table 2) including the reference letter of the respective initiative which can be traced through the Appendix Table 1. We made the conscious decision to not categorize the respective FSI to a specific new way of doing, framing, knowing or organizing (for instance, whether the FSI is a new way of framing or a new way of knowing), leaving room for interpretation. This provided useful as several new ways are often united within one FSI. For instance, the organic or agroecological farmers markets (i.e., initiatives d, i) are new ways of organizing the distribution of food (e.g., new rules) but also spaces where

farmers are able to convey the value of food and its production (i.e., new way of framing) or to engage with consumers about the ways their food is produced (i.e., new ways of knowing). We included *cooperation, networking, dialogue* in both spheres (cf. Appendix Table 2, row 1 and column A) as some initiatives reported that one of their main activities constitute the formation of networks which they pursue by fostering dialogue or cooperation.

A particularly noticeable aspect was the important link to the region or regional development as an intentional aim that was mentioned several times across initiatives—for varying reasons. For instance, the German research farm (initiative l) highlighted their role in networking and anchoring in the region to achieve their goals. The Polish consumer cooperative (initiative e) mentioned that producing locally (in an ethical and sustainable way) and enabling access to these produces raises awareness among consumers. The Moroccan network of agroecological initiatives (initiative q) stated that local production ensures high food quality and the Danish seasonal meal boxes (initiative a) mentioned that they

believe that they need to work much more with local food systems to become more sustainable.

Transformative domains targeted by agri-food initiatives

Based on our investigation of initiatives' activities, the cluster developed in the previous section and transition research (Geels 2004; Bui 2021; Salavisa et al. 2021), we infer the dominant agri-food regime domains the initiatives are tackling in the territorial cases. For this, we aggregated the nine agri-food fields (cf. Appendix Table 2) into six agri-food regime domains (cf. Fig. 3, middle): (a) practices (e.g., agricultural practices and methods), materials, technologies, (b) policies, regulations, institutions, (c) socio-culture (e.g., consumer preferences, social relations, habits), (d) science, knowledge, skills, (e) food supply chain, and (f) nutrition and health.

In Fig. 3, we embedded these regime domains within the MLP. The initiatives' activities are represented through the small blue circles. The figure shows the three MLP levels including a fourth level, the intermediary space. In recent transition literature, the concept of transition intermediary was introduced (e.g. Mignon and Kanda 2018; Kivimaa et al. 2019a; Kanda et al. 2020), describing actors that network, mediate, bridge between different actors and levels or disseminate information and by this, advance sustainability transitions. Resultant from our analysis, we found that four initiatives are already engaging in governing networking activities, forming wider networks across niche and regime actors. Moreover, some initiatives are developing and implementing political food strategies or policies (cf. initiatives b, g) and seem to be already quite integrated in the existing infrastructures and institutions. For instance, one initiative representative mentioned that they see themselves as realizers of political goals geared towards sustainability (cf. initiative m, "we [...] the service providers making

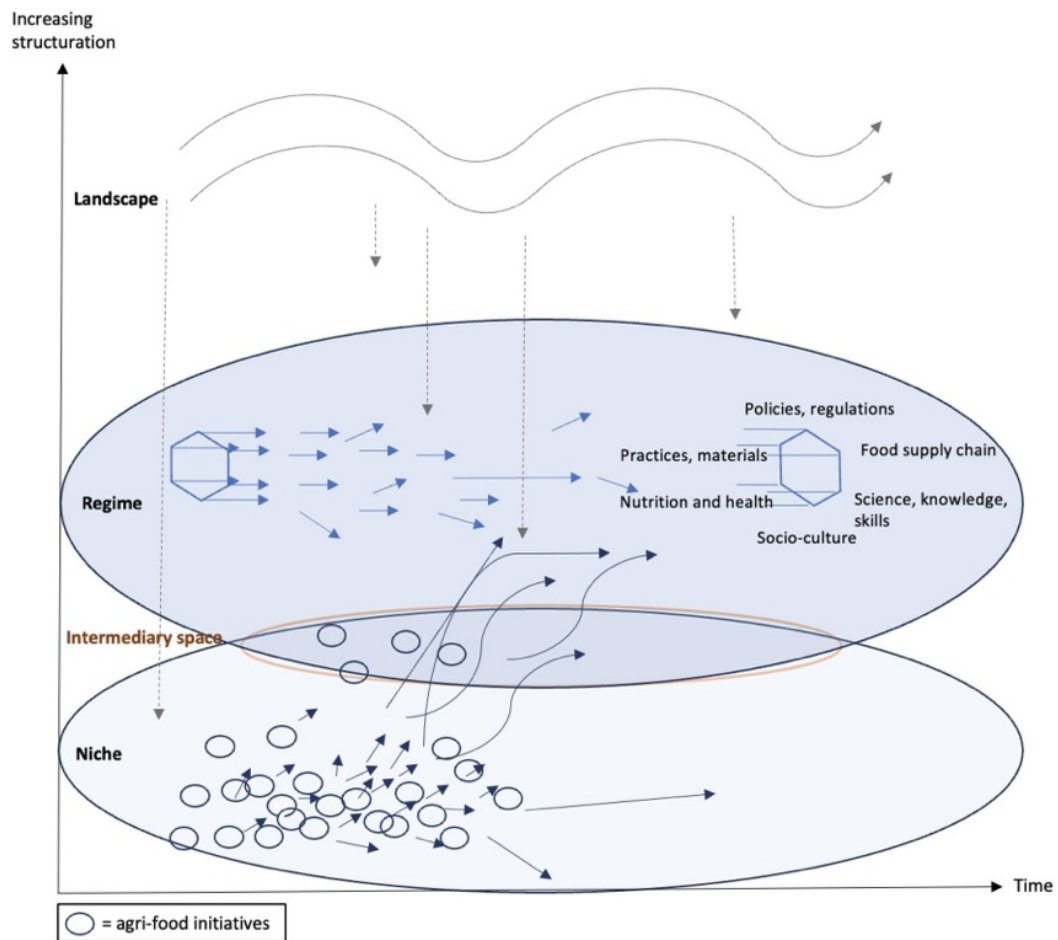


Fig. 3 Agri-food initiatives within the levels of the multi-level perspective. Agri-food regime domains (middle) derived from initiatives' activities based on a snapshot in time. [Multi-level perspective diagram adapted from Geels (2011), inspired by Bui (2021)]

these political goals achievable in the first place" (IAN)). In our view, the observed activities exceed niche functions. Hence, we assigned some initiatives to this intermediary space between niche and regime (cf. Fig. 3). Interestingly, we found at least one initiative that acts as an intermediary in every territory, except for Warsaw. However, this could also be explained by our selection procedure or the limited amount of initiatives that we took into account.

Nevertheless, based on initiatives' self-description, most activities can still be assigned to the niche level as they see themselves, for instance, as grassroots innovations (e.g., consumer cooperative (e)) or radically diverging from the incumbent ways of doing (e.g., urban public community gardening (k)), trying to seed counterparts to the "capitalist exploitation context" (3 EV).

The identified agri-food initiatives are trying to anchor to the aforementioned agri-food regime domains but also to the other levels in various ways. The overall anchoring mechanisms comprise, first, network anchoring, second, anchoring through different practices and materials and last, institutional anchoring. First, network anchoring seems to stand out and is pursued by initiatives through other initiatives, political actors, scientists, civil society or the private realm (cf. Appendix Table 2). Steering cooperation and dialogue are in the center of those interactive processes and followed in one or the other way by all identified initiatives around their FSI (cf. Appendix Table 2, row 1 and column A). Second, the anchoring through practices and materials involves further developing the proposed concepts and practices that diverge from the incumbent ways of doing, for instance, organic agriculture or agroecological practices (e.g., initiatives e, h, n, o), the development of food meal boxes (e.g., initiative a) or protection and conduct of research among about ancient varieties (e.g., initiative j). Third, institutional anchoring takes place by changing the dominant supply chain (i.e., economic domain, e.g., initiatives b, d, e, i, k, l, n, q), enabling vision building or sensemaking of the world (i.e., interpretative domain, e.g., initiative k through providing a place to experience, imagine different community concepts) or the development and implementation of more sustainable agri-food strategies and policies (i.e., institutional domain, e.g., initiatives b, g).

Drivers and barriers for initiatives' development

We identified several enhancing and restraining forces reported by initiatives' informants and assigned these to three levels, inspired by the MLP: landscape, regime and initiative level (cf. Fig. 4). We refrained from labelling the third level *niche*. As outlined in the section before, not all initiative activities can clearly be assigned to one or the other level. Thus, we attributed some supportive factors to

the overlapping space between regime and niche. These constitute mainly the support from municipalities or regional entities that are often seen as intermediaries between both levels (cf. Özatağan and Karakaya Ayalp 2021), fostering sustainable local activities though at the same time being embedded in or subordinated to the dominant rules and regulations. For instance, the Danish initiative to enhance sustainability in public kitchens (initiative b) stated that the political decision to reduce the capital's CO₂ footprint supports their actions and the city of Warsaw is perceived as conducive to reducing food waste activities (initiative c).

We found external trends, shocks or developments (e.g., migration, climate change, COVID-19 pandemic), European regulations and funding opportunities but also more infrastructural aspects such as the environmental conditions of the territory itself as supportive factors on the landscape level. Initiatives sensed a raised awareness among society as regards the climate crisis and partly already a pressure for more sustainable actions. Nevertheless, food culture and changing habits are still seen as challenges, in need of change. For instance, the association committed to food system change (initiative m) mentioned that changing deeply entrenched habits on the private household level is one of the biggest obstacles they face in their work but also more generally to become a more sustainable society.

Some political actions on the national or global level were perceived as enhancing forces (e.g., Green Deal, Paris agreement, organic regulation) although not consistent with their intended outcome. As an example, the organic regulation and certification system was criticized as engaged farmers or companies are obliged to pay for proofs regarding their more sustainable efforts whereas business as usual is not restricted. Generally, the German initiatives regarded the funding structure as bureaucratic and not always conducive since mostly new and innovative ideas receive funding whereas the long-term implementation of those funded innovations or projects is rarely supported. This may result in forfeiture of the initial efforts invested in their development.

However, certain aspects were differently perceived by initiatives. For instance, it was mentioned that the COVID-19 pandemic increased health-awareness (as a secondary, positive effect) which brought more interested people to respective initiatives. This was reported by the organizational entity of the Eco-Region in Cilento (j) and the network of agroecology al initiatives in Kenitra (q). However, other initiatives perceived the pandemic as restrictive to their activities, such as the food bank in Warsaw (c) or the municipal strategy to enhance sustainability in public kitchens in Copenhagen (b) since the pandemic, for instance, brought regulatory restrictions with it. Participatory and collaborative actions are of importance and perceived as supportive. However, initiatives' relations towards each other

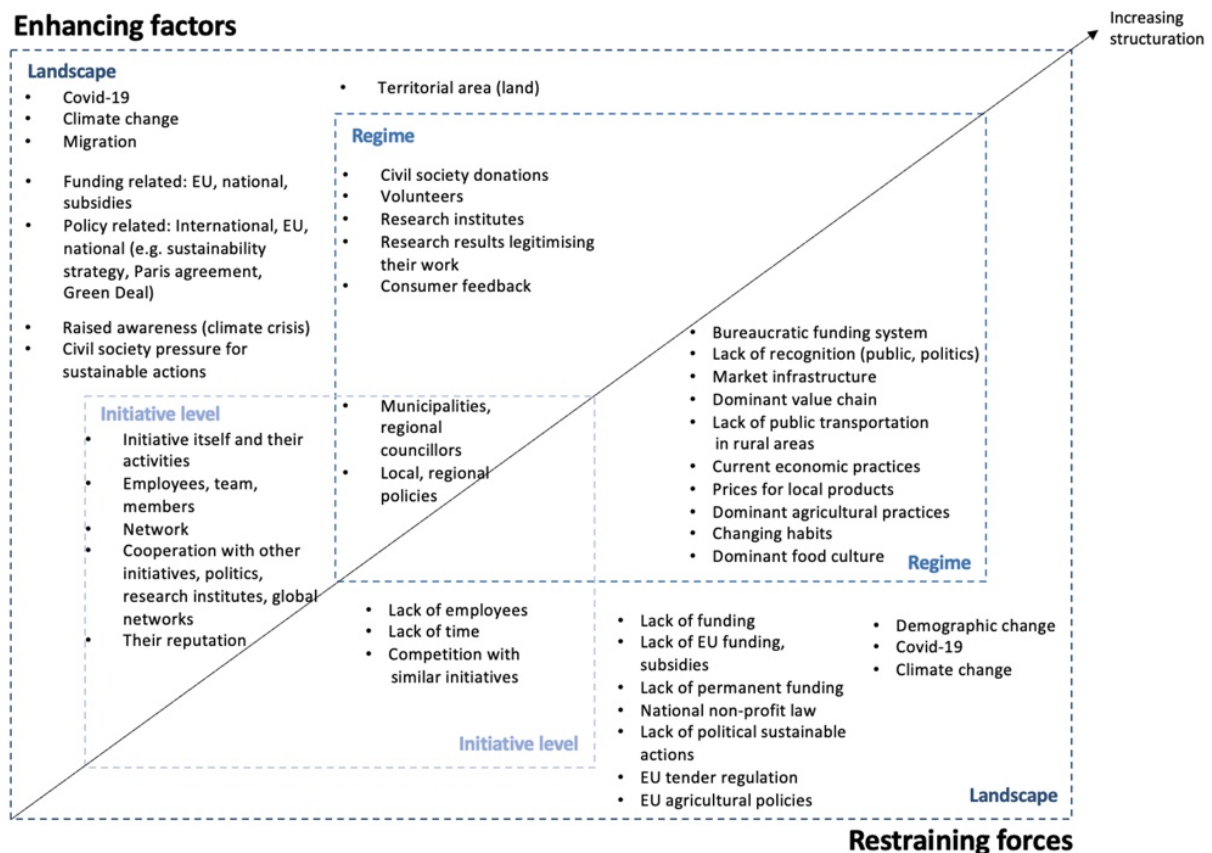


Fig. 4 From agri-food initiatives point of view: drivers (upper left triangle) and barriers (bottom right triangle) for initiatives' development assigned to the multi-level perspective levels (landscape, regime, ini-

tiative level (initiative level goes beyond the niche). Data based on semi-structured interviews with initiative informants

are not only driven through perfect conformity. The food bank in Warsaw reported on contestation and competition among initiatives operating in the same field where the rules of the game are not determined yet and where “black sheep” operate that misbehave.

Discussion

For this investigation, we analyzed how socially innovative agri-food initiatives aim to transform the incumbent local regime and the challenges and opportunities they face. In the previous section, we showed that the initiatives assert their activities through four social interaction processes, and we derived a cluster of FSI. Then, we presented the regime domains and the mechanisms through which the initiatives anchor the regime. Lastly, we presented the drivers and barriers the initiatives face and structured them within the MLP. We will discuss these findings in the remainder of this paper.

Socially innovative agri-food initiatives challenging dominant ways of doing, framing, knowing, organizing

The agri-food initiatives cover mainly social or interplays of social-ecological and material aspects and suggest new ways of doing, framing, knowing, organizing (i.e., FSI) in relation to bringing about change. These new FSI are supposed to be understood as different concepts or practices to the incumbent ways, including revival of ancient knowledge and marginalized practices and not new as such but might stem from pre-capitalist systems or pre-green revolution thinking and have not been taken further or marginalized in the meantime (e.g., agroecological practices, direct food distribution from farmers to consumers) (cf. de Boon et al. 2022).

Our developed cluster of FSI shows the mechanisms through which the initiatives implement their FSI (i.e., cooperation, exchange, enabling, knowledge generation) and the respective agri-food fields. Although we did not

include even nearly as many initiatives as Wittmayer et al. (2022) for their typology on SI in energy which limits our findings, this approach allowed us to consider all the reported activities the initiatives are engaging in (not claiming them to be exhaustive) without limiting us to the core activity only [as in Wittmayer et al. (2022)]. Further, we did not cluster the FSI according to the new ways of doing, framing, knowing, organizing (so called *manifestations*) as we found that several new ways can be retrieved within one FSI. Due to the diverse agri-food sectors that the initiatives are tackling, we considered it for our case to be more valuable to structure the activities to the agri-food fields to demonstrate the diversity of socially innovative activities taking place. This may especially provide useful for, e.g., policy, if change processes in specific subsystems of the agri-food system (e.g., food waste) are to be managed. For instance, if local political actors strive to bring about change in food waste issues, the cluster may inform these discussions on suitable actions by providing an overview of present FSI from distinct regions, shifting the focus to the variety of involved actors and their roles. Further, based on the cluster, conducive conditions for similar types of FSI could then be created.

Compared to the social interaction processes assessed in energy (cf. Wittmayer et al. 2022; cooperation, exchange, competition, conflict), the social (interaction) processes we inferred from the analysis of the agri-food initiatives (i.e., cooperation, exchange, enabling, knowledge generation), seem to be less conflict-ridden. For instance, we did not find any forms of protests or boycotts. This could be explained by the fact that the niche initiatives under consideration primarily interact with consumers, producers or other initiatives, whereas the intermediary initiatives communicate with a much more diverse range of actors. However, the intermediary initiatives tend to take on a more mediating and networking role, making them more likely to resolve conflicts rather than inducing them. Thus, the extent to which activities are carried out through conflict may be dependent on the target group or position within the system. This could be examined in greater detail in future research. Especially among the initiatives within a region, there seems to be a more supportive nature towards each other (i.e., cooperation, exchange, enabling), strengthening each other's agency [i.e., other initiatives or the civil society (e.g., consumers)] although not always being in perfect harmony towards one another (cf. food bank in Warsaw). This could be explained due to the lack of an initiative that acts as an intermediary in that region, mediating conflicts and steering networking activities. However, we only included a limited number of initiatives in each territory and thus, this may not be representative for the whole territory. The studied FSI are closely connected to consumers, involving them

in certain development stages as a lot of those agri-food activities are intertwined with individuals' everyday practices. This seems to be understood and taken up by initiatives in order to bring about change. We also found that the initiatives with their FSI engage in change processes by proposing new ways rather than stopping old ones (e.g. through protests, boycotts). In line with this, the initiatives largely engage in (cooperational) knowledge generation, conducting research and experimenting with new decision-making processes or new commons. Interestingly, all initiatives are engaging in cooperational activities and use networking or participatory forms to implement their FSI. This is similar to findings from other scholars on FSI that underscore the participatory and networking activities (cf. Juárez et al. 2018; Alberio and Moralli 2021; Zoll et al. 2024).

The results hint to different self-perceptions of initiatives' roles within the change process. The data revealed both more radical self-descriptions and already more aligned self-estimations, particularly in relation to the political field. This may be explained due to the fact that some political actions towards sustainable development are presently set in place (e.g., Paris agreement, European Green Deal) and thus the (resultant) territorial commitment to those global (or national) sustainability strategies might hint to sustainable efforts already being in motion (e.g., Milan urban food policy pact). Currently, it seems like those agri-food initiative roles are two-fold by reproducing the "rules of the game" (cf. Holtkamp and van Mierlo 2022) but at the same time changing them or at least influencing them into a more sustainable direction, for instance, the initiatives affiliated to municipalities or the initiatives as initiators of broader networks. These initiatives are governing networking and collaborative activities, forming and strengthening wider networks among engaged actors and thus uniting different innovative activities but also creating links to the political or private realms. These findings support current transition studies in the agri-food domain, highlighting the necessity of socio-organizational innovations restructuring power relations in order to foster transitions (e.g. Gugerell and Penker 2020; Bui 2021; Ortiz and Peris 2022).

Initiatives linking processes to the regime

The socially innovative initiatives anchor to the identified six agri-food regime domains through three anchoring processes, slightly diverging from the more technological transition research as we replaced technological anchoring with anchoring through *practices and materials*. Another strategy to gain more importance seems to be the creation of links between initiatives engaged in transition but also between civil society and other businesses. Some of the identified agri-food initiatives seem to diverge radically from the

reported incumbent ways of doing, acting within a space where protection (cf. Smith and Raven 2012; protective space) is offered by local politicians and funding is provided by non-governmental organizations or public funds. In our study, protection is offered from all MLP levels. Particularly, the agri-food initiatives seem to provide a certain kind of protected space for each other, especially the ones that are already actively engaging in network formations. The literature suggests that protection should be of a temporary nature (Leeuwis et al. 2021). For our cases, this can be questioned as, for instance, the protection the initiatives are providing for each other might be useful to last throughout the process, e.g., advisory processes and support of each other.

Whether the initiatives whose activities can be assigned to the intermediary space are steering transitions in a systemic way or are more in favor of niches or regimes (cf. typology of intermediaries Kivimaa et al. 2019a) remains open for this investigation. Also, the future development of those initiatives is uncertain. For instance, some scholars observed that intermediaries seem to appear in certain phases of transition (i.e., pre-development, acceleration and embedding, stabilisation (Kivimaa et al. 2019b) and disappear once the phases change. Other intermediaries adapt to the changing conditions. These aspects represent an interesting future branch of research for our selected cases. At least, these initiatives seem to be more influential (based on their ability to create wider networks among other initiatives and links to other actors, like politicians) and the question arises if this influence was only reached by adapting (in one way or the other) to the more dominant institutional structure as brought forward by other scholars (Averbuch et al. 2021). As we based our analysis on data from a specific point in time, we did not consider initiatives' whole developmental paths. Therefore, we cannot infer any conclusions about the role of those initiatives during these developments, for instance, whether they emerged from the niche, then diffused and followed a "fit and conform" strategy (cf. Smith and Raven 2012). Building up on and extending the data collected for this study, this may represent a research direction that could be pursued in the future.

