



OPEN ACCESS

EDITED BY

Anas Hamdani,
National Institute for Agricultural
Research, Morocco

REVIEWED BY

Giulio Cascone,
University of Catania, Italy

*CORRESPONDENCE

Bonnie Averbuch
✉ bonnie.averbuch@agro.au.dk

RECEIVED 07 December 2025

REVISED 04 March 2026

ACCEPTED 04 March 2026

PUBLISHED 25 March 2026

CITATION

Averbuch B, Stone T, Sandén T,
Schwarz G, Thorsøe MH, Bindelle J,
Boeraeve F, Cassart P, Dalgaard T,
Dumont B, Herrera B, Kambashi B,
Karikallio H-M, Knierim A, Koutsouris A,
Kozar R, Lagneaux S,
Lahnamäki-Kivelä S, Leitheiser S,
Loconto AM, McPhee C, Moeller N,
Plaas E, de la Portilla CS,
Fernández-Soletto P, Trkulja I, Vlahos G,
Zerbian T and Berg TR (2026) Bridging
agroecology and food system transition
frameworks: identifying shared
methodological and conceptual
tensions.

Front. Sustain. Food Syst. 10:1762693.
doi: 10.3389/fsufs.2026.1762693

COPYRIGHT

© 2026 Averbuch, Stone, Sandén,
Schwarz, Thorsøe, Bindelle, Boeraeve,
Cassart, Dalgaard, Dumont, Herrera,
Kambashi, Karikallio, Knierim, Koutsouris,
Kozar, Lagneaux, Lahnamäki-Kivelä,
Leitheiser, Loconto, McPhee, Moeller,
Plaas, de la Portilla, Fernández-Soletto,
Trkulja, Vlahos, Zerbian and Berg. This is
an open-access article distributed under
the terms of the [Creative Commons
Attribution License \(CC BY\)](https://creativecommons.org/licenses/by/4.0/). The use,
distribution or reproduction in other
forums is permitted, provided the
original author(s) and the copyright
owner(s) are credited and that the
original publication in this journal is
cited, in accordance with accepted
academic practice. No use, distribution
or reproduction is permitted which does
not comply with these terms.

Bridging agroecology and food system transition frameworks: identifying shared methodological and conceptual tensions

Bonnie Averbuch^{1*}, Tiffanie Stone¹, Taru Sandén²,
Gerald Schwarz³, Martin Hvarregaard Thorsøe¹,
Jerome Bindelle⁴, Fanny Boeraeve⁴, Pauline Cassart⁵,
Tommy Dalgaard¹, Benjamin Dumont⁴, Beatriz Herrera⁶,
Bienvenu Kambashi⁴, Hanna-Maija Karikallio⁷, Andrea Knierim⁶,
Alex Koutsouris⁸, Raffaella Kozar⁹, Séverine Lagneaux⁵,
Susanna Lahnamäki-Kivelä⁷, Stephen Leitheiser¹⁰,
Allison Marie Loconto^{11,12}, Chris McPhee¹³,
Nina Isabella Moeller¹⁴, Elke Plaas³, Clara Sabán de la Portilla¹⁵,
Patricia Fernández-Soletto¹⁶, Ivana Trkulja¹⁷, George Vlahos⁸,
Tanya Zerbian¹⁸ and Torsten Rødel Berg¹

¹Department of Agroecology, Faculty of Technical Sciences, Aarhus University, Tjele, Denmark,

²Department for Soil Health and Plant Nutrition, Austrian Agency for Health and Food Safety (AGES), Vienna, Austria, ³Thünen Institute of Farm Economics, Braunschweig, Germany, ⁴TERRA Teaching and Research Center, Gembloux Agro-Bio Tech, University of Liege, Liège, Belgium, ⁵Sustainability,

Systems and Perspectives Department, Walloon Agricultural Research Centre, Gembloux, Belgium, ⁶Department of Communication and Advisory Services in Rural Areas, Stuttgart, Germany,

⁷Luonnonvarakeskus, Helsinki, Finland, ⁸Department of Agricultural Economics and Rural Development, Athens, Greece, ⁹Leibniz-Zentrum für Agrarlandschaftsforschung (ZALF) e V,

Müncheberg, Germany, ¹⁰Farming Systems Ecology Group, Wageningen, Netherlands, ¹¹INRAE, Paris, France, ¹²Laboratoire Interdisciplinaire Sciences Innovations Sociétés (UMR LISIS 1326 - CNRS, ESIEE,

INRAE, UGE), Champs-sur-Marne, France, ¹³Agriculture and Agri-Food Canada Ottawa Research and Development Centre, Ottawa, ON, Canada, ¹⁴Department of Business and Sustainability, University of

Southern Denmark, Odense, Denmark, ¹⁵Instituto Madrileño de Investigación y Desarrollo Rural,

Agrario y Alimentario, Madrid, Spain, ¹⁶Universidad Autónoma de Madrid, Madrid, Spain, ¹⁷International Center for Research in Organic Food Systems, Tjele, Denmark, ¹⁸Institute of Economics, Geography

and Demography, Centre for Human and Social Sciences, Spanish National Research Council (CSIC), Madrid, Spain

This perspective paper draws on insights from a 2024 symposium entitled ‘Exploring methods for researching shifts in knowledge production for agroecology transition’. The symposium critically examined emerging conceptual and methodological challenges arising from combining agroecology with living labs and research infrastructures as key instruments promoted within EU policy to strengthen Agricultural Knowledge and Innovation Systems (AKIS). Through presentations, group discussions, and iterative reflections, we identified four key tensions: structural constraints limiting farmers’ agency within living lab approaches, the problematic nature of AKIS as supposedly neutral frameworks, the oversimplification of transition frameworks as linear rather than overlapping categories, and risks of definitional dilution or cooptation. We then demonstrate that these tensions are not unique to agroecology, bridging the concepts and methods within agroecology research with those used in other fields of sustainable food system transition research, such as transdisciplinary research and sustainable transitions.