Initiatives' opportunities and challenges: implications for governance of transitions

From the reported enhancing and restraining forces, we derived some implications for governing transitions. The

strong cooperation and exchange with actors from different realms and MLP levels were reported as conducive for initiatives' development. These findings are consistent with former studies (cf. introductory section). However, other scholars voiced caution regarding too much interaction with actors favorable to the dominant regime as this could impede or steer developments into unintended directions (cf. Anderson et al. 2019). This highlights again the important role of intermediary actors as moderators for these interactions and linking processes of both actor groups, underscoring the importance of research on intermediaries in sustainability transitions that is currently enjoying great interest in the transition community (cf. Kivimaa et al. 2020). Bureaucratic burdens for funding should be minimized and the implementation of already funded novelties similarly supported as they might otherwise lead nowhere. Internally, initiatives struggle with the availability of different resources, such as employees, which might stem from the broader landscape development of demographic change. Although national and global regulations in favor of sustainable development are set in motion, not all are consistent, and thus, hamper initiatives' actions and potentially also behavioral changes if the sustainable option does not represent the easier choice.

Our study supports the aspect that political actors on smaller territorial levels, e.g., cities or regions, seem to be often in favor of sustainability transitions and are getting increasingly involved as, according to the initiatives, they are more closely connected to the area and show a better knowledge of territorial-specific conditions, adapting policies to local needs (cf. also Cohen and Ilieva 2015; Hansen and Coenen 2015). For agri-food system transitions, this proves especially useful as FSI are often dedicated to a delimited area (e.g., local meal baskets, urban gardening). Those local politicians may be better incorporated in broader scale decision making processes that effect local territories.

Conclusion

For this investigation, our research interest was threefold: first, we aimed to analyze the mechanisms behind the implementation of FSI and to derive implications for SI in the agri-food system. Second, our objective was to ascertain the linking processes socially innovative initiatives exercise to

change the incumbent regime and lastly, we sought to elaborate on the challenges and drivers the initiatives face.

First, we found that socially innovative agri-food initiatives implement their activities through four (social) interaction processes: cooperation, exchange, enabling, knowledge generation. Based on the recent appeal to expand SI research to other realms beyond energy, we applied and adapted the typology on SI in energy to our FSI. To this end, we derived a cluster system structuring the FSI into the above mentioned four social (interaction) processes and nine agri-food fields. With this cluster, we are able to present the variety of FSI regarding their “new” ways of doing (e.g., agroecology, changing habits by including less animal and more plant-based food in their meals), framing [e.g., making sustainability “*tangible, liveable, seizable*” (3 EV)], knowing (e.g., educating, developing new understandings) and organizing (e.g., shortening value chains, policy development and implementation) within the agri-food system. For the development of the cluster, we did not include as many initiatives as Wittmayer et al. (2022). Nevertheless, this allowed us to consider all the reported activities taking place (not claiming them to be exhaustive) without limiting us to the core activity only. Thus, the typology derived in this study only constitutes a first step of capturing the diversity of activities and classifying SI in the agri-food system. As we did not limit the selection of initiatives to bottom-up organizations, we found that SFI can be initiated by different agri-food system actors, regardless of their form (e.g., bottom-up or top-down initiated, civil society or government initiative). Our developed cluster may be useful for policy to create conducive conditions for similar types of SI in specific subsystems of the agri-food system or inform public discussions on FSI and their transformative potential.

Second, we found that initiatives are anchoring to the following agri-food regime domains, (a) practices (e.g., agricultural practices and methods), materials, technologies, (b) policies, regulations, institutions, (c) socio-culture

(e.g., consumer preferences, social relations, habits), (d) science, knowledge, skills, (e) food supply chain, and (f) nutrition and health. They not only anchor their new ways through networks, practices and materials and institutions to the regime but also within the niche and an overlapping space between niche and regime. Hence, the focus on the agri-food realm with its important cultural domain has the potential to broaden the attention to more socially induced transition processes and the social relations and roles of actors that come into play.

Third, our analysis of the challenges and drivers revealed that those conducive and restraining forces come from all MLP levels. However, at the level of the regime, the restraining forces prevail. Cooperation among actors is perceived as a major driver. Protection is offered from, for instance, municipalities and local political actors. In some cases, the expressed desire for more funding and continuation of funds indicates that some of the initiatives are not ready to leave the protected space (yet). However, it can be questioned whether protection from all levels needs to cease completely for the initiatives to become successful. Especially the support from other initiatives seems to be of importance that could last throughout the process, e.g., advisory processes and support of each other.

By reflecting on our investigation, we came across some limitations. Although we tried to include a broad range of initiatives, our choice might not be representative for the myriad number of initiatives engaged in agri-food system transition. In this study, we aimed to provide an overview of the activities taking place and how these are being realized in specific territories. Hence, we were not able to consider spatial peculiarities of each territorial case. Future research could explore these territories in greater depth, comparing the distinct states of transitions as well as considering the developmental processes of initiatives in relation to the local region.

Appendix Table 1 on this study's agri-food initiatives

Table 1 Initiatives engaged in making the local food system more sustainable, their founding year, brief description, mission and objectives as regards sustainable development and legal organizational form. Data was gathered from initiatives' websites and semi-structured interviews*

| Territorial case | No. | Initiative | Founding year | Brief description | Mission/objectives in terms of sustainable development (initiatives' self-perception) | Legal organizational form |
|----------------------------|-----|---|---------------|---|--|--|
| Copenhagen, Denmark | (a) | Seasonal organic meal boxes | 1999 | Preparation and delivery of meal boxes with recipes and all ingredients needed to prepare a meal. The organic meal boxes are targeting different consumer groups and include also an educational aspect in terms of how to prepare healthy and more plant-based food | <ul style="list-style-type: none"> - Recreating close connection between cultivation of land and joy of meals - 100% organic, 80% plant-based - Sustainable packaging, printed materials cradle-to-cradle certified | Stock corporation, subsidiary of a limited liability company |
| | (b) | Municipal strategy to enhance sustainability in public kitchens | 2001 | The initiative aims to implement greener and more environmentally friendly meals in public kitchens. Focus is also on education of kitchen staff as regards sustainable, organic, tasty and nutritious food | <ul style="list-style-type: none"> - Healthy, tasty and climate-friendly food for all (e.g., reduction of carbon footprint from foods and meals) - Education of employees in sustainable, nutritious, organic, tasty, nutritious foods - To reach 90% organic in public kitchens in Copenhagen municipality | Part of municipality |
| Warsaw, Poland | (c) | Food surplus distributor | 1994 | Food bank, reducing food waste mainly by collecting food as well as distributing and donating food to people in need. The initiative conducts also educational and project work | <ul style="list-style-type: none"> - Deals with free procurement of food that is at risk of being wasted and its distribution to those in need ("we collect food. We give away dignity") - Limiting the environmental impact of food surpluses | Registered association |
| | (d) | Organic market | 2010 | Organic market for mainly small farmers with direct selling to consumers, located in old industrial factory hall. The initiative also supports farmers in conversion to organic | Restructuring of value chain (direct selling from farmers to consumers), cooperation with small-scale farmers and farmers in conversion to organic | Limited Liability Company |
| | (e) | Consumer cooperative | 2013 | First consumer food cooperative in Warsaw. It has around 420 members. Through a strong network with small-scale local farmers, the cooperative provides members with sustainable high-quality food at fair prices. The initiative supports ethical labor, local and sustainable agriculture | <ul style="list-style-type: none"> - Provision of affordable, healthy, fresh, seasonal and organic food to people in Warsaw - Supporting the development of local and organic farms - Promoting the economy of cooperation and the common good - Promoting activism on direct democratic principles | Registered association |
| | (f) | Polish chamber of organic food | 2017 | Polish Chamber of Organic Food is an umbrella organization encompassing the organic food companies, gathering the farmers, producers, processors and retailers of certified organic food and the supporting sectors, supporting new legislation on organic food | <ul style="list-style-type: none"> - Promotion of organic food as healthy for people and planet - Reconciling farmers/producers, processors, sellers of certified organic products - Promotion of sustainable lifestyle and education of the public about the health benefits of organic products - Promotion of knowledge about the certification of organic products ("euro-leaf") - To support and promote Polish agriculture and the conversion of farmers to organic | Sectoral organization |
| | (g) | Warsaw urban food policy | 2019 | The initiative develops and implements a sustainable urban food policy and aims to promote healthy diets. Warsaw is signatory to the Milan Urban Food Policy Pact (MUFPP) | <ul style="list-style-type: none"> - Reduction of food waste, prevention and management of food surplus - Encouraging sellers to reuse food surplus - Promotion of more responsible consumption behavior | Part of municipality |

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Table 1 (continued)

| Territorial case | No. | Initiative | Founding year | Brief description | Mission/objectives in terms of sustainable development (initiatives' self-perception) | Legal organizational form |
|--|-----|---|---------------|--|---|---------------------------|
| Eco-Region Cilento, Italy | (h) | Organic Cooperative | 1976 | Organic agricultural cooperative with over 400 members and 2500 hectares of land. The initiative aims to protect the land and work it sustainably in order to improve the quality of life (of the planet and humans). Additionally, the initiative runs a restaurant, an oil mill, an educational farm and fosters eco-tourism | <ul style="list-style-type: none"> - Working "with passion, ethics and care for biodiversity to cultivate food and wine products that improve the quality of life" - Promoting healthy and sustainable lifestyle - Protection of biodiversity, regeneration of soil | Registered association |
| | (i) | Organic and regional food market | 2019 | Farmers market for organic and regional produces. Exchange platform for younger and experienced farmers | <ul style="list-style-type: none"> - Bringing farmers/ producers and consumers closer together - Enhancing collaborations between farmers - Meeting local food demand with local sustainable products - Promotion of understanding one's roots to be aware of one's future: "a market of ideas, slow time and art. It is identity, creativity, ethics, culture, conviviality." | Registered association |
| | (j) | Organizational entity of the Eco-Region | 2004 | Network organization aiming at organic transition of the entire area (Cilento). The initiatives support various projects and offers guidance for other initiatives | <ul style="list-style-type: none"> - Supporting development of organic production and culture - Boosting sustainable, integrated, participatory and climate-neutral territorial development and binding various regional actors to these goals through a formal agreement - Working towards an ecological transition of the area through diverse activities (e.g., sustainable farming, processing, sustainable tourism, gastronomy, education). | Non-profit association |
| Organic model region North-Hesse, Germany | (k) | Urban public community gardening | 2009 | The initiative works on the development of a lively, productive urban landscape with urban gardening opportunities for everyone | <ul style="list-style-type: none"> - Promotion of diverse local food production in the city of Kassel - Enriching the city and its surroundings with fruiting plants - Promotion of adaptability of the city to changing global conditions (e.g., climate change) | Non-profit association |
| | (l) | Organic research farm of the local university | 1998 | Teaching, research and transfer center for organic farming and sustainable regional development, certified organic. The initiative is the teaching/experimental farm of Kassel University. | <ul style="list-style-type: none"> - Intensifying research on organic agriculture - Making organic agriculture visible and experienceable to the wider public | Registered association |
| | (m) | Association committed to food system change | 2014 | Association committed to food system change, organization of projects in different areas (e.g. food waste, networking, nutrition platform, regional recipes) | <ul style="list-style-type: none"> - Exploration of levers and ways to promote sustainable food systems and support organizations (e.g., businesses, politics, civil society) to develop innovative concepts and practically realizing the - Promotion of collaboration and dialogue between different stakeholders active in sustainable development | Registered association |

Table 1 (continued)

| Territorial case | No. | Initiative | Founding year | Brief description | Mission/objectives in terms of sustainable development (initiatives' self-perception) | Legal organizational form |
|----------------------------------|-----|--|---------------|---|--|-------------------------------|
| Province Kenitra, Morocco | (n) | Agricultural cooperative | 1998 | Cooperative, producing, local and organic products e.g., honey, jam, olive oil. The initiative supports rural women and has a tourism project underway | - Producing "clean" products without harming nature - Working hand in hand with rural women, peasants and regional producers, respecting fair trade | Registered association |
| | (o) | Agricultural farm | 1994/2017 | Agroecological farm with 294 hectares. Some area is farmed certified organic with citrus, other fruits and almonds. The initiative engages in educational activities | - Agroecological farm since 2017 | Registered association |
| | (p) | Federation of consumer rights | 1999 | The association is the first consumer rights movement of its kind in Morocco. It is active in food waste reduction through awareness raising among citizens | - Advocacy, education of consumers, with a focus on raising food waste awareness and coordinated actions with other stakeholders for food waste limitations - Enabling consumers to make their informed choices as regards their health and the environment | Non-governmental organization |
| | (q) | Network of agro-ecological initiatives | 2013 | Network of agroecological initiatives to inform, link and connect, meet, advocate and share agroecology in Morocco. The initiative has developed a Participatory Guarantee System (PGS) | - To offer a space for meeting, connecting and knowledge exchange between agro-ecological actors in Morocco, promoting synergies between initiatives - To raise awareness in civil society regarding the sustainability benefits of agroecology | Registered association |

*Table references: Initiatives' own websites and reports. For further requests please contact the corresponding author

Appendix Table 2 on the agri-food initiatives' activities sorted into agri-food categories in relation to social (interaction) processes

Table 2 The FSI are placed in the middle of the table. The reference letters in parenthesis refer to the respective initiative (cf. Appendix Table 1). Data based on semi-structured interviews with initiative informants

| | Cooperation | Exchange | Enabling | Knowledge generation |
|---|---|--|---|--|
| | Cooperation, networking, dialogue | (Knowledge) exchange | Advising, supporting, educating, awareness raising | Research and experimentation |
| 1 | <p>Cooperation, networking, dialogue</p> <ul style="list-style-type: none"> - Creation of exchange/networking platform (online, on-site) for farmers, initiatives, other stakeholders (i, j, m, q) - Cooperation among initiatives (b, d, k, m, e, q) - Dialogue with actors from value chain (farmers, producers, consumers) (a, c, d) - Networking beyond the territory with similar initiatives (a, b, c, j, m, q) - Constant dialogue with consumers to receive feedback (d) - Foster intercultural dialogue through cultural events (k) - Through events: getting into dialogue with consumers to take up their wishes (l) | <ul style="list-style-type: none"> - Receive/collect feedback, opinion from stakeholders (farmers, politicians, other initiatives, private businesses, consumers), implementing it (b, c, g, m, o, d) | <ul style="list-style-type: none"> - Supporting farmers, initiatives (j, m, o, q) - Advise farmers, initiatives (a, j, q) - Promoting other initiatives (j) - Strengthen existing structures (with initiatives), support, promote them (m, g) | <ul style="list-style-type: none"> - Cooperation with research institutions (a, b, h, j, l, p) - Initiating research networks (m) - Conducting research with businesses, initiatives (b, m) |

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Table 2 (continued)

| | Cooperation | Exchange | Enabling | Knowledge generation |
|--|---|---|---|---|
| | Cooperation, networking, dialogue | (Knowledge) exchange | Advising, supporting, educating, awareness raising | Research and experimentation |
| 2 Food access and availability | - | - | - Distributing food surpluses to people in need (c) - Organizing self-harvest for low-income families (l) - Created a solidarity fund among their members dedicated to poorer people (e) - Offer discount for seniors (e) | - |
| 3 Reorganization of food value chains | - Organic/agroecological farmers' market: connecting producers with consumers - shortening supply chain (i, d, e, k, l, n, q) | - | - | - trying out different concepts, e.g., new commons, new decision-making processes (k) - more self-processing and producing (b) |
| 4 (Organic, agroecological) farming practices | - Cooperation with farmers about cultivation plan, ancient varieties (a) - Through public community farming making healthy food accessible for all (k) | - Organizing workshops for exchanging and teaching horticulture techniques (k) - Organizing workshops for farmers to convert to organic and exchange on the process (l) - Accompany and offer trainings for farmers (q, o) - Organizing campaigns to inform about agroecology (q) | - Supporting farmers in (conversion to) organic agriculture or agroecology (d, f, j, q) - Advising farmers in marketing of their products (q) - Cooperation with farmers in rural areas to support them (n) - Community education through gardening (role of soil, techniques) (k) - Shift focus to origin of food through organic market (d) or educational work (f) | - Conducting research on organic farming (l) - Conducting, supporting research on ancient varieties (j) - Through their community gardens: make food production tangible, seizable, visible (k) |
| 5 Sustainable, healthy diets, organic food and food culture | - Through store: get into dialogue with consumers to get to know their wishes and needs (a) - Promotion of organic food among consumers (f) | - Sharing recipes through online platform (b) - Workshops for preparation of foods (a) - Workshop on Mediterranean Diet (i) - Competence development of staff (b) - Translation of scientific knowledge for broader public (g) - Providing information on organic foods for public kitchens, public (f) - Launching campaigns to increase vegetable consumption (b) | - Supporting public kitchens in increasing their share of organic (b, m, f) - Through meal boxes: try to teach people to increase amount of vegetables and fruits, decrease amount of animal products; to ferment, to pickle (a) - Provide employees with more "sustainable" meals to show the range of options (l) - Creation of online academy to inform and enable people (m) - Through store/restaurant: influence and inspire consumers to cook more sustainable meals, raise awareness (a, d, h, q) - Raise awareness for higher prices of organic or local foods by selling their products, communicating this (d, i, n, o) or educational activities (f, p) - Provide information material for consumers so that they can make their informed choices (p) | - Publications on the link between food and environment (f) - Experimentation with meals to decrease meat, animal foods, food waste with no financial increases (a, b) - Experimentation for tasty plant-based organic meals (a, b) - Experimentation with meals to decrease meat, animal foods and change consumer habits, food culture (a, b) - Test consumer boundaries (regarding more sustainable options) through their meals (a, b) - Change the way people eat through supporting initiatives activities within a region (j) |

Table 2 (continued)

| | Cooperation | Exchange | Enabling | Knowledge generation |
|-------------------------------------|---|--|--|---|
| | Cooperation, networking, dialogue | (Knowledge) exchange | Advising, supporting, educating, awareness raising | Research and experimentation |
| 6 Food waste | - Collaboration with initiatives dealing with food surpluses (d, e, k) - Fostering/promoting cooperation projects dealing with food waste (g, m) | - Campaigning against food waste through newspaper articles (l) - Education of other initiatives, public, entrepreneurs regarding food waste through workshops (c) | - Managing and distributing surpluses of food to people in need (c) - Supporting other initiatives in decreasing their amount of food waste (j, m) - Through meal boxes: teaching people how to store foods (a) - Conducting seminar with pupils on food waste (i) | - Trying out different ways to decrease amount of food waste (b) |
| 7 Food policy and regulation | - Partnerships with ministries to implement their ideas (p) | - Through policy implementation: inform public about sustainable diets, promote them (g) - Establish social consultation process for policy development with all stakeholders to receive their opinions (g) | - Develop and implement "food and meal" policy/strategy (b, g) and set framework for public kitchens, increase share of organic (b) - Accompany development of nutrition strategy (m) - Through policy development and implementation: making food available for all (g) - Provide feedback during social consultation process for policy development (c, d) | - Development of own participatory guarantee system (q) |
| 8 Regional development | - By cooperating with local farmers, producers increasing share of local products (b) - Through organic research farm anchor and network in the region (l) - Source from farmers no further than 60-100km (e) - Organization of organic regional initiatives (j) | - Foster knowledge exchange by sharing studies and experiences by several initiatives among other initiatives (j, m) - Establish movement by greening the city (lived health promotion, relaxation through gardening) (k) | - Supporting the region by promoting sustainable tourism, marketing of local products (i, j) - Promoting local diverse food production through community public gardening (k) - Increase share of regional foods in community catering by advising public kitchens (m) - Offer space for local farmers to sell their products (d) - Support local farmers by advising them (q) | - |
| 9 Climate impact | - Communication of climate impact of meals (b) - Optimization of transportation processes through dialogue with food surplus donors (c) | - | - By city greening through urban gardening: promoting city's ability to adapt to changing climate (k) - Organization of cultural events supporting artists in relation to sustainability ("Earth Day") (k) | - Offer a place for consumers to live and experiment sustainable practices (k) - Usage of CO2 calculation tool for their public kitchens (b) with aim to reduce 25% of municipalities CO2 by 2025 (b) - Development of software/online tools to calculate climate impact of meals (m) |

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Declarations

Conflict of interest The authors declare no conflict of interest.

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Chapter 6. Policy intermediation for agri-food system transition: Food Policy Groups from middle Europe, Australia and United States

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Policy intermediation for agri-food system transition: food policy groups from middle Europe, Australia and United States

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Politics of power

ABSTRACT

Food policy groups (FPGs) are locally grounded approaches that engage with agri-food policy and challenge unsustainable practices. Thereby, FPGs intermediate between actors at the interface of civil society, science, policy and practice. As transition intermediaries, FPGs hold the potential to advance sustainability transitions. Yet, both their policy-related functions and the factors shaping their activities warrant closer investigation. Through the prism of transition intermediary research, we investigate the functions, policy priorities, organizational forms and relationships to government that constitute the policy intermediation of FPGs across three geographical contexts. Based on survey data of FPGs ($n = 260$) across United States, middle Europe (mainly Germany) and Australia, we conduct a mixed-methods analysis, applying qualitative coding and statistical measures. We find that FPGs primarily intermediate in processes of social innovation, characterized by changing practices and social relations, rather than in the facilitation of technological innovations. We identify nine intermediary functions that remain similar across the three geographical contexts but differ from the functions typically associated with intermediation around technological innovations. FPGs engage in empowerment processes, network-building and work towards achieving collective goals. Due to FPGs' nature as multi-actor platforms, they are conflict-ridden and arbitrate between distinct agri-food actors. The policy priorities, organizational forms and relationships to government differ across the three geographical contexts and thus seem to be context dependent. A stronger linkage to government does not appear to be associated with the policy priorities an FPG focusses on, suggesting that even FPGs with strong connections to government retain their independence.

1. Introduction

A variety of actor types play a role in sustainability transition processes, whether in developing innovations, facilitating their diffusion but also in decelerating or preventing change (Avelino and Wittmayer, 2016; Farla et al., 2012; Köhler et al., 2019). The sustainability transition literature frequently draws on the multi-level-perspective on socio-technical transitions (MLP) to structure actors' activities and their position within the system in focus (Avelino and Wittmayer, 2016; Kivimaa et al., 2019a). The MLP suggests that transitions (ideally) occur resultant from dynamics between three structural levels: the landscape comprises the exogenous context for niches and regimes; the dominant regime is understood as the "deep structure" of dominant socio-technical and ecological systems; and niches as the lieu for experimentation and

innovation development, diverging from the incumbent structure (i.e., regime) (Geels, 2011). However, boundaries between the MLP levels are rather fluid than clear-cut (Geels, 2011) and further research has recognized the role of the intermediary space, an overlapping space between niche and regime, that can be instrumental in driving innovations (Bergek, 2020; Martiskainen and Kivimaa, 2018; Ptak et al., 2023; Vihemaeki et al., 2020). Transition intermediary research deals with the role of those intermediary actors in advancing sustainability transitions as mediators, disseminators of information or connectors between different levels (Elsner et al., 2023; Kanda et al., 2020; Kivimaa et al., 2019a). Thus far, a majority of studies on intermediation have focused on the energy and housing sectors, alongside contributions from other sectors, with a primary concern for technological innovations (e.g., Bergek, 2020; Bush et al., 2017; Hodson et al., 2013; Hyysalo et al.,

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2022, 2018; Kivimaa and Martiskainen, 2018).

Alongside the housing, energy or mobility sectors, the agri-food sector is associated with considerable ecological, social and economic costs and is particularly relevant regarding its capacity to alleviate climate change and the accompanying impacts (IPCC, 2019). Agri-food systems are interwoven, multi-tiered and characterized by intricate relational dynamics. This very essence impedes systemic changes (Coulson and Sonnino, 2019; Leeuwis et al., 2021). Place-based approaches to more sustainable agri-food systems are recognized as improving agri-food systems' resiliency and equity. A crucial determinant is the governance of such local agri-food systems since agri-food policies tend to be determined on national levels and market-based solutions prevail (Blay-Palmer et al., 2016; Coulson and Sonnino, 2019; Edwards et al., 2024; Moragues-Faus and Sonnino, 2019). Food policy groups (FPGs) appear to be filling this void and serve as local multi-actor platforms to encourage community and stakeholder involvement, empower unheard voices and amplify democratic participation to resolve agri-food policies and practices (Boden and Hoover, 2018; Calancie et al., 2018). FPGs engage in various agri-food systems' related topics such as food access, democracy, sovereignty, education or justice and aim for sustainability transitions of agri-food systems (den Boer et al., 2023; Michel et al., 2022; Schiff, 2008). FPGs bring together a variety of representatives across the agri-food system and use democratic institutional structures to meet their objectives (Birnbaum and Lütke, 2023; Calancie et al., 2018; Michel et al., 2022). In the literature and in practice, FPGs go by names such as "food policy council", "food policy network", "food council", "food system network", "food policy coalition", "food committee", "food forum" or "food alliance" (Bassarab et al., 2019; den Boer et al., 2023; Godrich et al., 2023; Sieveking, 2019). The different labels are indicative for the diversity of roles FPGs play and the various regions where they are present. For this research, we will make use of the more general term food policy group (FPG). To achieve their goals, FPGs act at the interface between civil society, science, policy and practice and aim for boundary spanning relationships between those sectors (Bassarab et al., 2019; Leitheiser et al., 2022). By doing so, they advance an unequivocal transition agenda and can thus be seen as intermediaries in transition processes (den Boer et al., 2023). First and foremost, FPGs act at the local or communal level, though they are also increasingly organized on national and global levels (den Boer et al., 2023; Michel et al., 2022; Schiff, 2008).

Recent intermediation studies expressed a need for further research on functions or roles of intermediaries around policy work (Cramer, 2020; Kivimaa et al., 2019a; Mignon and Kanda, 2018). Current research often focusses on the functions related to a specific technological innovation in the energy or housing sectors (e.g., Bastás and Mignon, 2025; Hyysalo et al., 2022; Nordt et al., 2023), but insights into the breadth of topics addressed by intermediaries remain limited. The functions performed by FPGs and the policy priorities they address point to the shortcomings and existing challenges of the current system, alongside possible avenues for achieving more sustainable progress. Gaining deeper insights into these aspects may prove valuable for policymakers and planners involved in sustainability transitions. Furthermore, little is known about the organizational structures of intermediaries and the nature of their relationship to government although this knowledge could enhance our understanding of the key characteristics of actors engaged in sustainability transitions (Bastás and Mignon, 2025; Bergek, 2020). Additionally, this information could be insightful for transition governance for the support and intentional shaping of intermediaries. As systems (e.g., agri-food, energy, mobility) and their characteristics differ, so too may the organizational form, roles and functions of the actors embedded within them. Current intermediary research could benefit from greater inclusion of insights from agri-food system studies, thus tapping into agri-food systems' potential to contribute to a sustainable development. In addition, comparing different countries is essential to effectively address the challenges that are globally interconnected (i.e., sustainable development), deriving findings that are

either generalizable across contexts or specific to geographic areas.

Thus, our research aims to provide insights on agri-food related intermediaries' functions around policy work, their policy priorities, their organizational structures and their relationships to government across three geographical areas. This leads us to two research questions: (1) how are the policy-related functions, organizational forms and relationships to government of FPGs across three geographical contexts distributed, and (2) is there an association between the organizational form or relationship to government and the policy priorities an agri-food related intermediary focusses on?

For this, we focus on the FPGs from United States (US), middle Europe (mainly Germany) and Australia. As regards the functions, we understand the roles (around policy work) intermediaries play in sustainability transitions (e.g., influencing political vision building, facilitating collaborations among diverse actors in agri-food policy development) which are pursued through different activities. By organizational form, we refer to the type of organization (e.g., grassroots coalition, non-profit, FPG embedded in government). By relationship to government, we understand the nature of the connection (e.g., FPG supported by government, FPG members appointed by government, government seeking advice from FPGs). We aim to contribute to the scientific discourse by providing insights on FPGs' intermediation across different geographical regions, thereby identifying both differences and commonalities. While transition research in general has made significant conceptual advances, the field may profit from a broader range of methodological perspectives and approaches (Truffer et al., 2022). This research addresses this issue by applying a mixed-methods approach, demonstrating how statistical techniques such as the binomial logit model and chi-square test can help identify correlations between several nominal independent variables and a dependent variable, thereby offering methodological insights that may be useful for other transition research. Furthermore, we aim to shift the focus from intermediary research in energy and housing to the agri-food sector. We conclude this study with recommendations for policymakers and planners.

2. Theoretical framework

2.1. Transition intermediary research

Groups or individuals that are brokering or bridging between two or more entities such as producers and consumers or entrepreneurs and users, facilitating exchanges and joint activities, occur in an array of research strands (Kivimaa, 2014) and are labeled as hybrid actors (Elzen et al., 2012), system orchestrators (Gomes and Barros, 2022), change agents (Van Poeck et al., 2017), boundary spanners (Smink et al., 2015) or innovation intermediaries (Howells, 2006; Klerkx and Leeuwis, 2009). In the sustainability transition literature, the term transition intermediary seems to prevail and constitutes a rather recent research focus (Kivimaa et al., 2020, 2019a, 2019b; Martiskainen and Kivimaa, 2018; Mignon and Kanda, 2018). In distinction to other concepts in the literature, transition intermediaries are defined not only by their in-betweenness between two or more actors, but also by the specific actions they undertake, such as brokering relations, mobilizing resources, supporting experimentation, and actively shaping the conditions for sustainability transitions by linking niches and regimes, orchestrating networks, and influencing governance processes (Kanda et al., 2020). Conceptually, transition intermediaries build on earlier work on systems of innovation, niche intermediation, urban transitions or research on technology organizations (Geels and Deuten, 2006; Howells, 2006; Kivimaa et al., 2019a; Klerkx and Leeuwis, 2009; Nelson, 1993; van Lente et al., 2003), while empirical applications have since expanded to diverse fields. Research on transition intermediaries elaborates on these intermediaries as key catalysts for sustainability transitions (Kivimaa et al., 2019a; Martiskainen and Kivimaa, 2018; Ptak et al., 2023). Kivimaa et al. (2019a) define transition intermediaries as "actors and platforms that positively influence sustainability transition

processes by linking actors and activities, and their related skills and resources, or by connecting transition visions and demands of networks of actors with existing regimes in order to create momentum for socio-technical system change, to create new collaborations within and across niche technologies, ideas and markets, and to disrupt dominant unsustainable socio-technical configurations” (p. 1072). In the literature, transition intermediary actors comprise and are organized, amongst others, as government-affiliated intermediaries, charity/social enterprises, member organizations, non-governmental organizations, public private networks, private organizations, collaborative platforms or universities (Bastás and Mignon, 2025; Kivimaa, 2014; Kivimaa et al., 2020; Moreno-Serna et al., 2024; Vihemaeki et al., 2020; Wolf et al., 2021).

2.2. Transition intermediary functions (around policy work)

Transition research identified intermediary functions, often inspired by strategic niche management literature (Kemp et al., 1998). Fig. 1 visualizes these functions. Broadly, authors reported on eight intermediary functions. For instance, intermediaries engage in innovation process management through project design, evaluation, mediation or resource procurement or by providing institutional support through advocacy activities and support in lobbying activities (Kilelu et al., 2011; Kivimaa, 2014; Kivimaa et al., 2019b; Moreno-Serna et al., 2024; Stewart and Hyysalo, 2008).

From the analysis of intermediaries engaged in policy work around sustainable constructions and housing in United Kingdom and Finland (Kivimaa et al., 2020; Martiskainen and Kivimaa, 2018; Vihemaeki et al., 2020), further functions are reported and visualized in Fig. 1 (right-hand side, functions a-i). For instance, Kivimaa et al. (2020) analyze the functions of intermediation along the policy cycle (i.e., agenda setting, policy formulation, decision-making, implementation, evaluation and completion (cf., Jann and Wegrich, 2007)) and find several core functions for intermediation in each phase which we incorporated into Fig. 1. The authors conclude that intermediaries engaged in policy processes for building energy efficiency in Finland are especially important for policy implementation, for instance, the interpretation of policies to recipients or the coordination of the policy implementation process (Kivimaa et al., 2020). Martiskainen and Kivimaa (2018) remark that intermediaries are especially relevant in advancing policy change when policy support is lacking. However, the functions identified thus far stem from analyses centered on the diffusion and development of a specific technological innovation and from a limited number of intermediaries (Kivimaa et al., 2020; Martiskainen and Kivimaa, 2018; Vihemaeki et al., 2020). It remains open whether intermediary functions differ in other contexts, such as in different sectors or geographical regions.

3. Methodology

This research draws on an empirical research design. Data are obtained from three online surveys, distributed among FPGs in the United States (US), middle Europe (mainly Germany, but also the Netherlands, Belgium, Austria, Switzerland) and Australia. We selected these countries based on contacts to FPG networks that facilitated access to the respective FPGs. In the following sections, we introduce our study object, FPGs, and elaborate on the survey development, data collection, as well as data cleaning and analysis.

3.1. Study object: food policy groups (FPGs) as agri-food system intermediaries involved in policy work

The first groups captured as food policy councils evolved in the 1980s and thereupon, those councils spread throughout the world, differing in terms of how they are organized (i.e., formed by civil society or government), structured, funded or their scope of action (Harper et al., 2009, De Marco et al., 2017, Michel et al., 2022). In the US, the first FPGs were formed in response to poor food planning coordination which resulted in limited access to healthy food. By now, around 350 FPGs operate across the US (Bassarab et al., 2019; Birnbaum and Lütke, 2023). The first middle European FPGs evolved in 2016 in Germany with the aim of placing food policy on the local agenda. The groups have now grown to around 60 FPGs across Belgium, the Netherlands, Switzerland, Austria and Germany (Birnbaum and Lütke, 2023). Some early studies reported on FPGs in Australia (Hawe and Stickney, 1997; Schiff et al., 2022) and by now, there are around 12 active groups that may be considered as FPGs, engaged in building sustainable and healthy agri-food systems.

For our analysis, we understand FPGs as transition intermediaries aiming for boundary spanning relationships at the interface of science, policy, practice and civil society. FPGs as transition intermediaries may be active on niche, regime, system or project level, and are groups of people committed to working together to address issues across the food system, primarily through policy or programs. For the purpose of this study, we adopt the following understanding of FPGs’ intermediary roles in policy: FPGs address issues across the food system, first and foremost through political actions and engagement. Political actions include activities along the policy cycle (i.e., agenda setting, policy formulation, decision-making, implementation, evaluation and completion (cf., Jann and Wegrich, 2007)), for instance, development of policies or how policies get administered, funded or implemented at various levels but also changes in policies and standards within institutions (e.g., schools, government agencies). Beyond that, policy work could include working directly to change these various policies but also educating or coordinating others who might be advocating for such policies. Although some

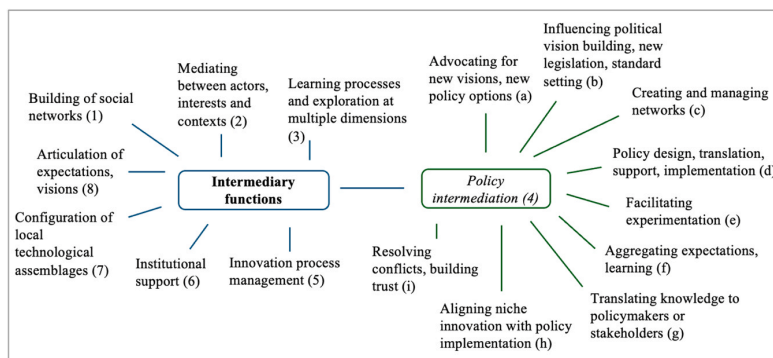


Fig. 1. Transition intermediary functions and the functions around policy work from the literature (Kilelu et al., 2011; Kivimaa, 2014; Kivimaa et al., 2020, 2019b; Klerkx and Leeuwis, 2009; Martiskainen and Kivimaa, 2018; Moreno-Serna et al., 2024; Stewart and Hyysalo, 2008; van Lente et al., 2003; Vihemaeki et al., 2020).

FPGs are focusing on one specific area, e.g., out-of-home meals, and have no working group specifically focusing on policies, their actions are political in a broader sense as they, for instance lobby for projects or connect local initiatives or canteens with federal funders.

3.2. Survey development

The US-survey data come from a survey of FPGs conducted by the John Hopkins Center for a Livable Future in the US in 2023. Since 2013, the institute runs a bi-annual survey of FPGs to learn about their work, each time with slightly modified questions (e.g., Bassarab et al., 2019; Santo et al., 2020). Every survey is pre-tested with around ten FPG representatives. The institute shared the survey data with this study's research team.

The middle European and Australian surveys were developed by the authors of this publication. The development was inspired by the US-survey, FPG and intermediary literature (Bassarab et al., 2019; den Boer et al., 2023; Godrich et al., 2023; Kivimaa et al., 2020, 2019a; Mignon and Kanda, 2018; Schiff et al., 2022; Sieveking, 2019). We devised a German and English version of the survey and translations were verified by native speakers. After the European and Australian survey development, the survey was shared with two representatives from the German network of FPGs for feedback which was discussed and incorporated in the survey. We uploaded the survey on the platform LimeSurvey CE Version 6.6.3. We conducted a pre-test with five FPG representatives from Germany and the Netherlands which met a thoroughly positive response and necessitated no further adaptations. The present research is based on a set of survey questions that were identical across all surveys (see [Supplementary Material](#), survey). The survey questions relevant to this research address FPGs' geographic focus (1), current status (established, in initiating process, inactive) (2), formation year (3), type of organization (amongst others, e.g., non-profit, grassroots, embedded in government) (4), sectors represented by FPG's membership (5), statements that describe FPG's connection to government (6), policy priorities (7), reasons for founding the FPG (8) and greatest accomplishments (9).

3.3. Data collection

We compiled a near-complete list of FPGs for each geographical area (US, middle Europe, Australia), drawing on databases of national FPG networks, mailing lists of national FPG networks, exchanges with spokespersons of said networks, scientific and gray (e.g., FPG reports, publications) literature, and FPGs websites. For US FPGs, we contacted the John Hopkins Center for a Livable Future. For the middle European FPGs, we decided to go with the self-understanding of the recently established German national network of FPGs which aims to represent not only the German FPGs but also those from the surrounding countries. For the Australian FPGs, we contacted Sustain – the Australian food network and were in exchange with its executive director who enabled us to connect with the Australian FPGs. To our knowledge, the compiled lists represent the majority of active FPGs in each geographical area at the time of survey disseminations. The surveys were distributed to the full lists of identified FPGs.

In 2023, the US-survey was sent out to 342 FPGs by email in the period of March to August 2023. If no answer was received, email reminders and subsequent calls were made. The US-survey took about 15–20 min to complete. Mid-May 2024, the middle European survey was sent out to 67 FPGs through the mailing list of the German network of FPGs which includes FPGs from the Netherlands, Belgium, Austria and Switzerland. At three points in time, reminders were sent out. More specifically, two weeks after the first invitation, a reminder was distributed through the network. Another week later, every FPG that had not participated by then was contacted individually via email. Another two weeks later, board members were contacted via email or phone call and asked to complete the survey. We closed the survey in

August 2024. The Australian survey was distributed among 12 Australian FPGs by the executive director of Sustain – the Australian food network. An email containing the survey link was shared among FPGs in June 2024 and a reminder was sent out four weeks later. Again, the survey closed in August 2024. The middle European and Australian surveys took about 15 min to complete. For all three surveys, one knowledgeable person (e.g., board member) was asked to complete the survey on behalf of the respective FPG. All surveys provided a definition of an FPG and only groups that felt addressed by this were invited to complete the questionnaire.

3.4. Data cleaning and analysis

For the data cleaning and assessment of data quality, we controlled for speeding (less than 50 % of the calculated duration (i.e., <7,5 min)), incompleteness (less than 90 % completed) and duplicates. Moreover, we only included responses of groups that considered themselves as an FPG. If nominal variables occurred as strings, we converted them to numeric variables.

The US-survey terminated with 242 responses of which 23 were removed due to incompleteness (n = 21), duplicate (n = 1) or a group that filled out the survey that does not consider itself as an FPG (1). The middle European survey closed with 43 replies. We removed seven responses due to incompleteness (n = 3) and duplicates (n = 4). The Australian survey terminated with six responses of which one was removed (incomplete). We conducted our analysis with the following samples: US-survey n = 219, middle European survey n = 36, Australian survey n = 5. The distribution of middle European FPGs is as follows: Germany n = 32, the Netherlands n = 1, Belgium n = 1, Austria n = 1, Switzerland n = 1. Accordingly, the response rates were as follows: US-survey 64 % (219 out of 342), middle European survey 53 % (36 out of 67), and Australian survey 41 % (5 out of 12). To assess potential nonresponse bias, we compared early and late respondents, assuming late respondents as a proxy for nonrespondents (following Armstrong and Overton, 1977; Duszynski et al., 2022). Respondents who completed the surveys before a reminder was sent were classified as early respondents, while those who completed them after the reminders were classified as late respondents. We did not identify any significant differences, allowing us to assume that nonresponse bias did not affect the results. Furthermore, after the completion of the surveys, we consulted the respective websites or social media profiles of the FPGs to verify whether they were actually active.

We drew on first, qualitative coding, and second, descriptive and inferential statistics to analyze FPGs' functions around policy work and FPGs' organizational form, relationship to government and policy priorities. First, for the analysis of FPGs' intermediary functions around policy work, we analyzed the open-ended responses from all surveys and applied qualitative coding. Data were extracted based on a deductive-inductive coding pattern. We derived concept-driven categories from FPG and intermediary literature (Bassarab et al., 2019; den Boer et al., 2023; Godrich et al., 2023; Kivimaa et al., 2020, 2019a; Mignon and Kanda, 2018; Schiff et al., 2022; Sieveking, 2019). We coded the responses accordingly and derived new categories inductively from the data. Thereupon, we reorganized the coding scheme, merged some categories in some cases and built sub-categories in others (cf., Appendix Table A). We utilized the QDA-Software MAXQDA2022 (VERBI Software. Consult. Sozialforschung. GmbH, Berlin, Germany) for the qualitative coding procedure.

Second, for the descriptive part on FPGs' organizational form, relationship to government and policy priorities, we created multiple response sets of the variables allowing for multiple answers and built crosstabs to contrast the frequencies, for instance, to depict an FPG's relationship to government in relation to its type of organization. For questions allowing multiple responses, we calculated the percentage of respondents selecting each option (percent of respondents). This enables comparison across geographical areas despite differing sample sizes. We

performed this analysis with all datasets. However, we must note that the sample sizes across the three geographical areas vary considerably, reflecting differences in the number of existing FPGs as well as survey response rates. As such, comparisons between the three geographical contexts should be interpreted with caution, as unequal sample sizes may limit the generalizability and comparability of findings. To identify possible correlations between our nominal, mainly dichotomous (i.e., “0” for response “not chosen” and “1” for “chosen”) variables, we applied, first, binomial logit model and, second, bivariate chi-square test. We only tested correlations for the US-dataset as the dataset recorded the highest number of responses (n = 219) from which meaningful correlations may be determined (at all). First, we employed logit model to examine which variables may have an influence on the probability that an answer is chosen (i.e., estimation of the probability that value 1 occurs). We chose this method as it allows us to measure the influence of several independent variables on one dependent variable. Then, with the variables suggesting correlations at the ten percent level (p-value <0,1), we applied the bivariate chi-square test, compiling two-by-two matrices of potential results. This test examines whether the frequencies occurring in the sample differ significantly from the expected frequencies. Thus, observed and expected frequencies are being compared and deviations analyzed to be able to make predictions about correlations between the variables in focus. Again, we considered results significant at the ten percent level (i.e., p-value < 0.1). Many studies, especially in a medical context, use a p-value of 0.05 to determine statistical significance. However, the determination of a p-value is based on arbitrariness and needs to be adapted to the specific research context or sample and its representativeness. Thus, p-values of 0.1 (i.e., correlation with 90 % certainty) are considered meaningful in the context of a thorough interpretation of results (Fisher, 1950). To find out whether organizational form or relationship to government are related to the policy priorities chosen, we assessed the associations between the independent variables *type of organization* and *relationship to government* (with their respective answer options) and the dependent variable *policy priorities* (with its respective answer options). For the statistical analysis, we utilized IBM SPSS Statistics Version 29.02.0 (cf., [Supplementary Material](#)).