This conceptual mapping of shared tensions reveals opportunities for mutual learning. Bridging these fields would help create clarity at the conceptual and methodological levels, ultimately strengthening the theoretical foundations and enabling more nuanced approaches to food system transition research.

KEYWORDS

agricultural knowledge and innovation systems, agroecology, AKIS, living labs, research infrastructures, sustainable food system transition, sustainable transitions, transdisciplinary research

1 Introduction

Recent EU policy initiatives center on agroecology as the basis for more resilient farming systems that may also help address climate, biodiversity, environmental, economic, and social challenges (e.g., the European Green Deal, Farm to Fork, and the Biodiversity strategy) (EC, 2020a, 2020b). These initiatives highlight the need for agroecological transitions, systemic shifts from our current agricultural paradigm toward more ecologically sound and socially just food systems. While agroecology encompasses the application of ecological principles to farming practices, the scientific study of ecological processes in agricultural systems, and a social movement advocating for sustainable agriculture and food sovereignty (Wezel et al., 2009), agroecological transition research also explores the broader context of the processes, pathways, barriers, and enablers to reconfiguring agricultural systems toward agroecology (Geels, 2011; Lamine et al., 2019).

These policy initiatives entail restructuring centralized research models and shifts in knowledge production, where living labs, decentralized research infrastructures (RIs), and Agricultural Knowledge and Innovation Systems (AKIS) are seen as central to (knowledge) co-creation for advancing agroecological transitions (European Commission, 2019; EC, 2020b). Living labs are multi-stakeholder collaborative spaces for co-creating innovations in real-world settings (ENoLL, 2025). Living labs have become increasingly common in agricultural contexts to promote innovation (and its diffusion) and sustainable transitions (Cascone et al., 2024; Timpanaro et al., 2025). Decentralized RI are distributed resources used to conduct research, such as facilities, data systems, and equipment (EC, 2025). AKIS are networks of people, organizations, and institutions that shape farming practices by collectively generating, sharing, and using agricultural knowledge (EU SCAR, 2012). The integration of living labs, RIs, and AKIS for agroecology transition can be seen as an attempt to bridge two distinct research traditions by integrating participatory, place-based experimentation with more formal academic agronomic and ecological research.

There is a knowledge gap regarding different conceptualizations of agroecology, particularly tensions between approaches that position farmers as data sources versus approaches that redistribute power in knowledge systems and creation (Levidow et al., 2014). Additionally, European agroecology emphasizes its ecological and technological dimensions (compared to Latin American agroecology, which focuses primarily on territorial transformation and political economy) (Giraldo and Rosset, 2018). Furthermore, living labs are evolving and contested concepts. While living labs share the common feature of involving often-marginalized actors in innovation processes, living lab models and governance arrangements are still quite diverse (Cascone et al., 2024).

Thus, the addition and combination of agroecology with living labs and AKIS in participatory (action) research in a transition context

represents new levels of complexity for which concepts and methods are only just emerging, thus deepening the knowledge gap regarding concepts and methods being used, their shortcomings, and how to effectively integrate them into practice and measure their impact on agroecology transition outcomes. The knowledge gap is further complicated by a limited understanding of how the concepts and methods used in agroecology transition research (and the tensions that emerge) relate to parallel debates in sustainable food system transition research more broadly (Juri et al., 2024; López-García and de González Molina, 2021), including sustainability transition research that applies socio-technical transition frameworks to food systems and transdisciplinary food system research that employs participatory and multi-stakeholder methodologies and focuses on knowledge systems and innovation approaches. The relatively unexplored connections across sustainable food system transition research might result in fragmented knowledge production, in which insights from siloed research fields fail to inform one another (Nature Food, 2020). By bridging these fields, researchers can better learn from common challenges and build on similar approaches (Grace et al., 2021).

2 Linking disconnected European research environments and approaches

In November 2024, a symposium entitled ‘*Exploring methods for researching shifts in knowledge production for agroecology transition*’ convened 36 researchers from ten countries and two representatives from the European Commission (DG Agri) to discuss three questions:

- Which methods, theories, and analytical approaches may help critically advance understandings of shifts in knowledge production?
- What is the role of AKIS for agroecology transition in Europe’s diverse social, economic, institutional, and biophysical conditions?
- How do we obtain experiences and insights that may advance research guidance for agroecology transition?

The convened researchers work within the agroecology transition field with a range of expertise and backgrounds. The group brought together expertise in specific domains, including participatory research approaches, knowledge co-creation, digitization and data governance in agroecology transition, (micro) AKIS, and those examining structural barriers and enablers to agroecology transition. These diverse perspectives within agroecology enabled valuable critical discussions of methodological and conceptual challenges in the field.

Eighteen presentations explored the symposium’s theme and served as the basis for broader group discussions. Afterwards, the symposium organizers reflected on the presentation and discussions. Reflections were presented to the group during the closing presentation, with time for comments and feedback. A final round of reflections revealed tensions in how agroecology transition research is conceptualized and the methods used to conduct the research.

The four key tensions identified were: the structural constraints limiting farmers’ agency within living lab approaches, the problematic nature of AKIS as supposedly neutral innovation frameworks, the oversimplification of Gliessman’s (2016) transition-transformation levels as linear rather than overlapping and fluid categories, and the risk of dilution or cooptation of the High Level Panel of Experts (HLPE) agroecology principles (HLPE, 2019) (Table 1 presents these using broader terminology).

3 Discussion

The symposium explored agroecology transition research, and, therefore, the four tensions were identified within that context. However, connections to parallel tensions in other sustainable food system research emerged during the literature review and analysis. Thus, many of these tensions are not unique to agroecology frameworks and connect more broadly to research across often-siloed fields studying sustainable food system transitions. Further, these four tensions can be grouped into two categories: tensions within transdisciplinary knowledge systems and tensions in the theoretical and conceptual frameworks used in sustainable transitions research.

3.1 Tensions within transdisciplinary knowledge systems

The tensions related to living labs and AKIS are also seen in food system transition research (and many fields beyond it) that employs

transdisciplinary methodologies. The structural constraints limiting farmers’ agency within living lab approaches are more broadly related to tensions about power imbalances, which could limit participants’ agency. Additionally, when participation is seen as a panacea solution, there is a tendency to overlook potential challenges. The problematic nature of viewing AKIS as neutral innovation frameworks is more broadly a tension between neutral conceptualizations of transdisciplinary knowledge systems that do not account for context and calls for decentralized, community-driven knowledge systems.

3.2 Tensions in the theoretical and conceptual frameworks

Gliessman’s transition levels and the HLPE principles are theoretical and conceptual frameworks that are specific to agroecology. However, while other food system transition research draws on different theoretical and conceptual frameworks, many of the tensions emerging in the agroecology transition frameworks are also experienced in the transition theories and sustainability definitions used in the other (food system transition) fields. The oversimplification of Gliessman’s (2016) transition framework is a tension seen across transition theories, as it inhibits the ability to capture the non-linear nature of change or simultaneous changes across multiple scales. The risk of dilution or cooptation of the HLPE agroecology principles is a tension seen across flexible sustainability-related definitions.

Table 1 outlines the key dimensions of these tensions across food system transition research fields. In the sub-sections below, we explore how the tensions identified in agroecology transition research mirror those encountered more broadly in sustainable food system transition research.

While there is overlap in the tensions that arise in agroecology transition research and other sustainable food system transition research, the manifestation of these tensions in agroecology is shaped by agroecology’s distinctive characteristics: Agroecology’s normative commitments to power redistribution and food sovereignty conflicts with power imbalances in participatory approaches and neutral

TABLE 1 Key tensions in agroecology transition research are also found in other food system transition fields, and the effects of those tensions.

FST field		Concept	Tension	Effect
Food system transition (FST) research	Transdisciplinary research	Living lab methodologies	Power imbalances between stakeholders	Limit participant agency
			Structural constraints	
		Participation as a universal solution	Overlooks practical challenges of implementation	
	Sustainable transition	Transdisciplinary knowledge systems	Knowledge systems as neutral infrastructures	Does not account for context
			Calls for decentralized, community-driven knowledge systems	Contested conceptualizations of knowledge systems
		Transition theories	Oversimplification	Cannot capture non-linearity or simultaneous change across multiple scales
	Sustainability definitions	Definitional flexibility	Opens possibility for cooptation and dilution	

Tensions were identified through symposium presentations, discussions among agroecology transition researchers, and iterative reflection. Parallels to broader food system transition research were explored afterward.

framings of AKIS; its territorial and place-based epistemology misaligns with linear models of transition; the combination of social, ecological, participatory, and governance dimensions is threatened by the dilution of agroecology's principles. The following sub-sections explore the shared tensions across fields, acknowledging that additional insights could be gained by examining how tensions unfold differently across distinctive epistemological grounding and normative commitments.

3.3 Transdisciplinary research tensions in food system transition research

3.3.1 Structural constraints limiting farmers' agency within living lab approaches

Symposium participants perceived that living labs (and co-creation by proxy) are often seen as a panacea solution in the current policy environment, a tension seen across food system transformation initiatives, from local alternative food initiatives to urban food strategies (Levkoe, 2011; Moragues-Faus and Marceau, 2019). It creates a tension between idealized visions of living labs as comprehensive transdisciplinary multi-method solutions to all food system challenges that close the society-science divide and the practical challenges they face, thus requiring moving beyond utopian conceptions (Cacciolatti et al., 2025; Cassart et al., 2025; Lagneaux et al., 2024; Schwarz et al., 2021). Identifying these practical challenges enables their management and reveals leverage points for overcoming barriers (Kozar et al., 2024). Further, understanding these challenges is necessary because living labs' transformative potential is scalar dependent (Thorsøe et al., 2024), and achieving transformation requires the true embeddedness of fair capacity-building for all actors, education, and co-learning (Schwarz et al., 2021).

Underlying these challenges is the question of whether participation is viewed as formal inclusion in an activity or as meaningful decision-making power over research agendas, resource allocation, and outcomes of the activities (Arnstein, 1969). Additionally, many of these practical challenges stem from the context within which the living labs operate. Both agroecology and broader transdisciplinary food system research have explored how deeper systemic issues might constrain living labs. Living labs exist at the intersection of active place-based participatory co-creation ideals and structural realities that shape the political, economic, and social contexts in which they operate, the ways they are implemented, and their outcomes (McPhee et al., 2021). Therefore, living labs might be constrained by deeper systemic issues related to power, economics, knowledge hierarchies (or knowledge production more broadly), and other institutional frameworks. These challenges are not unique to agroecology transition but rather are characteristic of transdisciplinary food system research [and transdisciplinary research in general (Boeraeve et al., 2018)], where different knowledge types and the active involvement of practitioners are key (Brandt et al., 2013).

Power imbalances within living labs constitute one systemic issue (Nguyen and Marques, 2022) and might persist despite participatory intentions. This tension is seen across food system domains, from agroecological transitions to alternative food networks to food policy arenas (Anderson et al., 2019; Cacciolatti et al., 2025; Cruz et al., 2024). Another related challenge is navigating shifting roles. Common examples of role shifts in living lab settings include researchers becoming facilitators and farmers becoming change agents (Den Boer et al.,

2021; McPhee, 2024). Similarly, there might be difficulties in linking traditional and scientific knowledge (Cruz et al., 2022). Furthermore, agriculture is becoming more digitized through technologies such as sensors, decision support systems, and precision tools (Timpanaro et al., 2025), raising questions about data ownership (a major source of power in the digital era) (Lahnamäki-Kivelä and Karikallio, 2024). Finally, structural constraints, such as financial lock-in and policy support mechanisms, also create tensions between farmers' formal participation and their actual agency, often leaving them with less agency than intended or assumed (Thorsøe et al., 2024).