4. Results

This section presents the results from the qualitative and quantitative survey analysis. First, we present FPGs’ intermediary functions around policy work. Second, we show the distribution of FPGs’ top three policy

priorities across the three geographical contexts. Then, we elaborate on FPGs’ types of organization and relationships to government per geographical area. Lastly, we present the distribution of US FPGs’ top three policy priorities by type of organization and relationship to government. We show statistically whether the selection of policy priorities is determined by the organizational forms or relationships to government. For this last part, we focus on US FPGs only due to the higher number of responses where potentially meaningful relations may be determined (at all).

4.1. FPGs’ functions in agri-food system intermediation around policy work

For the qualitative analysis of FPGs functions, we did not find any differences between the three geographical contexts. All functions were performed by FPGs from all countries (i.e., US, middle Europe, Australia). It seems that FPGs’ intermediation focusses on practices and social relations instead of intermediating for new products or technologies. Fig. 2 shows the identified intermediary functions around policy work of FPGs and Table 1 presents the definitions of the main (bolded) functions. A more detailed overview of the qualitative coding procedure of the open-ended survey questions can be found in Appendix Table A where we give a definition of each function as well as exemplary quotes.

We identified nine intermediary functions around policy work of which four can be further subdivided (i.e., managing situations prone to conflict, knowledge, gaining legitimacy and organizational matters) (cf., Fig. 2, Table 1). We will briefly elaborate on the following aspects: first, policy development and implementation, and second, building of social networks in relation to the geographical scale.

First, as stated in the section above (i.e., section 2.3), we understand FPGs as actors involved in political actions across the agri-food system. Even though some FPGs may not directly engage in actions around the policy cycle (cf., Jann and Wegrich, 2007), their activities are political in a broader sense as they, for instance, lobby for projects. However, we also specifically coded the functions that address actions along the policy cycle (cf., function “policy development and implementation”). Many FPGs across the three geographical areas already successfully developed, advocated and implemented agri-food related policies at the (mainly) local level. Thereby, policy involvement takes place directly (e.g., through development and implementation of urban food strategies) but also indirectly by lobbying for projects or fund procurement.

Second, building of social networks and brokering between actors who are unlikely to interact directly appeared to be the most prominent

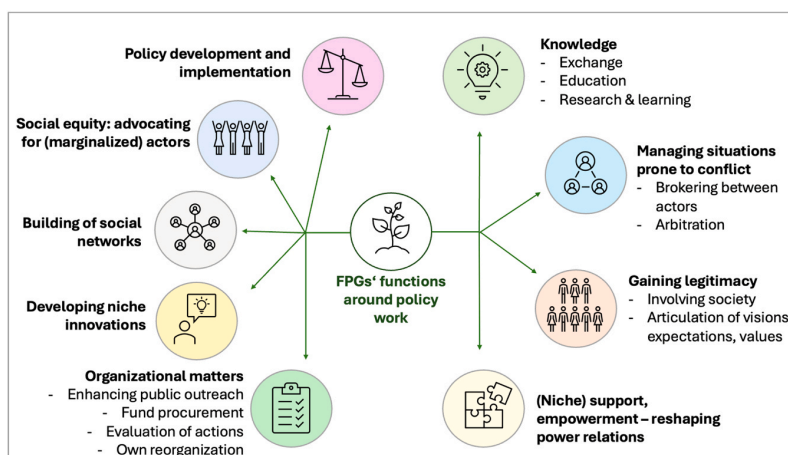


Fig. 2. Functions around FPGs’ policy work, based on results from all FPGs (US n = 210, EU n = 36, AU n = 5). The main functions are listed in bold letters. The functions around managing conflict, knowledge, gaining legitimacy and organizational matters are further subdivided into additional functions that fall under the respective category. A full overview of the functions including their definition and examples from FPGs can be found in Appendix Table A.

Table 1
Main (bolded) functions of FPGs and their definitions. The identified functions are based on results from all FPGs (US n = 219, EU n = 36, AU n = 5). A more detailed overview, including secondary functions and illustrative examples from the survey, is provided in Appendix Table A.

| Functions | Description |
|---|--|
| Policy development and implementation | All actions addressing issues across the food system along the policy cycle (e.g., agenda setting, policy formulation and decision-making, implementation, evaluation and termination (cf., Jann and Wegrich, 2007)) |
| Building of social networks | Facilitating encounters and interactions between relevant stakeholders around specific food system issues that are regarded as being relevant by the FPG; the FPG is actively involved in these networks, pursuing its interests. This includes networking with each (i.e., among FPGs). |
| Managing Situations prone to conflict | Mediating interactions between actors that can be prone to conflict. These situations can arise, for instance, because actors are unlikely to interact, due to, e.g., transaction costs or knowledge asymmetries. |
| (Niche) support, empowerment – Reshaping power relations | Supporting and/or empowering (niche) actors that are pursuing similar (sustainability) goals as the FPG; empowering (niche) actors through tangible (e.g., funding, resources) and intangible (e.g., knowledge, organizational matters) support; shielding, nurturing (i.e., niche protection, cf., (Smith and Raven, 2012); reshaping power relations in the agri-food system through empowerment actions |
| Social equity: advocating for (marginalized) people | Advocating for people that are underrepresented in society, not in a position/ unable to raise their own voice |
| Developing niche innovations | Development of, experimentation with agri-food related social innovations, diverging from the dominant ways of doing, framing, knowing, organizing that challenge, alter or replace dominant rules or practices (cf., Pel et al., 2020; Wittmayer et al., 2022) |
| Knowledge | Skills, understanding or information about something that was gathered by experience or study |
| Gaining legitimacy | Gaining social acceptability, eligibility and recognition |
| Organizational matters | The tasks and processes related to the management and functioning of an organization |

functions. Thereby, FPGs are, for instance, brokering between actors engaged in food access and actors involved in transportation. However, FPGs are also interacting among each other, sharing knowledge or joining forces to achieve common goals. The FPGs in focus are active on different geographical scales. Most FPGs operate on communal or city level. Some FPGs are active at federal state or state level, combining multiple administrative districts. Those FPGs act as spokespersons for the communal FPGs and aggregate their activities or engage in federal state or state policymaking. For instance, a German FPG on the federal state level (59) reported that it understands itself as the coordinator for communal or city FPGs and as their spokesperson on federal state policymaking.

4.2. FPGs' policy priorities

In total, 14 options for FPGs' policy priorities were retrieved (cf., Fig. 3). In relative terms, policy work around healthy food access is often prioritized by the US FPGs but also by the middle European and the Australian FPGs. The policy priorities of the Australian FPGs are fairly evenly spread across four distinct policy areas, i.e., healthy food access, food waste reduction, anti-hunger, and land use planning. For the middle European FPGs, food procurement and healthy food access seem to be the most often prioritized areas. Proportionally, the US FPGs place greater emphasis on healthy food access, followed by anti-hunger, food production, food procurement, and economic development. Noticeably, the option "not determined" was frequently selected by the middle European FPGs as well as by the Australian.

4.3. FPGs' organizational forms and relationships to government

A large number of US FPGs is embedded in government (22 %, n = 49) (i.e., government-affiliated) whereas no middle European or Australian FPGs are organized in such a way. The majority of US FPGs are housed in another non-profit (35 %, n = 77) while the middle-European FPGs are predominantly organized as non-profit organizations (61 %, n = 22) and the Australian FPGs (80 %, n = 4) as grassroots coalitions (cf., Fig. 4).

Fig. 5 shows the form of an FPG's relationship to government per area. The Figure presents the absolute number of given answers and the percent of answers, which enables a comparison of the relationships to government across the three geographical contexts. In general and across the three geographical contexts, a large number of FPGs has a relationship to government, in any form whatsoever. Predominantly, the government seeks advice from FPGs or supports them. The most common form of relationship to government among the US FPGs appears to

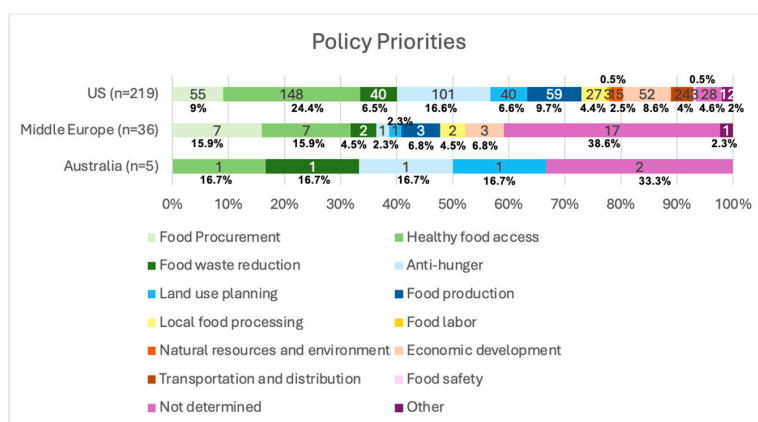


Fig. 3. Policy priorities. FPGs were asked to choose up to three policy priorities. Absolute values and in percent of respondents. US FPGs (n = 219), middle European FPGs (n = 36) and Australian FPGs (n = 5).

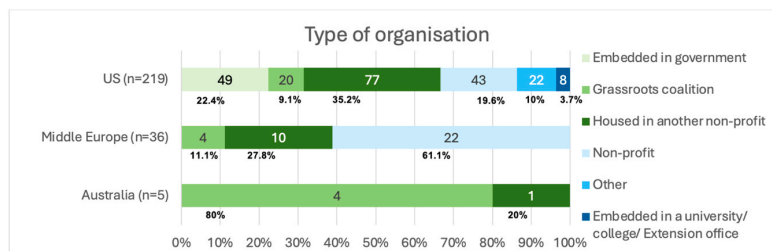


Fig. 4. Type of organization in absolute values and in percent. US FPGs (n = 219) (six out of six options chosen), middle European FPGs (n = 36) (only three out of six options chosen) and Australian FPGs (n = 5) (two out of six options chosen).

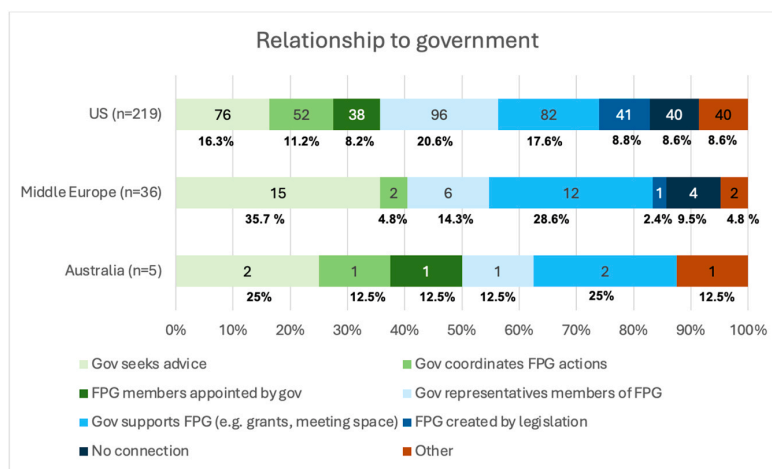


Fig. 5. Relationship to government (multiple responses). Absolute values and respondent percentage. US FPGs (n = 219), middle European FPGs (n = 36) and Australian FPGs (n = 5). Abbreviations: Gov=Government; FPG=Food Policy Group. Appendix Fig. A shows the percent of cases related to given answers, with the total being over 100 % due to multiple responses. On average, a US FPG reported 2.1 connections to government, a middle European FPG 1.5 and an Australian 2. In total 27.9 % of US FPGs are government-affiliated (i.e., either embedded in or coordinated by government). The relationship to government in relation to type of organization per country is displayed in Appendix Figures B-D.

be that government representatives are members of FPGs, while the middle European FPGs more frequently report that government seeks advice from FPGs. In comparison, the Australian FPGs predominantly report that government seeks advice or support FPGs, for instance, through funding. Interestingly, among the middle European FPGs, in no case does the government appoint FPG members.

4.4. US FPGs: type of organization and relationship to government related to policy priorities?

To analyze whether there is an association between organizational form, relationship to government and policy priority, we only included US FPGs due to the higher amount of FPGs and responses where potentially meaningful relations may be determined (at all).

The heatmap in Fig. 6 presents the percentage of cases (i.e., how many US FPGs of a specific type of organization selected a specific policy priority). The colors show the percentages in a spectrum from green (few) over yellow to red (many). For instance, 35 % percent of grassroots coalitions focus on anti-hunger issues whereas 46.9 % of US FPGs embedded in government prioritize anti-hunger policy work. Among all types of organizations, healthy food access is prioritized the most and here, especially US FPGs embedded in university focus on said policy issue (i.e., 87.5 %).

Similarly, the heatmap in Appendix Figure G shows the frequencies between US FPGs' relationship to government and policy priorities (both multiple answers). The figure displays how many times a specific

relationship to government option occurs together with a particular policy priority. For instance, 28 times a US FPG is supported by government and works on food procurement. The most intersections exist for US FPGs that have government representatives as members and work on healthy food access issues (cf., Fig. 7).

The binomial logit models predicted ten combinations that may significantly increase the likelihood that a certain policy priority is chosen. Then, with those variables suggesting correlations, we applied the bivariate chi-square test. Table 2 presents the results from the chi-square test. From the ten combinations, five suggest a significance at the 10 %-level. For instance, the analysis suggests that US FPGs supported by government (e.g., through grants or meeting space) are significantly more likely to focus on food procurement and if government seeks advice from an FPG, the analysis suggests that the respective FPGs are significantly more likely to work on anti-hunger issues. However, the effect size (as measured by the coefficient phi) from all the combinations suggesting significance is small, indicating that the strength of associations is rather weak (cf., Table 2).

5. Discussion

Based on previous literature and FPGs' activities, we built this study on the assumption that FPGs act as intermediaries for agri-food system transitions. Our analysis supports this role of FPGs as facilitators between different actors and their skills or projects, engaged in advancing sustainability transitions of agri-food systems. Specifically, we focused

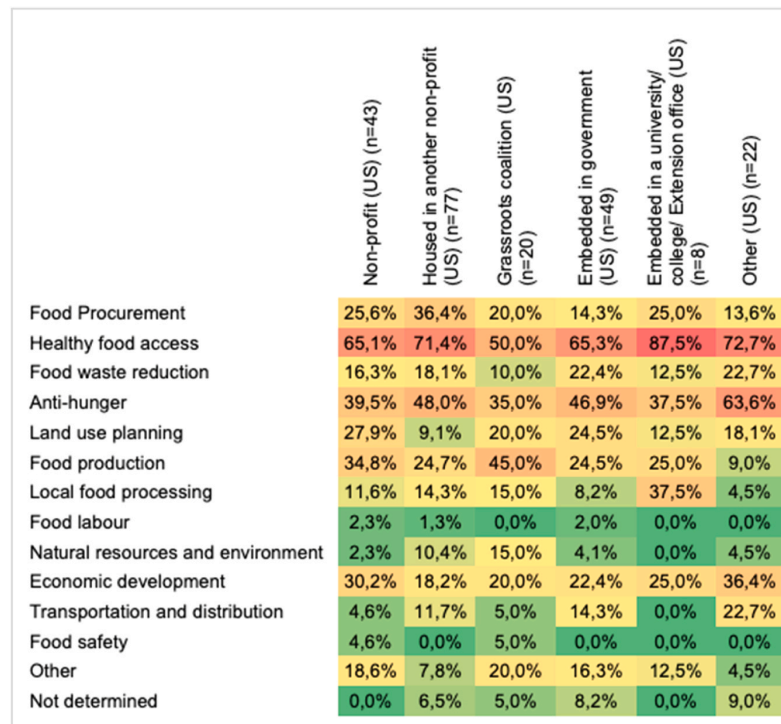


Fig. 6. Heatmap of US FPGs' type of organization in relation to US FPGs' policy priorities (top three chosen) in percent of cases. The percentage shows how many US FPGs of a specific type or organization focus on a specific policy priority. Due to multiple responses (policy priorities), the percentage per type of organization is over 100 %. US-dataset n = 219.

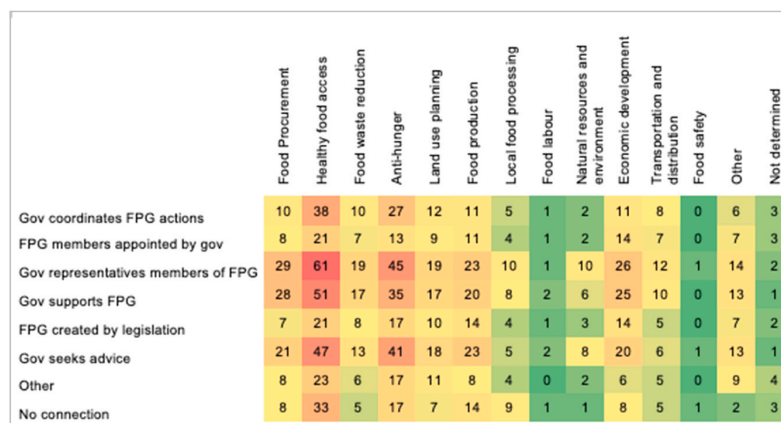


Fig. 7. Heatmap of FPGs' relationship to government (multiple response) in relation to FPGs' policy priorities (top three chosen). For instance, the heatmap shows how many FPGs are coordinated by government (first row) and how many of those FPGs focus on the policy priority "food procurement" (first column) (i.e. 10). The colors show the common frequencies in a spectrum from green (few common frequencies) over yellow to red (many). US-dataset n = 219.

on, first, FPGs' intermediary functions around policy work, second, the distribution of policy priorities, organizational forms and relationships to government across three geographical contexts, and lastly, the association between the organizational form or relationship to government and the agri-food related policy focus of FPGs.

5.1. FPGs intermediary functions around policy work

FPGs as intermediaries seem to intermediate mainly in the context of changing practices (e.g., how food is produced or consumed) and social

relations (e.g., managing collaborations) instead of facilitating technological novelties in agri-food systems. In doing so, we found that the identified functions are performed across all three geographical contexts. Similar to transition intermediaries in the literature (Barnes, 2019; Stewart and Hyysalo, 2008), FPGs facilitate (e.g., creating spaces for new networks, sharing knowledge, supporting fund procurement), configure (e.g., aligning visions of agri-food systems, multiple niches) and manage conflictual situations. However, unlike those transition intermediaries in energy, mobility or housing (e.g., Hyysalo et al., 2022; Martiskainen and Kivimaa, 2018; Nordt et al., 2024), it seems that the

Table 2

Results of the bivariate chi-square test. Combinations resultant from logit model that may significantly increase the likelihood that an agri-food related policy is prioritized. Correlations between independent variables (answer options from the questions “type of organization” and “relationship to government”) and the variable policy priority; p-value as a measure of significance ($p < 0.1$); phi as a measure of strength and direction of association (negative phi values indicate inverse relations) (US dataset $n = 219$).

| Independent variable | | Policy priority | χ^2 | p-value | Phi ϕ |
|----------------------------|------------------------------|---------------------|----------|---------|------------|
| Type of organization | Grassroots coalition | Anti-hunger | 1.095 | .295 | -.071 |
| | Grassroots coalition | Healthy food access | 3.105 | .078 | -.119 |
| | Housed in another non-profit | Food procurement | 7.991 | .005 | .191 |
| | Housed in another non-profit | Anti-hunger | .179 | .673 | 0.29 |
| | Non-profit organization | Anti-hunger | .933 | .334 | -.065 |
| Relationship to government | Gov coordinates FPG actions | Healthy food access | .949 | .332 | .066 |
| | Gov supports FPG | Food procurement | 5.686 | .017 | .161 |
| | Gov seeks advice | Anti-hunger | 2.871 | .090 | .114 |
| | FPG members appointed by gov | Anti-hunger | 2.624 | .105 | -.109 |
| | No Connection | Healthy food access | 4.972 | .026 | .151 |

present functions are rather taking place in the sense of enhancing new ways of doing, framing, knowing, organizing, understood as social innovations in transition processes (cf., Pel et al., 2020; Wittmayer et al., 2022). We will specifically discuss FPGs intermediary functions that are deviating from the policy functions from energy or housing intermediaries in the literature (cf. Section 2.1) around empowerment, power and gaining legitimacy (1), managing situations prone to conflict (2), and niche activities as well as organizational matters (3).