These structural dynamics reflect challenges in food system transformation more broadly, where dominant regimes resist change (Holt Giménez and Shattuck, 2011). Given the scalar-dependent nature of living labs and the importance of capacity-building and co-learning for achieving their transformative potential, this suggests a need to expand the focus of living labs to address these structural dynamics and constraints (Thorsøe et al., 2024) and to consider how the process of knowledge generation and innovation can scale successful transformative local initiatives to regional, national, or EU levels to achieve widespread change (Dalgaard et al., 2024). Different types of scaling (up, out, or deep) may be appropriate in different contexts (Moore et al., 2015). But, adding to the complexity of scaling, processes of different scaling approaches can be closely linked and the scaling dynamics of a particular local initiative can shift over time from scaling up to scaling out or vice versa (Hermans et al., 2016). This requires careful attention to which scaling approaches fit the local conditions and transformation goals.

3.3.2 The problematic nature of AKIS as supposedly neutral innovation frameworks

Symposium discussions also suggest a tension between conceptualizations of AKIS as neutral knowledge infrastructures (EIP-AGRI, 2022) and the reality that AKIS operates within political, cultural, and economic contexts that shape outcomes (Knierim et al., 2015). AKIS actors operate within political, economic, cultural, and ecological contexts that shape knowledge priorities, generation, exchange, and flows (ibid). These dynamics are also seen across other multi-actor and transdisciplinary spaces in food systems, such as local food policy groups (Santo and Moragues-Faus, 2019; Zerbian et al., 2024). Bringing together different agricultural worldviews, interests, and values creates competition between perspectives and innovations for legitimacy, resources, and influence (Anderson and Sumberg, 2017; Schwarz et al., 2021).

In agroecology transition, one way this tension manifests is in the evolving role of farm advisors, who navigate between their long-term relationships working with farmers and engaging with regulatory services (Blix Germundsson and Bååth, in press) and in shifts from public to private advisory services (Vlahos and Koutsouris, 2024) that may risk their objectivity. This tension also appears in discussions of broader multidimensional networks, including education, research, input suppliers, farmer organizations, and policymakers (Sutherland et al., 2023). In these new and evolving knowledge networks, a tension arises between simplified models of knowledge generation and transfer and what is happening on the ground, highlighting a tension between bottom-up and top-down knowledge flows. These tensions underscore the need for a multi-level AKIS model that can account for local and regional AKIS dynamics. This, in turn, has given rise to concepts like microAKIS, whose application has highlighted the

relevance of farmer-centered knowledge systems in agricultural innovation processes (Vlahos and Koutsouris, 2024; Zerbian and López-García, 2024). These findings have led to calls for greater consideration of informal knowledge exchange networks in AKIS dynamics (Kilis et al., 2022), echoing decentralized, community-driven food system governance in alternative food system contexts (Duncan et al., 2022; Renting et al., 2012). At the same time, Knierim (2025) questions the utility and legitimacy of the microAKIS concept, further illustrating the tension in AKIS conceptualizations. Framing AKIS as neutral risks obscuring the power dynamics that determine whose knowledge counts and how innovation priorities are set. Reconceptualizing AKIS as political, adaptive, and context-dependent (Anderson and Sumberg, 2017) would offer a more grounded understanding of how knowledge actually flows in agroecology transitions.

3.4 Theoretical and definitional tensions in food system transition research

3.4.1 The oversimplification of Gliessman's transition-transformation levels as linear rather than overlapping and fluid categories

Gliessman's (2016) agroecology transition-transformation framework identifies five levels of incremental to transformational transition from the agroecosystem to the food system scale, where the lower incremental levels emphasize input efficiency and substitution and the higher transformational levels emphasize redesigning the agroecosystem and global food system. It provides a nearly ubiquitous structuring framework for agroecology research. However, symposium participants critiqued the framework's linear presentation, arguing it oversimplifies transition processes and fails to capture the complexity and diversity observed in reality (McKay et al., 2025; Stone et al., 2025). Gliessman has acknowledged this shortcoming (i.e., it is not a new criticism), yet the tensions persist. The framework also tends to treat socio-cultural principles as external to on-farm practices, which limits the ability to contextualize and makes it challenging to create systemic change (Anderson et al., 2021). Further, the framework struggles to depict change occurring across multiple spatial dimensions simultaneously (e.g., from farms to foodshed to food system dynamics). Averbuch et al. (2024) suggest that adding analytical levels could enable the capturing of interactions among actors across scales. For example, distinguishing between meso and macro levels can reveal barriers and enablers from national and supranational (e.g., EU-level) interactions. A transition framework that captures non-linearity, multiple entry points, socio-cultural context, and interconnections between levels might better reflect the complexity of real-world transitions.

Another tension related to the scalar dimension of transition is that agroecology studies often focus on technical practices at lower levels, when social, economic, and political dimensions must be addressed across all levels (Moeller et al., 2023; Stone et al., 2024). Similar to critiques of the Multi-level Perspective framework for socio-technical system transitions, the use of discrete, ordered levels and hierarchies in theoretical frameworks does not align with observations of food system transition processes in practice (Geels, 2011). Instead, transition processes occur across multiple dimensions at once, with parallel processes operating simultaneously, suggesting that a food system transition

framework should reflect the possibility of multiple entry points and transition pathways. Fernández-Soletto et al. (2024) show that different barriers are present at different points along the transition continuum. Therefore, understanding where farms fall on the continuum is important (Gutiérrez-Briceño et al., 2025). Furthermore, engagement strategies might differ depending on an actor's stage of transition. Leitheiser et al. (2024) suggest that cognitive and conceptual outcomes may contain more transformative potential for actors whose possibilities (or ambitions) are limited to early-stage transitions, while amplification of agency and strategy development are more key for later-stage transitions.

Thus, transition frameworks should consider which stage(s) agroecosystems or food systems in transition might be in rather than assuming they start from level 1, allow for movement in multiple directions simultaneously rather than sequential progression, and explicitly incorporate meso- and macro- level dynamics to capture how barriers and enablers operate across scales.

3.4.2 The risk of dilution or cooptation of the HLPE agroecology principles

The 13 HLPE agroecology principles identify ecological, social, economic, and governance dimensions of agroecology to provide a holistic framework for sustainable food system transformation (HLPE, 2019). These principles—often combined with Gliessman's transition-transformation levels (Wezel et al., 2020)—are also nearly ubiquitous as a structuring framework within agroecology. However, symposium discussions revealed that these principles mean “many things to many people,” reflecting a tension between establishing core values while allowing for context-specific interpretations and applications. This flexibility enables adaptation to diverse farming systems and cultural contexts yet also provides opportunities for dilution and cooptation of the principles (Moeller et al., 2023). Historically, the dilution-cooptation tension has been present in agroecology as a movement (LVC (La Vía Campesina), 2015), and our findings suggest that as agroecology enters mainstream policy (Anderson and Maughan, 2021), the tension increases. Trkulja and Loconto (2024) highlight that this tension can be seen playing out in the current policy landscape. Many countries have fragmented policies that promote specific practices or organic certification but lack a coherent approach to the interconnectedness of sectors within agri-food systems. Furthermore, they show that current policies, Common Agricultural Policy payments, and AKIS systems are inadequately prepared to support agroecological transition, potentially contributing to the dilution of agroecology's systemic principles and transformative potential. This tension also exists in other alternative agricultural and sustainability frameworks (i.e., greenwashing). Thus, the tension is not unique and stems from fears of how alternative, potentially transformative approaches are systematically diluted when they gain institutional recognition.

As one way to combat this, Moeller et al. (2023) suggest using “red flags” to identify when adaptation of a principle becomes cooptation or dilution. These red flags aim to diminish the risk of dilution by ensuring that the core values of agroecology are not compromised. While Moeller et al. (2023) propose red flags for evaluating agroecology project proposals, they could be extended to serve as a research evaluation tool or governance instrument for identifying principle dilution, e.g., when participation becomes

tokenistic, or agroecology is reduced to input substitution. Other research on sustainable urban transformations has shown that reflexive governance and multi-actor collaboration can help institutionalize participatory approaches without losing their transformative potential (de Geus et al., 2024). Thus, reflexive governance might help agroecology navigate this tension. For instance, an early challenge to implementing living labs in Canada was that, while actors understood and supported the concept at a high level, it was challenging to implement it in practice, and thus there was a learning process to fully operationalize the living lab approach (Bancerz, 2021; Lévesque et al., 2025). Recognizing the explanatory limitations of agroecology transition concepts can lead to more precise political and scientific discourse, which reduces potential misconceptions in innovation and transition processes, and this can be supported through the development of more nuanced theoretical frameworks (Knierim, 2025).

4 Conclusion

This paper identified and explored conceptual and methodological tensions that arise when transdisciplinary knowledge co-creation methods are applied to achieve agroecology transitions, based on presentations and group discussions at a November 2024 symposium. The four tensions highlighted surround participatory research methods, knowledge mediation systems, transition frameworks, and cooptation. Importantly, we show that these tensions are not unique to agroecology transition research but are also evident in other fields engaged in food system transition research. The exploration of the tensions in a broader agri-food systems perspective revealed shared methodological and theoretical challenges (e.g., power imbalances in participatory research methods, limitations of linear transition frameworks, and the risk of cooptation). These commonalities suggest opportunities for mutual learning to strengthen food system transition theories and methods across research and practice.

These identified tensions point to fundamental reconceptualizations that treat AKIS as political and contextual rather than neutral, adopt non-linear transition frameworks, and actively address power imbalances in transdisciplinary research. Beyond researchers recognizing these tensions, practitioners working with agroecology living labs need operational guidance. First, because agroecology living labs exist at the intersection of two fields that are characterized by definitional flexibility, they might face double the risk of cooptation and dilution that exists at conceptual, methodological, policy, and implementation levels, but most acutely at the methodological level, where flexible definitions make it difficult to enforce rigorous participatory and agroecology standards. Developing a “red flags” framework for agroecology living labs, similar to those proposed for agroecology principles, could help address this compounded vulnerability. These red flags could assess power (re)distribution in living labs and whether transformative intent is maintained when initiatives are scaled or institutionalized, for instance, by establishing criteria for meaningful participation and mechanisms for ongoing monitoring of power dynamics. Second, investing in capacity-building programs for AKIS actors with shifting roles (e.g., advisors and researchers) could help

develop competencies for facilitating co-creation processes that go beyond technical knowledge transfer.

Clarity at the conceptual and methodological levels is necessary for successful real-world implementation. Therefore, by reducing siloing and jointly addressing these tensions, we can develop more effective approaches to support food system transitions that account for complexity, power dynamics, place specificity, and multiple change pathways.

Data availability statement

The original contributions presented in this study are included in the article and the book of abstracts from the ‘Exploring methods for researching shifts in knowledge production for agroecology transition’ Symposium (<https://www.agroecologypartnership.eu/en/symposium-2024-exploring-methods-for-researching-shifts-in-knowledge-production-for-agroecology-transition>). Further inquiries can be directed to the corresponding author.

Author contributions

BA: Conceptualization, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing. TSt: Conceptualization, Formal analysis, Investigation, Visualization, Writing – original draft, Writing – review & editing, Methodology. TSa: Writing – original draft, Writing – review & editing, Investigation, Methodology. GS: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing – review & editing. MT: Writing – original draft, Writing – review & editing, Conceptualization, Investigation, Methodology, Visualization. JB: Writing – review & editing, Investigation, Methodology. FB: Writing – review & editing, Investigation, Methodology. PC: Writing – review & editing, Investigation, Methodology. TD: Writing – review & editing, Investigation, Methodology. BD: Writing – review & editing, Investigation, Methodology. BH: Writing – review & editing, Investigation, Methodology. BK: Writing – review & editing, Investigation, Methodology. H-MK: Writing – review & editing, Investigation, Methodology. AKn: Writing – review & editing, Investigation, Methodology. AKo: Writing – review & editing, Investigation, Methodology. RK: Writing – review & editing, Investigation, Methodology. SLa: Writing – review & editing, Investigation, Methodology. SL-K: Writing – review & editing, Investigation, Methodology. SLe: Writing – review & editing, Investigation, Methodology. AL: Writing – review & editing, Investigation, Methodology. CM: Writing – review & editing, Investigation, Methodology. NM: Methodology, Writing – review & editing, Investigation. EP: Writing – review & editing, Investigation, Methodology. CP: Writing – review & editing, Investigation, Methodology. PS: Writing – review & editing, Investigation, Methodology. IT: Writing – review & editing, Investigation, Methodology. GV: Writing – review & editing, Investigation, Methodology. TZ: Writing – review & editing, Investigation, Methodology. TB: Writing – review & editing, Investigation, Methodology, Conceptualization, Formal analysis, Funding