Next to the intermediary functions around policy work from the literature such as building of social networks, actions around the policy cycle, influencing political vision building or informing the government (e.g., Kilelu et al., 2011; Kivimaa, 2014; Kivimaa et al., 2019b; Martiskainen and Kivimaa, 2018; Vihemaeki et al., 2020), we found that FPGs are especially active in empowering (niche) actors and engaging for (marginalized) actors who do not have a strong voice, position or resources to be heard. This resonates with strategic niche management and technological innovation system literature where niches emerge in “protected spaces” shielded from the unfavorable selection environment, nurtured (i.e., supported) and empowered by varying actors (Kivimaa, 2014; Smith and Raven, 2012). Different actor groups engage in protection (e.g., policymakers, NGOs) (Elsner et al., 2023). Yet, these actor groups are rarely associated with the construct of the intermediary (Kivimaa, 2014). FPGs as intermediaries seem to provide and maintain this protected space for agri-food related alternatives and their development by providing funding, advice or knowledge or by empowering actors to actively influence their (local) agri-food system (e.g., how food is produced, consumed or regulated) (Ambrose et al., 2022; den Boer et al., 2023). FPGs engage in knowledge exchange or learning and legitimize their actions (and thus their presence) by gaining trust, social acceptability, eligibility and recognition through the direct involvement of society (e.g., neighborhood markets, joint food processing) or articulation of their visions or values. Knowledge and legitimacy are the two forms of ideational power, strengthening actors’ ability to influence political matters and are thus seen as relevant for the transformation of agri-food systems, next to material sources of power (e.g., economic and

technological resources) (cf., Fuchs and Glaab, 2011; Rossi et al., 2019). By empowering (marginalized) actors, shaping ideational sources of power and by jointly enabling co-action across the agri-food system, FPGs are involved in reshaping power structures (Prové et al., 2019). Considering that agri-food system transitions are inextricably tied up with issues of power and power relations of current agri-food systems are unevenly distributed (i.e., corporate concentration of power in few hands), agri-food system transitions depend on the extent to which these power structures are weakened. Within a conceptual perspective on power capacities in transition studies, i.e., “power to”, “power over”, “power with” (cf., Avelino et al., 2023), FPGs seem to engage in the politics of power, exercising all three forms. FPGs intentionally mobilize resources to achieve specific goals (“power to”, e.g., providing funding, organizing networks); FPGs drive actors to engage in actions they would not otherwise undertake (“power over”, e.g., steering collaborations between actors from different domains); and FPGs act in concert (i.e., together), to achieve collective goals (“power with”, e.g., advising niche actors, collaborations with science, policy, practice). Thus, FPGs offer the opportunity to further analyze specific power (re-)structuring processes around social innovations in agri-food systems.

FPGs operate in situations prone to conflict. Next to their brokering activities between actors who are unlikely to interact (e.g., due to high transaction costs), FPGs are involved in arbitration processes between actors from different agri-food system domains. Alongside arbitration between actors outside of the FPG, FPGs deliberately invite conflict and are thus inherently conflict-ridden themselves due to their composition as multi-actor platforms, composed of actors from different agri-food system domains. More precisely, those stakeholders are influenced by their own interests and have little knowledge of each other which paves the way for tensions and contestation. Thus, mediation and mentoring skills have an important role to play. For instance, FPGs host roundtable discussions, directly tackling evolving disagreements. In transition research, the role of conflict is gaining increasing importance as driver for transitions (Kalt, 2024). Here, FPGs as transition intermediaries offer a valuable opportunity to further explore the role of conflict in agri-food system transitions.

Next to intermediary functions, we also found that few FPGs are at the same time involved in niche activities. Thus, it seems that few FPGs have a double role, acting as both niche and intermediary for agri-food system change, developing their own agri-food related social innovations but at the same time bridging between actors to promote these new ways diverging from the dominant regime. For instance, one FPG implemented cooking classes in schools and at the same time developed a school meal program with the local government. This also shows the difficulty of assessing where intermediation begins and ends (cf., Kivimaa et al., 2019a). Organizational matters appear to be an essential function of FPGs. Here, FPGs engage in activities such as enhancing public outreach, fund procurement (for themselves but also to fund others), evaluation of actions as well as their own reorganization (e.g., restructuring group, actions to attract new members) which may be an indicator that they are adapting to the changing conditions of transition processes.

5.2. Intermediaries’ policy priorities, organizational forms and relationships to government across three geographical contexts

Between the three geographical contexts, we could not detect any differences as regards the performed functions. However, differences as regards the FPGs’ policy priorities, organizational forms and relationships to government are present. Among the US FPGs, healthy food access is by far the most often selected policy focus (24.4 %). This aligns with historical trajectories, as advocating for healthy food access was a key driver behind the initial emergence of FPGs in the US during the 1980s (Pothukuchi and Kaufman, 1999). This focus is also still reinforced by targeted funding programs and policy incentives, making healthy food access a persistent policy priority (Santo and

Moragues-Faus, 2019). This shows that the US FPGs are not only “neutral” intermediaries. Instead, they appear to act as targeted intermediaries, addressing selected societal inequities. The middle European FPGs focus primarily on food procurement and healthy food access and here especially on regional food procurement and shortening food supply chains. Notably, the option “not determined” was selected quite frequently among the middle European (38.6 %) and Australian FPGs (33.3 %). This can be explained by the fact that many FPGs in these areas are still relatively young and, as such, are in the process of establishment and setting their priorities.

A substantial difference exists between the three geographical contexts in terms of their organizational forms. Among the FPGs in middle Europe and Australia, only three (two) different types of organizations are present. The presence of FPGs in both geographical areas is a newer phenomenon, and the FPGs arose with the aim of placing food policy on the local agenda. Here, the criticism on the current governance of agri-food systems resonates, calling for an alternative approach. Moreover, case studies on middle European FPGs suggest that those FPGs rather evolved from civic action and activism (Schiller-Merkens and Machin, 2023; Sieveking, 2019) which may explain why no FPGs are embedded in government. Further, in our survey, some middle European FPGs even reported that political decisionmakers cannot become members of the respective FPG which is also highlighted by Sieveking (2019).

The diversity of organizational forms across the US FPGs may be explained by the larger sample size. However, a substantial percentage (22.4 %) of US FPGs are embedded in government whereas no middle European or Australian FPGs are organized in such a way. Further, compared across the three geographical contexts, a substantial percentage of US FPGs are coordinated by government or members are appointed by government, pointing to a more pronounced linkage to the government compared to the middle European or Australian FPGs. Linkages to government seem crucial in intermediation for sustainability transitions (cf., Kivimaa, 2014; Kivimaa et al., 2019a). However, caution is advised, as an excessively close relationship may result in constraints and external influence. In the literature, the degree of linkages to government are controversially discussed, especially being located inside or outside government (Boden and Hoover, 2018). Intermediaries face the challenge of balancing legitimacy and credibility meaning that both regime (i.e., government officials) and niches ought to have trust in them. At the same time, they need to protect their freedom to operate when aiming for a transformation of the incumbent system (Boden and Hoover, 2018; den Boer et al., 2023). Critics point to the lack of independence of intermediaries with strong relationships to government or being embedded in government which may lead to more incremental transitions than radical system changes (Boden and Hoover, 2018). Thus, FPGs as intermediaries struggle between being a relevant player or being played with. However, as the next section shows, it seems that organizational forms or relationships to government do not appear to be strongly associated with the policy priorities being pursued (at least for the US FPGs). These findings allow for the cautious conclusion that, at least here, the extent of an intermediary’s relationship with the government does not make a substantial difference. Subsequent research could, however, delve more deeply into the factors or elements that influence or intertwine with the orientation of FPGs, for instance, by diving deeper into the “boundary infrastructure” (cf., Vilas-Boas et al., 2022), i.e., the connected elements that come into play in science, policy and practice actions.

5.3. Organizational forms or relationships to government associated with US FPGs policy focus?

We only relied on the US FPG dataset to find out whether the organizational form or relationship to government is associated with the agri-food related policy focus. The absolute numbers do not show such large differences as the policy domains appear to be distributed fairly evenly across the different organizational forms and relationships to

government. Considering the percent of cases, it becomes apparent that FPGs that have government representatives as members focus by far the most on healthy food access issues. This could be explained by the fact that food security is a universal human right (FAO, 2013) and through those FPGs, policymakers attempt to fulfill their responsibility to ensure food access. However, no statistically significant association could be found. We only found five combinations that suggest a significance at the 10 %-level. However, the effect size of those combinations suggesting significance is small, indicating that the strength of associations is rather weak. Thus, the analysis of the associations shows that the exact nature of the type of organization or the relationship to government does not seem to be of great importance as regards the targeted policy domain. As FPGs are multi-actor assemblages, composed of actors from different domains, it may be more relevant *who* is involved instead of *how* an FPG is organized (cf., Bassarab et al., 2019). For (agri-food) intermediary research, it may therefore be worthwhile to explore in more depth the internal composition of intermediary organizations, such as the actors involved (i.e., who participates, representing which sector or interests) or their decision-making processes. Future research should take this into account to better inform transition governance since understanding what influences the intermediaries’ priorities could help in strategically establishing FPGs for specific topics (top-down) or informing individuals that are interested in founding an FPG and would like to focus on specific topics (bottom-up).

6. Concluding remarks

FPGs bridge and broker between actors at the interface of civil society, science, policy and practice and thus, intermediate for agri-food system change. The goal of this article was to investigate, first, the policy-related functions, organizational forms and relationships to government of FPGs across three geographical contexts and second, whether the organizational forms or relationships to government are associated with the policy priorities an agri-food related intermediary focusses on. Building on these findings, we present policy recommendations and reflect on the limitations of our research.

The analysis showed that the policy priorities, organizational forms and relationships to government of FPGs across the three geographical contexts differ and thus, these factors seem to be context-dependent, whereas the intermediary functions remain similar across the three geographical contexts. However, the functions of agri-food related intermediation around social innovations identified in our analysis differ in parts from those typically associated with intermediation around technological innovations.

Based on this research’ findings, we can draw implications for policymakers and planners. The policy domains the FPGs are targeting reveal current agri-food systems’ shortcomings and the FPGs intermediary functions show proposed solutions to tackle these issues. The derived overview of intermediary functions (cf., Appendix Table A) could be used by policymakers and planners to position and incorporate them where such functions are lacking or are required. Furthermore, we found that although differences in organizational forms and relationships to government across the three geographical contexts exist, a stronger linkage to government does not seem to be associated with the chosen policy priorities. This may suggest that, despite partially close ties to the government, the intermediaries are able to mediate between actors as relatively independent entities and can (systemically, cf., Kivimaa et al. 2019a, den Boer et al. 2023) be utilized in such contexts. For research on (agri-food) intermediaries, it could be valuable to take a closer look at the internal composition, including the actors involved (i.e., who participates, representing which sector or interests) and their decision-making processes. Future research could take this into account to better inform transition governance since understanding what influences the intermediaries’ priorities could help in strategically establishing FPGs for specific topics (top-down) or informing individuals that are interested in founding an FPG and would like to focus on specific

topics (bottom-up).

In reflecting on our approach, we must consider certain methodological limitations that influence our results and interpretations. An important limitation of our study is the variation in sample sizes across the three geographical areas. This reflects both differences in the underlying population of FPGs and in survey participation rates. The underlying population of FPGs varies substantially across the three geographical areas, with a very large population of FPGs in the US, a medium-sized population in middle Europe, and a small population in Australia. While we present cross-country comparisons based on relative proportions, these results should be interpreted cautiously, acknowledging that the unequal sample sizes may introduce bias and limit the comparability of findings across contexts. Then, although the surveys were asked to be filled out by a knowledgeable person within the FPG and from the viewpoint of the FPG, the provided information may be biased by the perspective of the person filling out the survey and the information gathered from one representative may not reflect the entirety of all of an FPG's activities. Finally, we did not consider the contextual differences between the three areas. A comparative analysis including the different political and governance systems in place (e.g., on national, federal, communal levels) was out of the scope of this research but represents a promising next step, helping in explaining the underlying reasons behind observed divergences and commonalities.

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CRediT authorship contribution statement

Carola Strassner: Writing – review & editing, Supervision, Methodology. **Christian Herzig:** Writing – review & editing, Supervision, Methodology. **Friederike Elsner:** Writing – review & editing, Writing – original draft, Visualization, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of Competing Interest

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

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Appendix

Appendix Table A

Functions around FPGs policy work, based on results from all FPGs (US n = 210, EU n = 36, AU n = 5). The main functions are listed in bold letters. The functions around managing conflict, knowledge, gaining legitimacy and organizational matters are further subdivided into additional functions that fall under the respective category

| Functions | Description | Examples |
|--|--|--|
| Policy development and implementation | All actions addressing issues across the food system along the policy cycle (e.g., agenda setting, policy formulation and decision-making, implementation, evaluation and termination (cf., Jann and Wegrich, 2007)) | "create a regional food plan/strategy that sets out actions for strengthening food security in the region" (105) "Multiple policies codified in municipal general plans per our advocacy" (1784) "food strategy and action plan written for [city] and the surrounding area; both politically adopted in 2020" (15) |
| Building of social networks | Facilitating encounters and interactions between relevant stakeholders around specific food system issues that are regarded as being relevant by the FPG; the FPG is actively involved in these networks, pursuing its interests. This includes networking with each (i.e., among FPGs). | "collaborated with city staff and community to develop the city's Food Vision" (1573) "Facilitate meetings of the Food Access and Transportation Workgroup to convene stakeholders to identify opportunities to improve transportation routes to food retail and increase access to healthy foods." (1882) "We are the link to the two groups." (1552) |
| Managing situations prone to conflict | Mediating interactions between actors that can be prone to conflict. These situations can arise, for instance, because actors are unlikely to interact, due to, e.g., transaction costs or knowledge asymmetries. | |
| Brokering between actors | Bringing actors together who are unlikely to interact and mediating these processes; FPGs do not | "in the region, mediating between producers, administration and politics on the one hand and consumers on the other" (13) "Producer-buyer gatherings to build connections that have led to more local products in restaurants and institutions" (1766) |

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Chapter 6. Policy intermediation for agri-food system transition: Food Policy Groups from middle Europe, Australia and United States

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Appendix Table A (continued)

| Functions | Description | Examples |
|---|--|---|
| Arbitration | engage directly in the interaction or take position; through brokering, FPGs pursue their (sustainability) goals rather passively Mediating conflictual situations between different actors external to the FPG but also internally | "Hosting a roundtable discussion with all stakeholders and local municipality, tackling disagreements" (68) |
| (Niche) support, empowerment – Reshaping power relations | Supporting and/ or empowering (niche) actors that are pursuing similar (sustainability) goals as the FPG; empowering (niche) actors through tangible (e.g., funding, resources) and intangible (e.g., knowledge, organizational matters) support; shielding, nurturing (i. e., niche protection, cf., (Smith and Raven, 2012); reshaping power relations in the agri-food system through empowerment actions | "Support of small food crafts, food services and communal catering in the use of regional produced foods." (38) "With our support, community partners have continued to improve food access and food education in our region." (1797) "Supported the work of our local food systems partners at meetings and events" (1876) "Food Policy Council members reviewed applications and selected 9 farmers, food business owners, and nonprofits to receive a total of \$100,000 of funding" (1088) |
| Social equity: advocating for (marginalized) people | Advocating for people that are underrepresented in society, not in a position/ unable to raise their own voice | "ensure fair working conditions and remuneration for all farmers, processors and service providers involved" (29) "Provide opportunities for diverse communities and those with lived experiences of food insecurity to be involved in the Local Food Coalition initiatives." (103) "Completed the pilot phase of [.] a fruit and vegetable coupon benefit program designed to increase access to healthy food" (1176) |
| Developing niche innovations | Development of, experimentation with agri-food related social innovations, diverging from the dominant ways of doing, framing, knowing, organizing that challenge, alter or replace dominant rules or practices (cf., Pel et al., 2020; Wittmayer et al., 2022) | "We have implemented cooking classes [.] city program as partners, started strategic planning for the next 3–5 years" (1057) "Setting up 'Food-sharing spots', contributing to saving and passing on food and [.] submitting citizen suggestion for healthy and sustainable school meals which was taken up by politicians" (32) |
| Functions | Description | Examples |
| Knowledge exchange | Skills, understanding or information about something that was gathered by experience or study Sharing knowledge with other actors | "Incubated a seed library concept that launched spring 2023, with multiple institutional partners" (1907) |
| education | Teaching actors about a topic | "just starting [.] a Little Food Explorers project to support early years food literacy in long day care center" (103) |
| research and Learning | Conducting research to acquire new knowledge or to confirm information | "Interviewed over 100 people in our food system about their policy needs and priorities, and how [FPG] could support their work" (1792) "This project is in the first-year data collection phase, which includes conducting stakeholder interviews, community-wide surveys that inquire about food systems and drivers of health, and community-based organization research projects with the end goal of creating a more equitable local food system." (1571) |
| Gaining legitimacy Getting society involved, motivated | Gaining social acceptability, eligibility and recognition Encourage actors to engage in/ join activities that are supporting the FPG's (sustainability) goals | "Activate and motivate people to join the food transition movement" (31) "visits to several counties would provide an opportunity to foster direct public engagement" (1570) |

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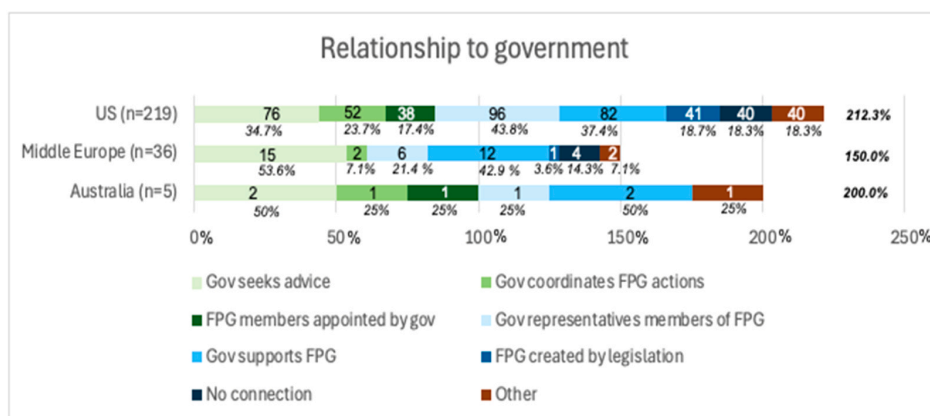
Chapter 6. Policy intermediation for agri-food system transition: Food Policy Groups from middle Europe, Australia and United States

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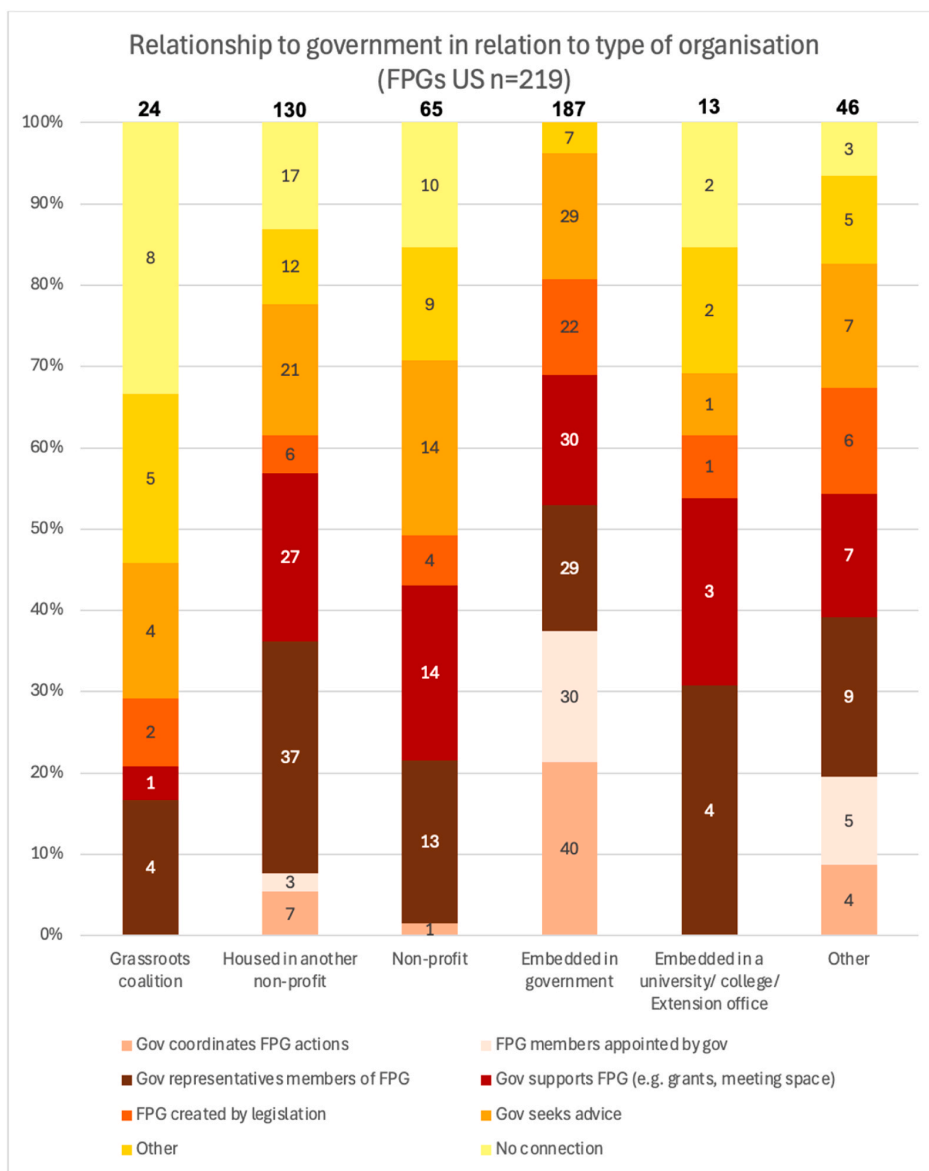
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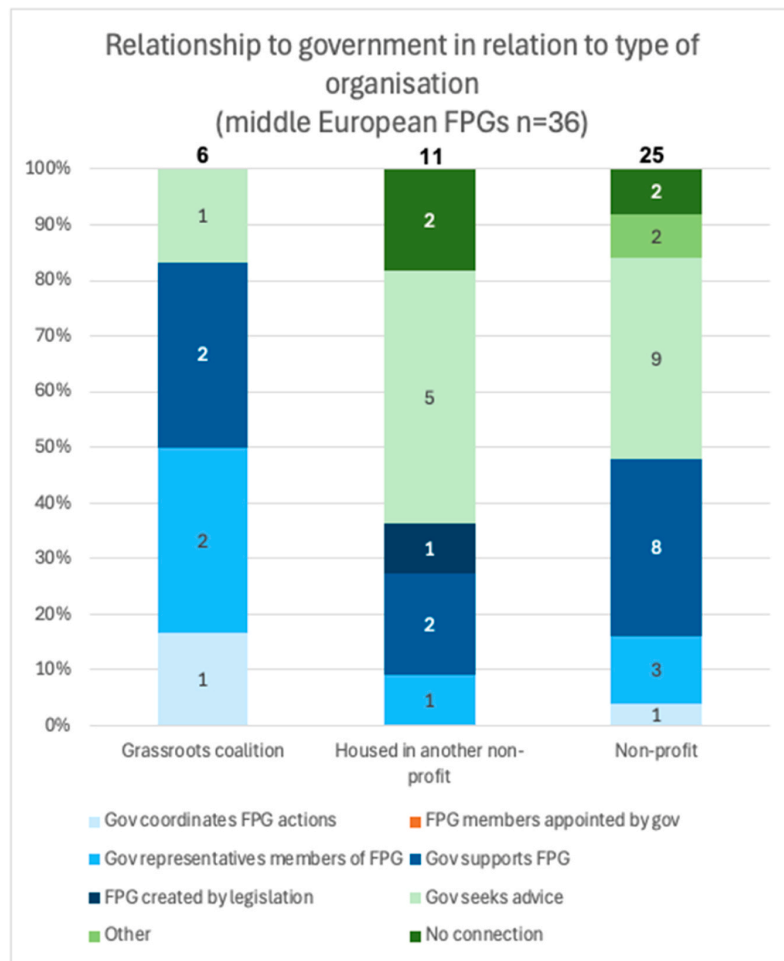
| | | |
|---|---|--|
| Articulation of expectations, visions, values | Development of internal vision, values and expectations to be shared/ spread to reach FPG's (sustainability) goals; and take unanimous action | "establishment of a [...] project with an information center, a shopping community, seasonal gardens, a neighborhood market, joint food processing's and educational opportunities" (29) "Beginning of a strategic plan with a focus on hunger relief" (1237) "Held a half day meeting with development of goals and plans for current year." (1877) "forming our mission and vision statements, creating our local food council logo, selecting our four main priority areas, selecting the goals within each of the priority areas, and selecting 2-5 strategies for each of the goals within the priority areas." (1888) |
| Organizational matters Enhancing public outreach | The tasks and processes related to the management and functioning of an organization Improving public visibility of the FPG and its actions; public relations outreach | "Developed and began implementing plan for building community outreach and communications" (1227) "launched a new website which includes a local food directory that we continue to maintain and update" (1790) |
| Fund procurement | Raising funds to finance the FPG's persistence and to realize the FPG's actions (e.g., raising funds to support niche projects) | "Our program is still in development, the greatest accomplishment for us has been securing a food based grant." (1772) "Securing funding for Farm to School projects, funding for school nutrition authorities" (1396) "Since 2018 the food council has their own budget (60 000 euro / year), with which they support innovative, sustainable food projects. They have supported 27 projects so far." (63) |
| Evaluation of actions | Assessing the outcomes, impact or effectiveness of specific actions | "Evaluating policy goals and capacity for advocacy" (1893) "Setting priorities and name change." (1394) |
| Own reorganization | Restructuration of the FPG and its organizational matters and activities; this includes actions to attract new members, for instance | "recruited new young steering members" (1678) "We have focused on expanding our operations and hired our first Executive Director." (1095) "and developing an onboarding guide to support new members." (1569) |