acquisition, Project administration, Supervision, Writing – original draft, Resources.

Funding

The author(s) declared that financial support was received for this work and/or its publication. BA, TSt, TSa, GS, MHT, JB, FB, BD, BK, HMK, AKo, RK, SLK, AML, EP, IT, GV, and TRB were funded by the Agroecology Partnership, which is co-funded by the European Union, under Grant number 101132349; PC and SLe were funded by the Agroecology-TRANSECT project that has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No. 101060816; TZ was funded by the AETERAKIS project funded by the European Union under Grant HORIZON-MSCA-2023-PF-01, project number 101146631; SLa was funded by the Walloon Recovery Plan (PRW), Walloon Agricultural Research Centre (CRA-W), and Agroecology Transect, Horizon Europe No. 10049476. The views and opinions expressed are those of the authors only and do not necessarily reflect those of the European Union or European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

Acknowledgments

We would like to thank the other participants of the Exploring methods for researching shifts in knowledge production for agroecology transition symposium for the valuable discussions and insights that shaped this work.

References

- Anderson, C. R., Bruil, J., Chappell, M. J., Kiss, C., and Pimbert, M. P. (2019). From transition to domains of transformation: getting to sustainable and just food systems through agroecology. *Sustainability* 11:5272. doi: 10.3390/su11195272
- Anderson, C. R., Bruil, J., Chappell, M. J., Kiss, C., and Pimbert, M. P. (2021). "Conceptualizing processes of Agroecological transformations: from scaling to transition to transformation" in *In: Agroecology Now!* (London: Palgrave Macmillan, Cham). doi: 10.1007/978-3-030-61315-0_3
- Anderson, C. R., and Maughan, C. (2021). "The innovation imperative": the struggle over agroecology in the international food policy arena [original research]. *Front. Sustain. Food Syst.* 5:2021. doi: 10.3389/fsufs.2021.619185
- Anderson, J. A., and Sumberg, J. (2017). "Knowledge politics in development-oriented agronomy," in *Agronomy for Development: The Politics of Knowledge in Agricultural Research*, ed. J. Sumberg. 1st ed. (London: Routledge).
- Arnstein, S. R. (1969). A ladder of citizen participation. *J. Am. Inst. Plann.* 35, 216–224. doi: 10.1080/01944366908977225
- Averbuch, B., Iversen, S. V., Stone, T. F., Berg, T. R., Avila Castuera, J. M., Bijttebier, J., et al. (2024). "Addressing the heterogeneity of perceptions of living labs in relation to Agroecology transition across Europe" in *European Partnership AGROECOCLOGY Symposium: Exploring Methods for Researching Shifts in Knowledge Production for Agroecology Transition* (Brussels).
- Bancerz, M. (2021). Exploring collaborative innovation approaches: early deliberations from the living laboratories initiative. *Int. Public Manag. Rev.* 21, 46–79. Retrieved from: <https://ipmr.net/index.php/ipmr/article/view/427>
- Blix Germundsson, L., and Bääth, J. (in press). From legal compliance to knowledge brokerage: how a group of farm advisers developed mediation practices between farmers and regulatory authorities. *Journal of Agricultural Education and Extension*.
- Boeraeve, F., Dufrene, M., De Vreese, R., Jacobs, S., Pipart, N., Turkelboom, F., et al. (2018). Participatory identification and selection of ecosystem services: building on field experiences. *Ecol. Soc.* 23:27. doi: 10.5751/ES-10087-230227

Conflict of interest

TSa was employed by Osterreichische Agentur für Gesundheit und Ernährungssicherheit GmbH.

The remaining author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declared that Generative AI was not used in the creation of this manuscript.

Any alternative text (alt text) provided alongside figures in this article has been generated by Frontiers with the support of artificial intelligence and reasonable efforts have been made to ensure accuracy, including review by the authors wherever possible. If you identify any issues, please contact us.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

- Brandt, P., Ernst, A., Gralla, F., Luederitz, C., Lang, D. J., Newig, J., et al. (2013). A review of transdisciplinary research in sustainability science. *Ecol. Econ.* 92, 1–15. doi: 10.1016/j.ecolecon.2013.04.008
- Cacciolatti, L., Lee, S. H., Christodoulou, I., and Christofi, M. (2025). Living labs as ethical spaces: fostering innovation and sustainability in food systems. *J. Bus. Ethics.* doi: 10.1007/s10551-025-06174-8
- Cascone, G., Scuderi, A., Guarnaccia, P., and Timpanaro, G. (2024). Promoting innovations in agriculture: living labs in the development of rural areas. *J. Clean. Prod.* 443:141247. doi: 10.1016/j.jclepro.2024.141247
- Cassart, P., Frei, A., Hauggaard-Nielsen, H., Kruse Rasmussen, H., Swartebroeckx, A., Froidmont, E., et al. (2025). A heuristic framework to portray agroecological transition initiatives in reflexive arrangements, illustrated with a conservation agriculture network in Denmark. *Ecol. Soc.* 30:10. doi: 10.5751/ES-15770-300210
- Cruz, J. L., Albisu, L. M., Zamorano, J. P., and Sayadi, S. (2022). Agricultural interactive knowledge models: researchers' perceptions about farmers' knowledges and information sources in Spain. *J. Agric. Educ. Extens.* 28, 325–340. doi: 10.1080/1389224X.2021.1932537
- Cruz, J. C., Bertuglia, A., Sabán, C., and Saradi, S. (2024). *Knowledge, Communication, and change: Three AKIS Stages to foster the Agroecology transition. European Partnership AGROECOCLOGY Symposium: Exploring Methods for Researching Shifts in Knowledge Production for Agroecology Transition*. Brussels.
- Dalgaard, T., Accatino, F., Pfeifer, C., Sterly, S., Pabst, H., et al. (2024). *Potentials and Barriers for more Mixed Farming and Agroforestry Systems—Shifts Needed in Knowledge Production for Agroecology transition in Europe. European Partnership AGROECOCLOGY Symposium: Exploring Methods for Researching Shifts in Knowledge Production for Agroecology transition*. Brussels.
- de Geus, T., Wittmayer, J. M., and Silvestri, G. (2024). A balancing act: radicality and capture in institutionalising reflexive governance for urban sustainability transitions. *Urban Transf.* 6:2. doi: 10.1186/s42854-023-00061-z

- Den Boer, A. C. L., Broerse, J. E. W., and Regeer, B. J. (2021). The need for capacity building to accelerate food system transformation. *Curr. Opin. Food Sci.* 42, 119–126. doi: 10.1016/j.cofs.2021.05.009
- Duncan, J., DeClerck, F., Báldi, A., Treyer, S., Aschemann-Witzel, J., Cuhls, K., et al. (2022). Democratic directionality for transformative food systems research. *Nat. Food* 3, 183–186. doi: 10.1038/s43016-022-00479-x
- EC. (2020a). EU Biodiversity Strategy for 2030: Bringing Nature Back into our Lives (COM/2020/380 Final). Available online at: https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en (Accessed December 3, 2025).
- EC (2020b). A Farm to Fork Strategy for a Fair, Healthy and Environmentally-Friendly Food System (COM/2020/381 Final). Available online at: https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en (Accessed December 3, 2025).
- EC (2025). Research infrastructures: policy, strategy, how to apply and work programmes. *Directorate-General for Research and Innovation*. Available online at: https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/research-infrastructures_en (Accessed November 20, 2025).
- EIP-AGRI (2022). Agricultural knowledge and innovation systems (AKIS): boosting innovation and knowledge flows across Europe. Available online at: https://eu-cap-network.ec.europa.eu/publications/eip-agri-brochure-agricultural-knowledge-and-innovation-systems-boosting-innovation_en (Accessed October 8, 2025).
- ENoLL (2025). Living labs. Available online at: <https://enoll.org/living-labs/>
- European Commission (2019). The European Green Deal. COM(2019) 640 final. Available online at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2019%3A640%3AFIN> (Accessed October 1, 2025).
- EU SCAR (2012). *Agricultural Knowledge and Innovation Systems in Transition – A Reflection Paper*. Brussels: SCAR.
- Fernández-Soledo, P., Gutiérrez-Briceño, I., Márquez-Barrenechea, A., Pérez-Ramírez, I., Yacamán Ochoa, C., Lucantoni, D., et al. (2024). “Identifying and addressing farmers’ perceived barriers for the agroecological transition in the Madrid region,” in *European Partnership AGROECOCLOGY Symposium: Exploring Methods for Researching Shifts in Knowledge Production for Agroecology transition*, (Brussels).
- Geels, F. W. (2011). The multi-level perspective on sustainability transitions: responses to seven criticisms. *Environ. Innov. Soc. Transitions* 1, 24–40. doi: 10.1016/j.eist.2011.02.002
- Giraldo, O. F., and Rosset, P. M. (2018). Agroecology as a territory in dispute: between institutionality and social movements. *J. Peasant Stud.* 45, 545–564. doi: 10.1080/03066150.2017.1353496
- Gliessman, S. (2016). Transforming food systems with agroecology. *Agroecol. Sustain. Food Syst.* 40, 187–189. doi: 10.1080/21683565.2015.1130765
- Grace, K., Siddiqui, S., and Zaitchik, B. F. (2021). A framework for interdisciplinary research in food systems. *Nat. Food* 2, 1–3. doi: 10.1038/s43016-020-00212-6
- Gutiérrez-Briceño, I., Pérez-Ramírez, I., Yacamán-Ochoa, C., Lucantoni, D., Vizuete, B., Hevia, V., et al. (2025). Unravelling agroecological transitions: a multidimensional study of the horticultural sector in Madrid. *Int. J. Agric. Sustain.* 23:2551423. doi: 10.1080/14735903.2025.2551423
- Hermans, F., Roep, D., and Klerkx, L. (2016). Scale dynamics of grassroots innovations through parallel pathways of transformative change. *Ecol. Econ.* 130, 285–295. doi: 10.1016/j.ecolecon.2016.07.011
- HLPE (2019). “Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition” in *A Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security* (Rome).
- Holt Giménez, E., and Shattuck, A. (2011). Food crises, food regimes and food movements: rumblings of reform or tides of transformation? *J. Peasant Stud.* 38, 109–144. doi: 10.1080/03066150.2010.538578
- Juri, S., Terry, N., and Pereira, L. M. (2024). Demystifying food systems transformation: a review of the state of the field. *Ecol. Soc.* 29:5. doi: 10.5751/ES-14525-290205
- Kilis, E., Adamson-Fiskovica, A., Šūmane, S., and Tisenkopfs, T. (2022). (dis)continuity and advisory challenges in farmer-led retro-innovation: biological pest control and direct marketing in Latvia. *J. Agric. Educ. Ext.* 28, 653–670. doi: 10.1080/1389224X.2021.1997770
- Knierim, A. (2025). Why use the microAKIS concept? *J. Agric. Educ. Extens.* 31, 437–448. doi: 10.1080/1389224X.2024.2402307
- Knierim, A., Boenning, K., Caggiano, M., Cristóvão, A., Dirimanova, V., Koehnen, T., et al. (2015). The AKIS concept and its relevance in selected EU member states. *Outlook Agric.* 44, 29–36. doi: 10.5367/oa.2015.0194
- Kozar, R., Stone, T. F., Klemm, T., Dean, G., Csonka, V., et al. (2024). “Doing co-creation for transformative change. What are the implications for an agroecological living lab approach? A systematic review,” in *European Partnership AGROECOCLOGY Symposium: Exploring Methods for Researching Shifts in Knowledge Production for Agroecology transition*, (Brussels).