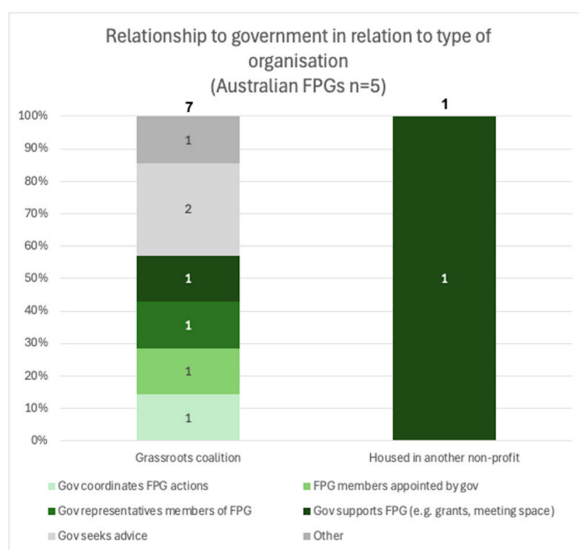
Appendix Figure A. Relationship to government (multiple responses). Absolute values and in percent of cases related to given answers. Due to multiple responses, the total is over 100 %. US FPGs (n = 219), middle European FPGs (n = 36) and Australian FPGs (n = 5). Abbreviations: Gov=Government; FPG=Food Policy Group



Appendix Figure B. Relationship to government (multiple responses) in relation to type of organization. The absolute numbers on top show how many relationships were chosen per type of organization. The colored bars represent the relationships to government. US FPGs n = 219. Abbreviations: Gov=Government; FPG=Food Policy Group



Appendix Figure C. Relationship to government (multiple responses) in relation to type of organization. The absolute numbers on top show how many relationships were chosen per type of organization. The colored bars represent the relationships to government. Middle European FPGs n = 36. Abbreviations: Gov=Government; FPG=Food Policy Group

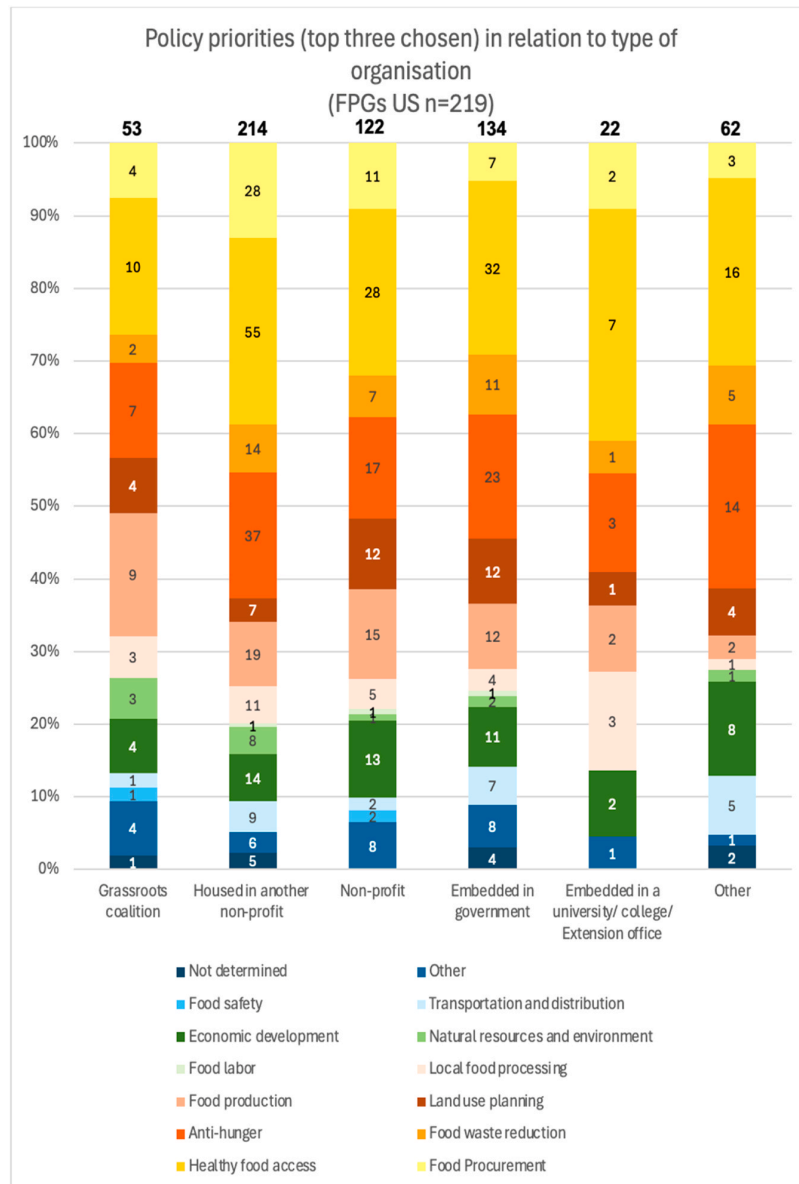


Appendix Figure D. Relationship to government (multiple responses) in relation to type of organization. The absolute numbers on top show how many relationships were chosen per type of organization. The colored bars represent the relationships to government. Australian FPGs n = 5. Abbreviations: Gov=Government; FPG=Food Policy Group

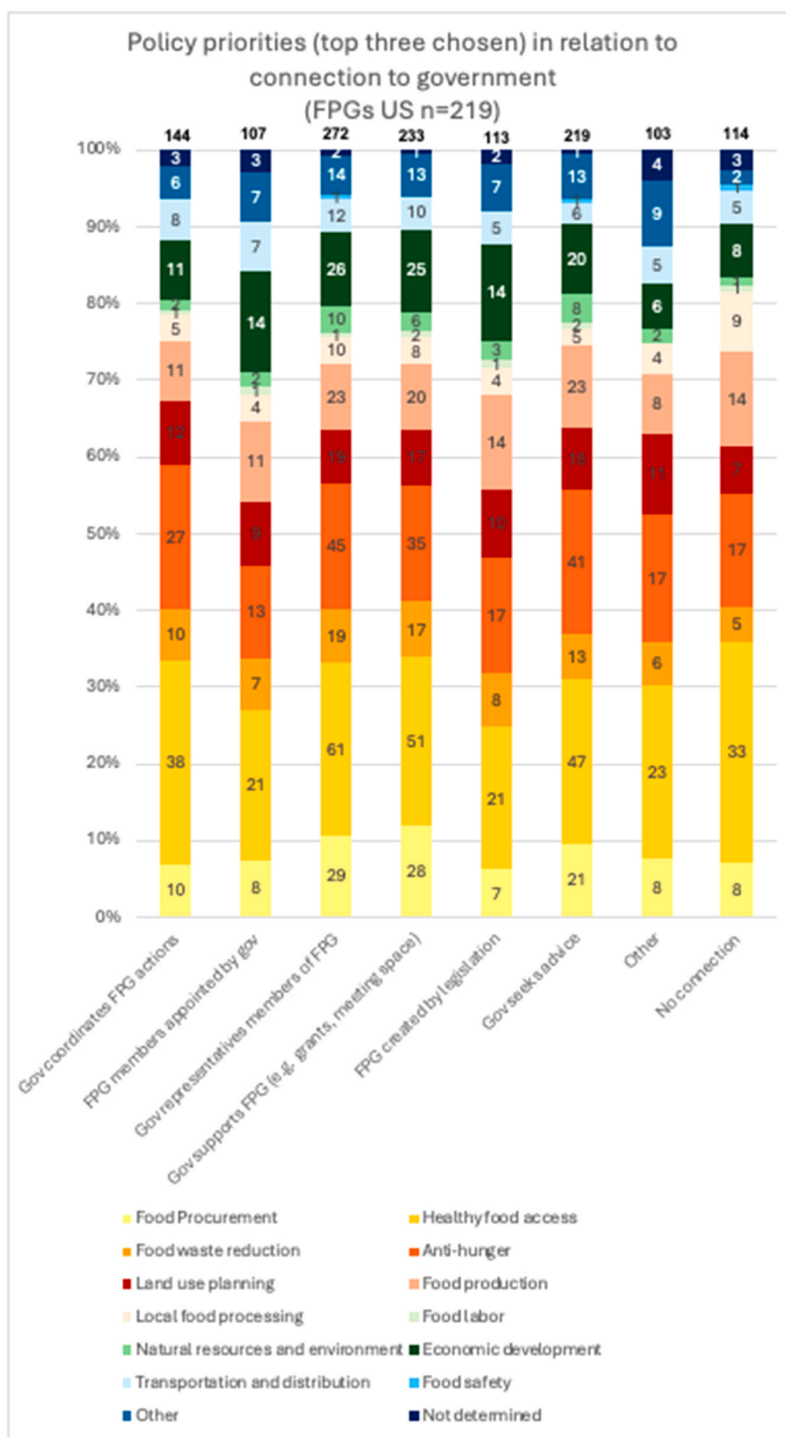
Appendix Table B

Frequencies of US FPGs' (n = 219) policy priorities (up to max. three responses per FPG) divided into absolute amount of answers chosen, in percent of answers and in percent of cases (i.e., respondents)

| | N | Percent | Percent of cases |
|-----------------------------------|-----|---------|------------------|
| Food Procurement | 55 | 9.1 % | 25.1 % |
| Healthy food access | 148 | 24.4 % | 67.6 % |
| Food waste reduction | 40 | 6.6 % | 18.3 % |
| Anti-hunger | 101 | 16.6 % | 46.1 % |
| Land use planning | 40 | 6.6 % | 18.3 % |
| Food production | 59 | 9.7 % | 26.9 % |
| Food processing | 27 | 4.4 % | 12.3 % |
| Food labor | 3 | 0.5 % | 1.4 % |
| Natural resources and environment | 15 | 2.5 % | 6.8 % |
| Economic development | 52 | 8.6 % | 23.7 % |
| Transportation and distribution | 24 | 4.0 % | 11.0 % |
| Food safety | 3 | 0.5 % | 1.4 % |
| Other | 28 | 4.6 % | 12.8 % |
| Not determined | 12 | 2.0 % | 5.5 % |



Appendix Figure E. Policy priorities (top three chosen) in relation to type of organization. The colored bars represent the policy priorities chosen per type of organization. US FPGs n = 219



Appendix Figure F. Policy priorities (top three chosen) in relation to connection to government. The colored bars represent the policy priorities chosen per connection to government. US FPGs n = 219. Abbreviations: Gov=Government; FPG=Food Policy Groups

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.envsci.2025.104227](https://doi.org/10.1016/j.envsci.2025.104227).

Chapter 6. Policy intermediation for agri-food system transition: Food Policy Groups from middle Europe, Australia and United States

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Data availability

Data will be made available on request.

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Chapter 6. Policy intermediation for agri-food system transition: Food Policy Groups from middle Europe, Australia and United States

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Chapter 7. General discussion

“Transition studies hold the promise of creating new approaches and understanding in moving society towards sustainability”

– Köhler et al. 2019, p. 22

As outlined in the preceding sections, this work draws on transition theory and agri-food research to unravel the role of AFIs in their envisioned contribution to agri-food system sustainability transitions. The agri-food research on initiatives indicated that the role of these initiatives is primarily understood as that of niche actors. As agri-food system transitions are ongoing processes, some roles may not only be limited to the niche, as roles can change, develop or mature, dependent on the respective context (cf., section 2.2.4). The aim of this thesis is to offer a wider perspective on how initiatives aim to contribute to sustainability transitions, drawing on insights from different geographical contexts and through the lens of transition research which offers conceptual tools to structure and understand the dynamics and interdependencies within transition processes. However, transition theory, especially transformative social innovation conceptualisations and transition intermediation frameworks used in the present analysis, is considerably shaped by studies on energy or mobility systems, alongside contributions from other systems. Expanding frameworks beyond their original realm is important, yet their transferability depends on system-specific characteristics and emergent properties (cf., Leeuwis et al. 2021). Beyond that, an adaptation of models and frameworks to the system in focus may allow for more tailored recommendations to be derived for the governance of sustainability transitions of said specific system. Against this backdrop, this thesis applies especially transformative social innovation conceptualisations and intermediary research to the agri-food system. Although the agri-food system experienced an upswing in transition research, it remains a central field of study due to its considerable potential for contributing to a sustainable development and the wide range of actors involved.

To briefly reiterate, this thesis is dedicated to the central question of *how AFIs aim to contribute to sustainability transitions of agri-food systems*. Accordingly, the research is structured into three parts, with each part addressing a specific sub-question. These sub-questions are as follows:

- 1. How is the MLP framework applied in recent research on agri-food system transitions?*
- 2. How do socially innovative AFIs aim to transform the incumbent local regime, and which challenges and opportunities do they face?*
- 3. How are the policy-related functions, organisational forms and relationships to government of FPGs across three geographical contexts distributed, and is there an association between the organisational form or relationship to government and the policy priorities an agri-food related intermediary focusses on?*

Each of these three sub-questions was addressed in a dedicated scientific paper, which were published in or submitted to peer-reviewed scientific journals. The following sections provide a cross-cutting discussion of the findings from these three parts in light of the main research question. While section 7.1 discusses the AFIs intended contribution to sustainability transitions of agri-food systems, section 7.2 proposes implications and recommendations for policymakers and governors of agri-food system sustainability transitions. Subsequently, the strengths and limitations of this thesis are discussed (cf., section 7.3), followed by an outline of potential pathways for future research emerging from this work (cf., section 7.4), before the main findings and insights are finally summarised.

7.1 Agri-food related initiatives – intended contribution to sustainability transitions of agri-food systems

The results of the empirical investigations show that some AFIs aim to contribute to bring about change by proposing mainly social innovations (identified as a result of the explorative analysis and subsequently used to inform the analytical framework due to the iterative research design) whereas others by intermediating in the context of changing practices and social relations. Thereby, the AFIs' role is influenced by drivers and barriers but not so much by their relationships to government or their types of organisation (e.g., organised as non-profit, grassroots initiative) (in particular for FPGs as AFIs). In the following, this section discusses the AFIs' intended contribution to sustainability transitions of agri-food systems through the lens of transition theory by elaborating on, first, AFIs social innovations and how these are supported by intermediary AFIs, second, the aggregated niche and intermediary functions, and lastly, the agri-food system malfunctions and visions for a more sustainable agri-food system from AFIs' perspective.

First, AFIs propose agri-food related social innovations that are often not new as such but may consist of ancient knowledge or practices that were pushed to the margins or did not align with green-revolutions thinking (i.e., the technocentric and productivity-focused approach gaining momentum in the 1960s, emphasising the use of high-yield crops, chemical fertilisers and pesticides, often with limited consideration of its environmental or social impacts (Soria-Lopez et al. 2023)). The agri-food related social innovations in focus seem to be complementary to one another and not necessarily in competition, especially within a region. Different alternative farming practices can exist next to each other as well as different forms of food distribution (e.g., farmers markets, CSA). The presence of cooperation and interactions between socially innovative agri-food approaches within a region was also observed by Alberio and Moralli (2021) or Rossi and Bocci (2018). Compared to social innovations in agri-food, social innovations in energy seem to be rather technology driven (cf., Wittmayer et al. 2022). Although technological innovations play a role in agri-food systems (e.g., food processing techniques, precision agriculture, vertical farming, genetic engineering etc.), the results show that agri-food related social innovations address collective and cultural practices, traditions and values, including farming and preparation methods, food rituals or symbolic meanings. From a consumer perspective, food is a daily choice and some individuals develop deeply entrenched food-related identities or ideologies (cf., Fischler 1988, Bisogni et al. 2002). Dietary patterns and food choices can often be linked to a person's culture or geographical region. There are country- or region-specific diets or dishes that can be associated with particular cultural contexts and identities (cf., Mediterranean Diet, New Nordic Diet). The social context influences human's food choices and intake regularly (Higgs and Thomas 2016, Dunbar 2017), there is research suggesting relationships between a human's identity and food choices, for instance, between meat and maleness (Rozin et al. 2012) as well as proverbs, such as "you are what you eat" by the German philosopher Ludwig Feuerbach (Cherno 1963) that relates food choices to a person's identity, the social context as well as the individual's physical and mental state (cf., Shapin 2014, Sasahara 2019).

On the other hand and remaining in a consumer perspective, a daily individual confrontation with energy matters (e.g., production, consumption) does mostly not take place and energy-related identities do not seem to exist although the choice can be influenced by attitudes towards sustainability (cf., Hyysalo et al. 2017). Non-renewable or renewable energies are used across different countries. The actual range of choices is significantly constrained by the (most) cost-efficient options, infrastructures and network operators and thus, rather regulated at higher

levels (cf., Biely et al. 2024). There are only very limited possibilities for individuals to personalise or determine their energy supply (e.g., by installing solar panels), meaning, options either exist or they don't. In contrast, in the agri-food sector, although retail companies largely determine which foods reach supermarkets and at what prices, individuals still retain a certain degree of choice (although this choice, however, is shaped by the "food environment", the surrounding conditions that influence what people select and consume (cf., Turner et al. 2018)). It seems highly unlikely that a person would say "you are what your energy supply is" - which sounds rather odd and unnatural. Generally, social innovations in energy tackle the integration of renewable energies in broader socio-technical webs or how new forms of energy can become socially acceptable. But also new forms of administrative processes, business models or consumer cultures around energy are addressed by social innovations (cf., Pel et al. 2023b). However, this suggests that social innovations in energy revolve mainly around a specific technology, e.g., advocacy for specific energy pathways or efficient use of energy (cf., Wittmayer et al. 2022). Following this argumentation, it appears that social innovations in agri-food are more about socio-cultural aspects (not exclusively) than social innovations in energy that still rather revolve around technologies (not exclusively). This has implications for the implementation or support of social innovations. For instance, for agri-food social innovations, this may imply that their successful implementation requires a stronger linkage to the respective geographical context, local culture, and collective identities in order to gain traction and achieve lasting impact.

As regards the intermediary activities supporting the development and/or implementation of agri-food related social innovations, intermediaries seem to shape the protected spaces for niche innovations (cf., Smith and Raven 2012). They shield the innovations from the unfavourable selection environment and support (i.e., nurture) these innovations through funding, advice or knowledge transfer, or through the creation of networks, enabling cooperations and exchange (between niche actors but also between actors from other levels). Unlike argumentations in the literature that protection is suggested to be of a temporary nature until niches break through (Smith and Raven 2012, Leeuwis et al. 2021), this thesis's results suggest that some parts of this protection could persist, even after niches' diffusion. As mentioned above, some agri-food related social innovations appear to coexist and function well alongside each other. To further support this coexistence, it may be beneficial to preserve certain protective measures, for instance, cooperations, favouring policies or knowledge exchanges.

Second, as regards the functions, it seems that although some niche and intermediary functions overlap (cf., Table 1), their ways (i.e., the activities) to fulfil these functions differ in parts. However, the activities take place on different levels of interactions. For instance, the function *raising awareness on various agri-food system malfunctions* (cf., Table 1) is pursued by niche and intermediary AFIs alike. An intermediary AFI fulfils this function by conducting a range of activities, e.g., developing political strategies, organising local farmers markets for consumers and local farmers, or collaborating with local information centres (cf., Chapter 6, Appendix Table A) and engage with a bandwidth of actors within the agri-food system whereas a niche AFI seems to rather focus on, e.g., inviting actors to their farm and educating about alternative farming practices. Thus, the activities seem to be pursued on different levels, e.g., intermediaries between different entities within a network and between networks and institutions (cf., Kanda et al. 2020), and niches in one-to-one interactions around their innovation.

Whether the observed functions are sufficient for the agri-food related innovations to break through remains open in this context as the impact or further development of niches is not targeted in this thesis. However, as presented in section 2.1.2, research on technological innovation systems (TIS) provides insights into the functions necessary for technological innovations to diffuse which comprise (Hekkert et al. 2007, Bergek et al. 2008, Hekkert and Negro 2009, Köhler et al. 2019): entrepreneurial activities (i.e., existence of entrepreneurs important for innovation generation and implementation) (1), knowledge development (i.e., learning processes) and diffusion through networks (i.e., knowledge exchange) (2), guidance of the search (3), market formation (e.g., temporary niche markets as protected spaces) (4), resource mobilisation (e.g., financial, human) (5), and creation of legitimacy (e.g., through creation of advocacy coalitions to create legitimacy for the new technology) (6).

Assuming that the functions carried out by AFIs as well as overcoming the barriers AFIs face are the ones necessary for the agri-food related social innovations to diffuse, overlaps between technological and *agri-food related social innovation systems* become evident. Comparing these functions of TIS to the ones of social agri-food related innovations, implications for agri-food related social innovation systems can be derived which may also be adaptable to social innovations in other systems.

All of the aforementioned TIS functions seem to overlap with functions AFIs fulfil. However, the agri-food functions can partly be differently interpreted than the TIS functions. For social

innovations it is similarly important that innovative actors exist – otherwise the agri-food related social innovations would also not exist in the first place (1). Knowledge development, exchange and knowledge circulation are key functions that AFIs perform to develop their innovations and share their learnings. Thereby, not only the network that is involved in the innovative process profits from the shared learnings but similarly important are knowledge exchanges with actors from different domains (e.g., governments, NGOs, other initiatives or movements) (2). As guidance of the search (3), some AFIs, especially the intermediaries, present their visions and values. Above that, AFIs demand that policymakers and planners provide shared visions of how a more sustainable agri-food system could be designed, for instance, through aligned political guidelines. As market formation (4), AFIs similarly seem to evolve in protected spaces. Resources, such as funding and interested members are of key importance as well and comprise a current challenge (5). Lastly, gaining legitimacy (6) for AFIs' actions is pursued by involving society or by articulating their visions and expectations and thus, critical to gain trust, social acceptability, eligibility or recognition.

The comparison shows that the AFIs seem to address similar functions as those discussed in the literature on the diffusion of technological innovations. Although these functions partly follow a different logic, for instance, the knowledge exchange (2) which takes place among AFIs, but also between AFIs with similar innovations or the creation of legitimacy (6) through embedding the innovation in its social context. However, from AFIs' analysis, this thesis results hint to further functions that are not mentioned for TIS but seem to matter for agri-food related social innovations' diffusion – from the perspective of AFIs. These comprise, for instance, the support by local politicians, intermediary activities as well as the linkage of the social innovation to the respective region. Thus, as already stated above, to be successfully implemented and have a lasting impact, the agri-food related social innovation systems need to be more closely connected to the local context, cultural background and collective identities. For instance, as opposed to market acceptance as an important goal of technological innovations systems (Bergek et al. 2008), it seems that for agri-food related social innovations, cultural acceptance seems to play a key role as the implementation of an agri-food related social innovation depends on practices and social relations, values or behaviour (not exclusively). Thus, embedding the agri-food related social innovation in its respective cultural, social, and contextual environment appears to be crucial for the innovation's long-term viability. Moreover, agri-food related social innovations are often impact-driven, pointing to societal or environmental problems, such as food insecurity or food access, unhealthy diets and resulting diseases or resource depletion

through food waste. Whether the functions identified here for agri-food-related social innovation systems are sufficient to enable the diffusion of a social innovation remains open in this context and is subject to future research.

Lastly, the analysis of the AFIs' activities and functions (Chapters 5 and 6) shows that, taken together, AFIs propose social innovations for or intermediate in the following agri-food system domains (derived from Chapter 5 Appendix Table B and Chapter 6 Appendix Table A): food security (including food access and availability) (1), sustainable, healthy diets (for institutional and individual consumers) (2), food culture (3), alternative agricultural practices (4), urban farming and edible cities (5), animal welfare (6), sustainable economy and fair working conditions (7), food waste (8), regional development and regionalisation of the agri-food system (9), short value chains (10), food policy and regulation (11), and climate impact (12) (cf., Figure 15).

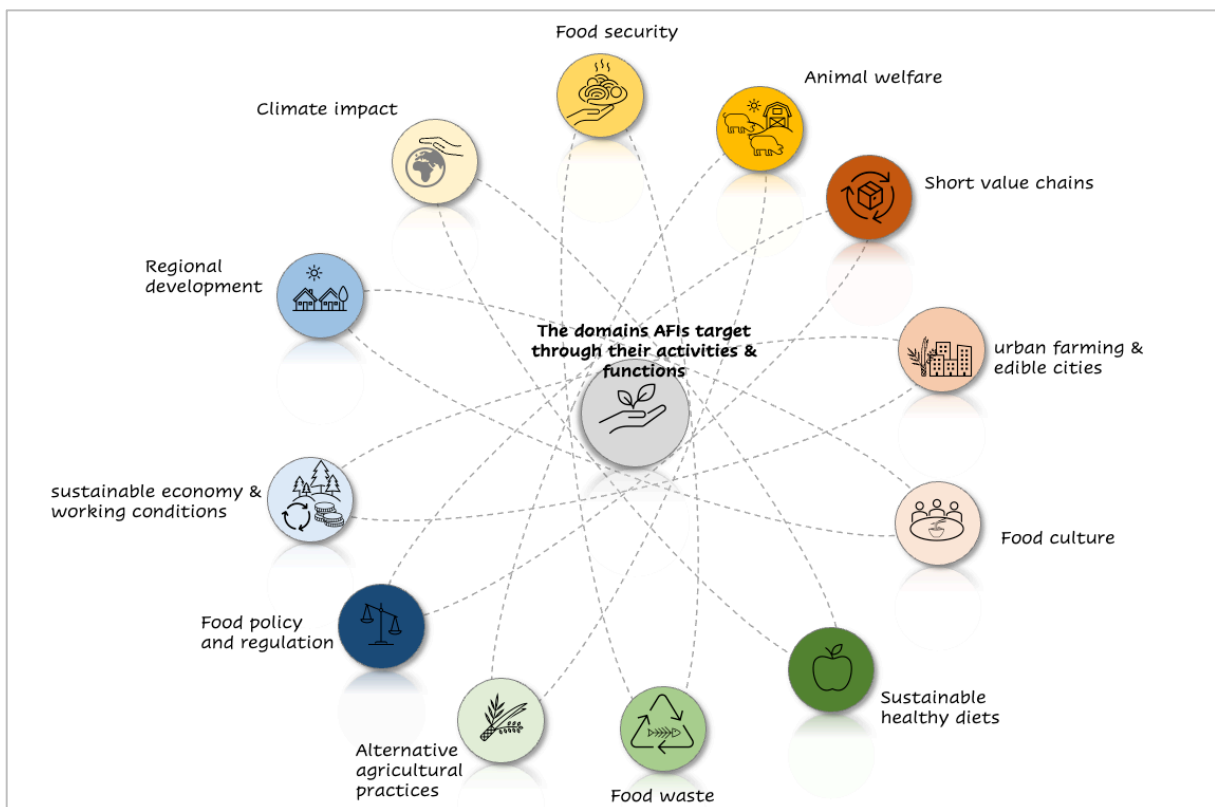


Figure 4: The domains of the agri-food system the AFIs target through their activities and functions. Derived based on Chapter 5 Appendix Table B and Chapter 6 Appendix Table A.

In innovation literature, the establishment of a niche or development of niche innovations hint to a gap, inefficiencies or an undesired property of a system (Schumpeter 1942, Geels 2002). Thus, the proposed innovations demonstrate which domains of a system are inefficient or

produce undesired properties – from the perspective of these innovatory actors (Wittmayer et al. 2017). For this thesis research object, i.e., AFIs, one can argue that the agri-food related social innovations the AFIs develop hint to the current undesired system properties. The intermediary functions suggest a perceived lack of certain system functions. Moreover, the proposed solutions (i.e., agri-food related social innovations) and functions AFIs fulfil implicitly show how these actors visualise more sustainable agri-food systems and which properties these systems should carry: a localised and circular agri-food system, producing no food waste; with political decision-making on the local level, involving currently unheard voices and enabling democratic participation; with a diet that is healthy and sustainably and nourishes humans and the planet alike; with short value chains enabling direct interactions between consumers and farmers as well as just and fair working conditions.

7.2 Implications and recommendations for policymakers and governors of agri-food system sustainability transitions

The section above discusses how AFIs intend to contribute to sustainability transitions of agri-food systems. From these insights as well as from further aspects from Chapters 5 and 6, implications and recommendations for policymakers and governors of agri-food system sustainability transitions are inferred. This section elaborates on two aspects from which these recommendations are derived: first, AFIs role, and second, the factors influencing AFIs' role.

First, through their activities and functions, the AFIs address persistent societal problems and system malfunctions – from AFIs perspectives. From the roles an AFI takes, one can infer the roles that other actors adopt and perform (or *not* perform) (cf., Wittmayer et al. 2017). Section 7.2 presents the agri-food system domains the AFIs are targeting. Macroeconomic perspectives (e.g., welfare economics) argue that market failures such as undesired externalities or injustice justify political interventions (Feldman and Serrano 2010) (for instance, externalities or injustices such as environmental depletion, food insecurity). This prompts the question of why some of the matters AFIs address are not tackled by policymakers but are instead shifted to groups with limited resources and capacities to handle them. This argument can especially be put forward for food security as a universal human right (FAO 2013) but also to environmental issues where certain dominant production methods lead to soil depletion or loss of biodiversity and the responsible and/or supporting parties are not held to account (e.g., through internalisation of external costs). Thus, policymakers and governors of transitions should reconsider their roles

and responsibilities and, with respect to the AFIs' functions and activities, infer aspects that are regarded as relevant. AFIs as actors involved in sustainability transitions of agri-food systems provide insights into the roles policymakers could/should take.

As sustainability is a normative concept, with individual views, interpretations and assumptions (Susur and Karakaya 2021), the creation of shared visions and clearly defined goals is crucial (Dumont et al. 2020). Policymakers and governors of transitions should embrace their roles and outline these directions. AFIs propose ideas of how more sustainable agri-food systems could look like and thus, are showcasing possible future agri-food systems while experimenting with and implementing their ideas on (mostly) small-scales. The derived cluster of agri-food related social innovations (cf., Chapter 5) could be used by policymakers and planners for inspirational matters, to create conducive conditions for AFIs activities or to lighten public decision making processes on what types of agri-food related social innovations future agri-food systems may account for.

The analysis of FPGs (cf., Chapter 6) shows that FPGs address the gap of governing local agri-food systems as agri-food policies tend to be determined on national levels and market solutions prevail (cf., Coulson and Sonnino 2019, Sieveking 2019). In doing so, FPGs demonstrate that local agri-food policy needs to be taken up on the political agenda as place-based approaches could improve a local system's resiliency and equity (Sieveking 2019). In some cases, political actors are directly involved in those FPGs or seek their advice. However, uncertainty exists whether FPGs' suggestions are taken seriously by politicians. Some FPGs reported positive examples where collaborations led to the implementation of successful agri-food strategies or policies. However, others reported difficulties as they do not feel heard by governments. Especially in FPGs, democratic participation plays a role to resolve agri-food system malfunctions. In or through FPGs, actors with different interests come together to discuss agri-food system matters, uncovering specific agri-food system interrelations and resolving conflicts of interest. Thus, interactions are promoted between actors who normally have little to no interaction within the dominant system. Particularly in present days, with the number of democracies globally at an all-time low (Bertelsmann Stiftung 2024), encouraging dialogues among various interest groups and contrasting perspectives, fostering individuals' engagement as well as motivating individuals to play an active role are of great importance. Active societal participation strengthens democracies (Skelcher and Torfing 2010, Bertelsmann Stiftung 2024). Thus, supporting active participation, taking these groups seriously by considering and especially dealing with

their ideas and by offering spaces for such democratic participation demands serious political attention and concrete action by policymakers and transition governors.

Second, the AFIs activities and functions are influenced by internal and external aspects. Chapter 5 elaborates on the drivers and barriers AFIs face during their development and implementation of agri-food related social innovations. Generally, it becomes apparent that the drivers (on initiative and regime level) seem to be more about social relations and people (e.g., support by local politicians, civil society) while the restraining factors (on initiative and regime level) tend to be more of a structural or processual nature (e.g., bureaucracy, infrastructure), creating lock-ins and path-dependencies. This could indicate that society is generally positive towards AFIs actions, however, the conditions under which AFIs operate need improvement (cf., Chapter 5). For policymakers, this implies that a general societal acceptance of AFIs activities and functions seems to be present, facilitating and justifying structural changes.

Many driving factors come from the initiative level, be it in form of engaged individuals within the initiative or in form of other niche initiatives and intermediary actors supporting their actions. Providing and maintaining these spaces to enable interactions of this type to support the development of agri-food related social innovations is thus important for policymakers and governors of transitions. The barriers the AFIs face come from both internal and external levels. Among the analysed AFIs, the bureaucratic funding system comprises an often-reported challenge as many AFIs face resource constraints such as time or employees/members. This is especially problematic for AFIs run by volunteers who lack the capacity of going through resource-intensive funding procedures. In that light, a general lack of funds was criticised but more importantly, the innovations that are being funded are not well received. It is reported that calls for proposals are predominantly focussing on new and innovative ideas such as technological novelties. However, as the analysis shows, the AFIs are proposing innovations of a mainly social nature (e.g., revival of ancient practices, community and collaborative concepts) which are not new as such but differ from the incumbent ways of doing and do not fit into many of the current funding schemes. Moreover, it is highlighted that especially implementations of funded novelties should receive further funding as well. As innovation literature shows, the protected space where novelties develop and are prepared to compete with dominant structures is highly important (cf., Smith and Raven 2012). This space seems to be maintained by intermediaries or some local political actors but not so much by supportive regulations on higher levels (e.g., the common agricultural policy is mainly in favour of large-scale production (through their funding

scheme) without considering externalities). The improvement of these conditions thus constitutes a key area for policymaking.

In Chapter 6, the organisational forms and relationships to government of FPGs were analysed. The analysis showed that the exact nature of the type of organisation or the relationship to government does not seem to play a major role in shaping policy priorities of FPGs. However, some correlations exist which could be taken up by policymakers and planners. As regards the relationship to government, the results suggest that FPGs supported by government (e.g., through grants or meeting space) are significantly more likely to focus on food procurement and if government seeks advice from an FPG, the analysis suggests that the respective FPGs are significantly more likely to work on anti-hunger issues (though both to small effect sizes). If these topics are regarded as relevant by policymakers and transition governors, respective support mechanisms could be implemented. Nevertheless, the analysis rather indicates that the composition of an FPG is more relevant (i.e., who participates representing which sector or interests). Future research should take this into account to better inform transition governance since understanding what influences the FPGs' priorities could help in strategically establishing FPGs for specific topics (top-down) or informing individuals that are interested in founding an FPG and would like to focus on specific topics (bottom-up). For instance, the German government already funded a project that aimed at creating an advising tool for FPGs (Heuser et al. 2019). However, insights into what affects FPGs priorities could have led to better recommendations on the targeted formation of FPGs for specific topics.

7.3 The strengths and limitations of this thesis

The aim of this thesis was to explore and assess the functions of AFIs in sustainability transitions of agri-food systems and the activities they perform to realise their goals as well as the influencing factors in this endeavour. For this, a mainly explorative research design with descriptive and explanatory elements was chosen. This approach is justified by the following: transformative social innovation conceptualisations and transition intermediary frameworks are greatly informed by studies on energy or mobility systems although agri-food studies are also receiving further attention. However, as systems and their characteristics differ, developed models and conceptualisations need to be scrutinised as regards adequacy and suitability and potentially adapted to the system in focus. Transformative social innovation concepts as well as intermediary conceptualisations could benefit from further insights from agri-food systems to extend and explore the use of these conceptualisations in other sectoral contexts, which

reinforces the rationale of this mainly explorative methodological approach. Through the iterative procedure (e.g., approaching the initiatives as such; working with the data; finding patterns as regards social innovations; adapting the scheme of analysis), this thesis was able to discover that AFIs suggest mainly social innovations and intermediate in the context of changing practices and social relations. By conducting research on AFIs across different regions using the same methodology, aggregated insights were derived that provide broader impressions of specific phenomena within the agri-food system. Moreover, the inclusion of AFIs from different regions could facilitate the broader applicability of the adapted and derived conceptualisations (i.e., cluster of agri-food related social innovations; intermediary functions around policy work) to a wider range of cases.

This thesis drew on a mixed-methods approach meaning that methodologically, both qualitative and quantitative elements (i.e., methods, data, analysis) were employed. In the following, the ways that were chosen to ensure good scientific practice as well as how the weaknesses of qualitative and quantitative approaches were handled will be discussed, with respect to, first, data collection and second, analysis.

First, to ensure a high level of reliability in data collection (i.e., semi-structured interviews and online survey), this thesis relied on (a) already validated semi-structured interview questionnaires for Chapter 5 and (b) a well-established survey for Chapter 6 that was slightly adapted (cf., Bassarab et al. 2019, Santo et al. 2020). The validated semi-structured interview questionnaires (a) proved useful for the analysis of grassroots initiatives (cf., in work of Wittenberg et al. 2022). As the questionnaires contained open questions only (e.g., “what are the main challenges and obstacles faced by the initiative?”), the interview guides were also regarded suitable for numerous actor groups (regardless of their position in the system, e.g., also top-down initiatives). The selection of AFIs in Chapter 5 was influenced by the individuals who carried out the data collection in the territories, along with their background and involvement in the respective regions. This was addressed through regular bilateral meetings between data collectors and this thesis’s author. A strength of involving data collectors within the region is that the interviews can be conducted in local languages to establish an interview situation that is as natural and simple as possible for the interviewees. An interview with a single representative of one AFI may result in biased findings, as it captures only one perspective – despite the request to respond from the AFI’s viewpoint. Also, it must be noted that the information gathered from one representative may not reflect the entirety of all of an AFI’s activities as the possibility

persists that information was missed out. In order to minimise this bias, upcoming research could conduct group discussions with several members of the respective AFI. Nevertheless, it must be emphasised that this approach is even more resource-demanding than conducting semi-structured interviews.

The survey for Chapter 6 (b) was based on a well-established survey from the John Hopkins Center for a Livable Future in the US. Since 2013, the institute runs a bi-annual survey of FPGs. The slightly adapted versions for European FPGs and Australian FPGs were pre-tested with five FPG representatives from Germany and the Netherlands which met a thoroughly positive response and necessitated no further adaptations. For the two areas with larger total populations (i.e., FPGs predominantly present in US and Europe, not so much in Australia), more than 50% of the total population was reached (e.g., from 342 existent FPGs (2023) in the US, 219 answers were received). Although it must be noted that the distribution of FPGs across the three areas is uneven. By far, the most FPGs exist in the US (around 340), around 60 FPGs exist in middle Europe and around 12 in Australia. This circumstance influenced the results, with US-FPGs accounting for by far the largest part of the sample. The surveys were targeted and distributed to FPGs only which reduces distortions of the sample (cf., Andrade (2020) for limitations of online surveys). Although the surveys were asked to be filled out by a knowledgeable person within the FPG and from the viewpoint of the FPG, the provided information may be biased by the perspective of the person filling out the survey and, similar as stated above for semi-structured interviews, the information gathered from one representative may not reflect the entirety of all of an FPG's activities.

Second, the chosen research approach induces implications for analysis and interpretation of the collected data. The developed agri-food related social innovations and intermediary functions around policy work were based on inductive and deductive reasoning (i.e., for data analysis, deductive categories were inferred from (mainly) energy system sustainability transition literature and applied to the dataset; inductive categories were derived based on the empirical data from transcripts and open-ended survey questions). This approach generally strengthens the interpretations (Johnson and Onwuegbuzie 2004, Kuckartz 2019). However, limitations remain such as uncertainty of conclusions, susceptibility to bias and generalisability of results (Raths 1967, Johnson and Onwuegbuzie 2004, Anderson 2010). Efforts were made to mitigate these through an increased sample size and diversity (i.e., a larger number of AFIs for both the empirical analysis and the inclusion of AFIs from different regions). For the analysis of

interview transcripts (cf., Chapter 5), an additional researcher, apart from this thesis author, applied the category system to the dataset to ensure a certain degree of inter-coder-consistency (to 50% of the transcripts) (i.e., inter-coder reliability, cf. Hopf and Schmidt (1993) and Kuckartz (2019)). A researcher's assumptions and worldviews especially impact qualitative research and a researcher's expectations may influence the interpretation of data. To address this, section 3.1 elaborated on the worldviews and assumptions of this thesis's author to enable other researchers (readers) to follow the line of thought. For the influencing factors in Chapter 6, results were considered significant at the ten percent level ($p\text{-value} < 0,1$). However, one must acknowledge that the determination of a p -value is based on arbitrariness and needs to be adapted to the specific research context or sample and its representativeness (Fisher 1950). This was addressed by a thorough interpretation of results, considering the effect sizes of the associations (cf., Chapter 6).

Finally, it must be noted that this thesis used system boundaries to simplify the research (cf., sections 2.2.1, 3.2). This work set system boundaries thematically (i.e., agri-food), temporally (i.e., a specific moment in time as the moment of data collection), spatially, (i.e., the geographical areas in focus) and on an actor level (i.e., agri-food related initiatives) which need to be taken into account for the interpretation of the results. As regards the temporal system boundary, this thesis focused on ongoing transitions and was based on data from a specific point in time. Thus, the past development of AFIs was not considered. Similarly, the contextual (spatial) factors of each territory were not included for this study. The chosen approach is supported by the aim of deriving aggregated insights on AFIs role and implications for social innovation concepts and intermediary research in the agri-food system, from a larger number of AFIs across different territorial areas. It further remains to be noted that the AFIs chosen for this study and the aggregated findings are not expected to be fully representative for all existent AFIs. However, this was also not the aim of this research. This thesis (mainly) exploratively derived insights on agri-food related social innovations and the intermediary functions. Thus, these results can be used as a foundation for further research to refine and broaden the derived implications to better analyse agri-food system sustainability transitions.

7.4 Future research avenues resulting from this thesis

This study provided valuable insights into the role of AFIs in agri-food system sustainability transitions, especially with respect to social innovations and intermediary research in the agri-food system. Yet, this study gave rise to further questions in the following areas: first, impact measurement, second, contextual factors, third, power relations, and lastly, role constellations.

First, examining actors in sustainability transitions frequently leads to questions regarding their impact within the change process. Although this was out of the scope of this research, implications for future research undertakings can be derived. For technological innovations, TIS literature suggests the necessary functions for their diffusion (cf., (Hekkert et al. 2007, Bergek et al. 2008, Hekkert and Negro 2009, Köhler et al. 2019)). In section 7.2, these functions were compared to the functions carried out by AFIs as well as the barriers AFIs face, assuming that the functions carried out are the functions necessary for agri-food related social innovations to diffuse. However, this thesis identified further functions that seem to be important for AFIs. Based on these results, the functions necessary for agri-food related social innovation systems could be derived. This could more generally lead to a conceptualisation of the functions of *social innovation systems (SIS)*. To the best of existing knowledge, the literature lacks conceptualisations of functions of SIS and hence, comprises an opportunity for future research.

Second, as this thesis focused on deriving aggregated implications for social innovation and intermediaries within the agri-food system, contextual factors of the research objects were not considered. However, transitions are context-dependent and these spatial aspects may have important implications for the success of sustainability transitions (Coenen et al. 2012, Hansen and Coenen 2015, Köhler et al. 2019, Von Wirth et al. 2019). The analysis of AFIs showed that AFIs engage in linking their agri-food related social innovation to the respective region and are also active in regional development. Thus, diving deeper into the space-specificities of particular AFIs could reveal why the implementation of certain innovations was successful in one setting but not in the other.

Third, in current agri-food systems, power relations are unevenly distributed, and transitions depend on the extent to which these power structures are challenged and transformed. The results showed that the AFIs acting as intermediaries (first and foremost FPGs) engage in empowerment processes, exercising mainly “power with”. This refers to the ability of actors acting in “concert” (i.e., together), to achieve collective goals, within the conceptual framework of

power in transition studies (i.e., “power to”, “power over”, “power with”, cf., Avelino et al. (2023)) (cf., Chapter 6). Moreover, the literature on power in sustainability transitions found that power structures differ between MLP levels, with regimes as spaces of *reinforcive* power, niches as spaces of *innovative* power and niche-regimes as spaces of *transformative* power (Avelino and Wittmayer 2016, Avelino 2017, Avelino et al. 2023). Thereby, the idea of regime’s dominance over niches is challenged, suggesting instead that power operates in multiple forms and emerges through interactions between top-down and bottom-up processes (Avelino and Wittmayer 2016, Rossi et al. 2019). Here, future analysis could focus on how intermediaries successfully reshaped power relations in a specific case. For instance, the relational dynamics and exercised forms of power could be investigated, through a chronological analysis of a successfully implemented change process shaped by an FPG. For this, the conceptualisation of (shifting) power relations by Avelino and Wittmayer (2016) could provide another entry point for research.

Lastly, this thesis elaborated on the role of AFIs in agri-food sustainability transitions. For this, it should be highlighted that AFIs are role constellations, meaning that AFIs consist of individual actors and are influenced by the role(s) these actors represent (given that individuals fulfil multiple roles) (cf., section 2.1.4). The analysis of these role constellations was out of the scope of this research, though comprises a topic of interest that could be further investigated in future research approaches. This research indicated that the composition of an FPG may be a relevant factor influencing decision making processes and the work domains an FPG focuses on. Thus, future research could take this up and elaborate on the role constellations influencing decision making processes. Here, the analysis could be combined with the above mentioned power conceptualisations to dive deeper into power relations within initiatives.

Chapter 8. Conclusion

*“The scarcest resource is not oil, metals, clean air, capital, labour, or technology.
It is our willingness to listen to each other and learn from each other
and to seek the truth rather than seek to be right.”*
– Donella Meadows

This thesis focused on the functions of AFIs in sustainability transitions of agri-food systems and the activities they perform to realise their goals as well as the influencing factors in this endeavour. Elaborating on actors and their role in certain processes allows to identify system malfunctions and proposed solutions – from the perspective of these actors. This research drew on the MLP, transformative social innovation conceptualisations as well as transition intermediary research to structure and classify the activities taking place and the functions that are being fulfilled as well as the enhancing and restraining forces the AFIs are facing. The research was centred around three main parts. The systematic literature review (i) hinted to the presence of social innovations within the agri-food system and an intermediary space between agri-food niches and regimes. Both aspects were taken up for the empirical investigations of agri-food related social innovations (ii) and intermediary functions (iii). To conclude this thesis, key findings will be reiterated (1), the contribution of this research is summarised (2), and an outlook for future research is provided (3).

First, this thesis discovered that the AFIs in focus suggest mainly social innovations and intermediate in the context of changing practices and social relations. A cluster of agri-food related social innovations was derived, structuring agri-food related social innovations into social (interaction) processes, i.e., cooperation, exchange, enabling, knowledge generation, and nine agri-food fields. Further, the analysis found that AFIs anchor and link to agri-food system domains and are empowered by local politicians and intermediary actors especially. The investigation of FPGs’ intermediary functions (FPGs as one specific group of AFIs) revealed that FPGs are active in strategic niche management activities, empowering actors and enabling interactions between various actors who would not usually encounter or communicate with one another. In AFIs, especially FPGs, democratic participation and involvement of distinct actors play a role to resolve agri-food system malfunctions. Active societal participation strengthens democracies which is particularly relevant in present days, with the number of democracies

globally at an all-time low. Policymakers and transition governors should consider and take the developed ideas seriously and support spaces for democratic participation.

Second, this research provided contributions and implications to both the transition literature and policymakers and transition governance, offering valuable insights into AFIs, including FPGs, within the agri-food system. This thesis contributed to the sustainability transition literature (first and foremost to transformative social innovation conceptualisations and intermediary research) by providing insights from the agri-food system. As each system shares its own characteristics, adjustments of models and frameworks to the system in focus are likely required. The innovations and functions AFIs propose and fulfil hint to current agri-food systems' malfunctions and show what AFIs perceive as necessary to do. Based on this, different implications for policymakers and planners were derived. These comprise, amongst other, recommendations for roles policymakers could/should take, taking the agri-food system domains the AFIs are addressing as inspirations for targeted governance, as well as matters of support for AFIs development.

By conducting research on AFIs across different regions using the same methodology, aggregated insights were derived that provide broader impressions of specific phenomena within the agri-food system. Moreover, the inclusion of AFIs from different regions may have facilitated the broader applicability of the adapted and derived conceptualisations to a wider range of cases (i.e., cluster of agri-food related social innovations; intermediary functions around policy work). However, it remains to be noted that AFIs are diverse groups, and the presented aggregated findings do not allow to derive final conclusions about the role of each individual AFI.

Lastly, future research could use the derived cluster of agri-food related social innovations and the derived intermediary functions to verify and build upon these findings. Moreover, future analysis could dive deeper into strategic niche management and TIS literature to derive implications on how agri-food related social innovations could diffuse (e.g., development of *SIS – social innovation systems*). Finally, this research found that FPGs engage in dismantling power structures and in mediating conflict among distinct actors. For both domains, changing power relations and conflict, insights from agri-food system research is scarce, with conflict research in particular being an emerging research domain among sustainability transition researchers (Kalt 2024).

Appendix

Appendix I. Conference abstract “Sustainable Consumption and Production” 2023 (SCP), SCORAI-ERSCP-WUR Conference: Transitioning to Sustainable Food Systems: Enhancing and Restraining Factors in current Research using the Multi-Level Perspective

The challenges the agri-food system is facing are interconnected and range from social issues over environmental impacts to economic tensions while influencing each other (Hinrichs 2014). Practices within the agri-food system have led to a loss of biodiversity, fuelling climate change or soil depletion (iPES Food 2021). In turn, the deterioration of nowadays problems proves to be a boomerang, only pressuring the food system even further, resulting in a self-reinforcing viscous cycle. A transformation of the food system is needed to tackle these intertwined challenges and enable food security and health of people and the planet for current and future generations (Ericksen 2008, Hinrichs 2014, Elzen et al. 2017). The multi-level perspective (MLP) on socio-technical transitions is increasingly used when analysing food system transformations (El Bilali 2019). It has proven to be a useful framework to analyse societal transitions from a systemic perspective and to understand the factors influencing processes of change at different levels: niche, regime and landscape (Geels 2002, 2020, Rut and Davies 2018). However, an overview of common factors that are either conducive or impeding the food systems' change process, across different sectors and studies, is not given yet. This contribution pursues the influencing factors that are enabling or disabling a transition towards sustainability in research using the MLP to analyse transitions of the food system. The information was gathered through a literature search on scopus database focussing on research articles applying MLP and a transition towards sustainability of the agri-food system. The results implicate that next to reconciliation of policies to create a conducive frame for the sustainability path, actors from all levels seem to play a vital role. Participation of a wide range of actors promotes knowledge exchange and the formation of alliances (e.g., Belda-Miquel et al. 2020, Gugerell and Penker 2020, Ortiz and Peris 2022, Sobratee et al. 2022). Leading actors should strive for commonly clearly defined goals and a shared vision of the path towards sustainability as an absent alignment can cause opposite effects (Deviney et al. 2020, Dumont et al. 2020). Networking activities lead to the realisation of collective goals (e.g., Polita and Madureira 2021, Salavisa et al. 2021, Van Poeck and Östman 2021). Governance and power relations need to be reconciled, involving marginalised actors and sectors (e.g., Anderson et al. 2019, Wieliczko et al. 2021, Boillat et al. 2022). When it comes to decision making processes, a smaller independent group seems to

work more efficiently than including all actors (Deviney et al. 2020). It can be concluded that the transition process should involve multiple stakeholder groups and aim for an even participation.

Appendix II. Conference abstract “Re-imagining Transitions. Beyond established methods and concepts”, Network of Early Career Researchers in Sustainability Transitions (NEST)-Conference 2023: Hybrid actors and intermediaries in sustainability transitions of food systems

In their present form, dominant food systems (FS) contribute to environmental degradation, loss of biodiversity and the over-emission of greenhouse gases. At the same time, FS suffer under these worsening developments. A systemic transition towards more sustainability is thus undeniable. An evolving research strand hints to the role of so called "hybrid actors" or “intermediaries” in advancing sustainability transitions as mediators, disseminators of information or connectors between different levels (in the sense of multilevel models). There is still significant ambiguity in what hybrid actors are in the context of sustainability transitions. Distinct notions exist due to different theoretical approaches (i.e. intermediaries, change agents, frontrunners, boundary spanners, hybrid actors). A recent systematic literature review focused on intermediaries in sustainability transitions suggests the existence of different types of those actors active (and required) during distinct transition stages. However, the derived conclusions are as yet untested. Especially, how many types exist and what kind of “intermediation” takes place during which transition state of FS. Through a critical realist lens, hybrid actors will be analysed and mapped, measuring the (dis-) alignment of two socio-technical configurations, i.e. the food system in Copenhagen, Denmark, and Münster, Germany. This will be done by a combination of the socio-technical configuration analysis (STCA) and a multi-level perspective (MLP). Qualitative data from semi-structured interviews and a quantitative questionnaire will inform the analysis. We expect that the types of hybrid actors will differ between both FS as different states of transition exist. This research will contribute to the evolving research on hybrid actors and intermediation in sustainability transitions of FS.

Appendix III. Conference abstract 17th scientific conference on organic agriculture 2024 (WiTa): sustainable agri-food systems: The understanding of organic agri-food initiatives

Abstract

Different actors and actor groups are engaging in a sustainability transition of the agri-food system. For successful transition processes, a shared vision of the path towards sustainability is vital. To receive an understanding of how actors perceive a sustainable food system (SFS), we investigated one of these actor groups, organic initiatives active in sustainability transitions of the agri-food system. We selected 15 initiatives from five different territorial regions in Europe and Northern Africa and conducted 20 semi-structured interviews. The organic initiatives refer to different characteristics from SFS literature and definitions, from the social, environmental, economic and health domains. Some initiatives refer to the process and the aspects that are in need of change, whereby others envision the end state.

Introduction

Organic food and farming can make valuable contributions to sustainable food systems (SFS). The transition process to and configuration of SFS and their outcomes are determined and shaped by human actors and similarly influence human actions and habits (Deviney et al. 2021, Leeuwis et al. 2021). Sustainable development is an interpretative and normative construct which evokes different visions and imaginations in human actors (Susur and Karakaya 2021). Nevertheless, a shared vision of the path towards sustainable development plays a vital role for sustainability transitions of agri-food systems as an absent alignment of actors can lead to unintentional outcomes (Dumont et al. 2020, Deviney et al. 2021). Therefore, it is crucial to receive greater insights into how different actors understand the construct of sustainable development in relation to SFS. With our research, we aim to dive deeper into organic initiatives engaged in agri-food system transition and investigate their understanding of a SFS. To receive a wider picture of those understandings, we include organic initiatives from different territorial regions and countries. Hence, we address the following research question: what do organic initiatives in different territorial regions associate with the concept of SFS?

Methods

For our research, we included organic initiatives from five territorial regions in Europe (Copenhagen, Denmark; Warsaw, Poland; Cilento Bio-district, Italy; the Organic Farming Model

Region North Hestia, Germany) and Northern Africa (Kenitra, Morocco). We selected organic initiatives that are undertaking regular activities for a sustainable development of their respective local agri-food system, that have at least two years of operation and two active members to ensure a continuity of their activities. For data collection and analysis, we used a qualitative research design, containing desk research and semi-structured interviews. We transcribed and analysed the data based on Kuckartz' (2014) thematic qualitative content analysis, using the software programme MAXQDA2022. Resultant from our selection procedure of agri-food initiatives, we selected 15 initiatives engaged in making their local food system more sustainable and conducted 20 semi-structured interviews.

Results and discussion

The initiatives are active within different fields of the agri-food realm. Their activities range from organic or agroecological cooperatives over organic farmers markets and shops or food-services (e.g., seasonal organic meal boxes) to policy development or network creators. Most of the interviewees highlighted the social and cultural aspects as important parts of SFS, followed by nature protection and resource conservation. These topics can also be found in SFS definitions in the literature (Ericksen 2008, HLPE 2017, Stefanovic et al. 2020). The organic initiatives understand the well-being of people as closely interlinked with the well-being of the planet and vice versa. Therefore, the way how food is produced and consumed in SFS should nourish both, the people and the planet equally. Figure 1 presents an overview of the different attributes that were raised.

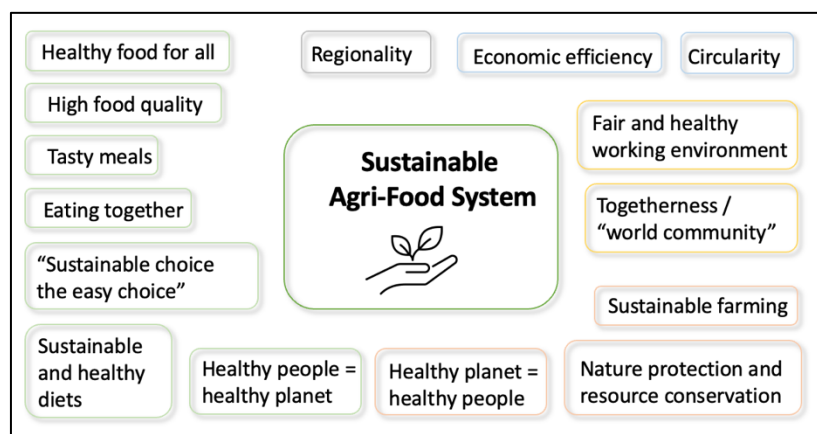


Figure 5: Initiatives' understanding of attributes of sustainable food systems

For most initiatives across the five territories, their pursued activities seem to be linked to their understanding of SFS. For instance, the representatives from cooperatives or farms highlighted

the protection and quality of natural resources, like soil, or mentioned more sustainable production methods, like organic or agroecological farming. The networking organisations referred, among others, to food access or security, the importance of togetherness or changing people's behaviour or habits. Although the five territories differ regarding their state of transition, we found this in all territories.

Particularly, a lot of initiatives mentioned local food production or local food systems in their answers and thus, seem to equate everything that is "local" as inherently sustainable. Attributing only positive facets to the "local" is partly criticised in the literature (cf. Winter 2003, Born and Purcell 2006, Birnbaum and Lütke 2023). The concept lacks a clear definition, and, for instance, Winter (2003) remarked the protectionist character of using the term "local" as argument against non-local producers or products.

Interestingly, some of the initiatives referred to the aspects that are in need of change, for instance, the current consumption patterns or economic practices, and thus, characterised the process of change (e.g., changing infrastructures, changing the way people eat) whereby others described how the end-state should look like and which outcomes the system should produce (e.g., healthy, nutritious food).

Conclusion

Our investigation of organic initiatives engaged in agri-food system transitions shows that their understanding of SFS is in line with the global concepts and definitions of SFS. The initiatives predominantly referred to social and cultural aspects. Their assigned characteristics of SFS seem to be linked to their activities. The "local" aspect was mentioned as an important criterion for SFS. References are both given to the process of change and the envisioned end-state. Though we interviewed 20 different and varied initiatives in 5 diverging territories, the responses are largely in agreement. To obtain a greater impression of all involved actors in agri-food system transitions, it may be of interest to assess other actors and actor groups' (e.g., politicians) understandings.

Appendix IV. Conference abstract International Sustainability Transition (IST) Conference 2024, “Sustainability Transitions and Nature”: Intermediating in Sustainability Transitions of Food Systems: Insights from Middle European and North American Food Policy Councils

Food Policy Councils (FPC) engage in various food system related topics such as food access, democracy, sovereignty, education, justice or policy and aim for sustainability transitions of food systems, especially at the local or communal level (Schiff 2008, Michel et al. 2022, den Boer et al. 2023). They bring together a variety of representatives across the food system and play a prominent role in food system governance (Calancie et al. 2018, Ambrose et al. 2022, Birnbaum and Lütke 2023). The first FPCs evolved in the 1980s and thereupon, FPCs spread throughout the world, differing in terms of how they are/were founded (i.e. formed by civil society or government), their structure (e.g. membership), funding or their scope of action (Harper et al. 2009, De Marco et al. 2017, Michel et al. 2022). FPCs act at the interface between civil society, science, policy and practice and aim for boundary spanning relationships between those sectors (Bassarab et al. 2019, Leitheiser et al. 2022). Furthermore, they advance an unambiguous transition agenda (den Boer et al. 2023) and can be seen as transition intermediaries. Transition intermediaries as a more recent research strand in transition studies deals with the role of those actors in advancing sustainability transitions as mediators, disseminators of information or connectors between different levels (in the sense of multilevel models) (Kivimaa et al. 2019a, Elsner et al. 2023). Currently, research on transition intermediaries in food systems or FPCs in general is scarce and qualitative studies outweigh other types of research. Some authors expressed a need for research on functions and roles of intermediaries (e.g. Kivimaa et al. 2019a, Cramer 2020) or their contribution to the development and implementation of policies for sustainability transitions (Mignon and Kanda 2018). Due to FPCs’ diversity in scope of action or structure, they offer the opportunity to address these open issues. To the best of our knowledge, only one study exists that analyses FPCs from a transition intermediary perspective (den Boer et al. 2023). The authors classify FPCs as systemic intermediaries and provide plausible arguments to assert this assertion. However, for our research we argue that FPCs’ intermediary position depends on their individual characteristics such as each council’s composition and resultant representation, their independence or affiliation to government or their scope of action. Based on the above, the aims of our research are threefold: we expect greater insights into, first, the role and agenda of FPCs as transition intermediaries, then, the impact an FPC’s structure has on system intermediation and third, to identify FPCs contributions to policy

development and implementation. To approach these, this research seeks to conduct a quantitative survey that will be distributed to FPCs in Germany and surrounding countries. The results will be compared to similar survey results from North American FPCs, conducted by the John Hopkins Center for a Livable Future in the U.S. Previous interviews with FPCs in Germany, from the German network of FPCs and representatives from FPCs' meta networks around the world as well as a documentary analysis of FPC reports and websites inform the quantitative survey. The survey will focus, amongst others, on the area served, FPCs' structure, source of funding, scope of action, policy work and the recipients of their services. This study will contribute to the evolving research on intermediaries in sustainability transitions with a specific focus on intermediaries' structure and intermediaries' policy work in food systems.

Appendix V: data availability statement

The raw data that support the findings of this study are available on request from this thesis's author. The data are not publicly available due to their containing information that could compromise the privacy of research participants.

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