- Lagneaux, S., Tosar, V., Fockede, A., Mathot, M., and Stilmant, D. (2024). “Data sharing on living labs enhancing agriculture’s transition,” in *European Partnership AGROECOCLOGY Symposium: Exploring Methods for Researching Shifts in Knowledge Production for Agroecology transition*, (Brussels).
- Lahnämäki-Kivelä, S., and Karikallio, H. (2024). “Three projects to improve transdisciplinarity and the co-construction of knowledge into the agro-ecological transition,” in *European Partnership AGROECOCLOGY Symposium: Exploring Methods for Researching Shifts in Knowledge Production for Agroecology transition*, (Brussels).
- Lamine, C., Darnhofer, I., and Marsden, T. K. (2019). What enables just sustainability transitions in agrifood systems? An exploration of conceptual approaches using international comparative case studies. *J. Rural. Stud.* 68, 144–146. doi: 10.1016/j.jrurstud.2019.03.010
- Leitheiser, S., Rossing, W., van Dam, D., Egmond, J., Hauggard-Nielsen, H., Kazakova, Y., et al. (2024). “How can actionable knowledge co-production contribute to agroecological transformation? A middle-range evaluation model to support transformative learning in mission-oriented science-society collaborations,” in *European Partnership AGROECOCLOGY Symposium: Exploring Methods for Researching Shifts in Knowledge Production for Agroecology transition*, (Brussels).
- Lévesque, A., Bancercz, M., Thivierge, C., Arseneau, M., Berberi, A., and McPhee, C. (2025). “Living in an agroecosystem living lab” in *Participant Reflections from the Living Laboratories Initiative in Canada [Conference Presentation]*. *Second International Forum on Agroecosystem Living Labs* (Bordeaux, France).
- Levidow, L., Pimbert, M., and Vanloqueren, G. (2014). Agroecological research: conforming—or transforming the dominant agro-food regime? *Agroecol. Sustain. Food Syst.* 38, 1127–1155. doi: 10.1080/21683565.2014.951459
- Levkoe, C. Z. (2011). Towards a transformative food politics. *Local Environ.* 16, 687–705. doi: 10.1080/13549839.2011.592182
- López-García, D., and de González Molina, M. (2021). An operational approach to agroecology-based local Agri-food systems. *Sustainability* 13:8443. doi: 10.3390/su13158443
- LVC (La Via Campesina) (2015). Declaration of the International Forum for Agroecology. Available online at: <https://viacampesina.org/en/2015/03/declaration-of-the-international-forum-for-agroecology-mali-2015/> (Accessed May 14, 2025).
- McKay, B. M., Nehring, R., and Catacora-Vargas, G. (2025). The political economy of agroecological transitions: key analytical dimensions. *J. Peasant Stud.* 52, 461–484. doi: 10.1080/03066150.2024.2399138
- McPhee, C. (2024). “Researching participant experiences: Lessons from Agriculture and Agri-Food Canada’s network of agroecosystem living labs,” in *European Partnership AGROECOCLOGY Symposium: Exploring Methods for Researching Shifts in Knowledge Production for Agroecology Transition*, (Brussels).
- McPhee, C., Bancercz, M., Mambrini-Doudet, M., Chrétien, F., Huyghe, C., and Gracia-Garza, J. (2021). The defining characteristics of agroecosystem living labs. *Sustainability* 13:1718. doi: 10.3390/su13041718
- Moeller, N. I., Geck, M., Anderson, C., Barahona, C., Broudic, C., Cluset, R., et al. (2023). Measuring agroecology: introducing a methodological framework and a community of practice approach. *Elem. Sci. Anth.* 11:42. doi: 10.1525/elementa.2023.00042
- Moore, M. L., Riddell, D., and Vocisano, D. (2015). Scaling out, scaling up, scaling deep: strategies of non-profits in advancing systemic social innovation. *J. Corp. Citizensh.* 2015, 67–84. doi: 10.9774/GLEAF.4700.2015.jy.00009
- Moragues-Faus, A., and Marceau, A. (2019). Measuring progress in sustainable food cities: an indicators toolbox for action. *Sustainability* 11:45. doi: 10.3390/su11010045
- Nature Food (2020). From silos to systems. *Nat. Food* 1, 1–1. doi: 10.1038/s43016-019-0027-8
- Nguyen, H. T., and Marques, P. (2022). The promise of living labs to the quadruple Helix stakeholders: exploring the sources of (dis)satisfaction. *Eur. Plan. Stud.* 30, 1124–1143. doi: 10.1080/09654313.2021.1968798
- Renting, H., Schermer, M., and Rossi, A. (2012). Building food democracy: exploring civic food networks and newly emerging forms of food citizenship *the international journal of sociology of agriculture and food*. *Int. J. Sociol. Agric. Food* 19, 289–307. doi: 10.48416/ijsoaf.v19i3.206
- Santo, R., and Moragues-Faus, A. (2019). Towards a trans-local food governance: exploring the transformative capacity of food policy assemblages in the US and UK. *Geoforum* 98, 75–87. doi: 10.1016/j.geoforum.2018.10.002
- Schwarz, G., Vanni, F., and Miller, D. (2021). The role of transdisciplinary research in the transformation of food systems. *Agric. Food Econ.* 9:35. doi: 10.1186/s40100-021-00207-2
- Stone, T. F., Alami, S., Bach, J. L., Bindelle, J., Busse, M., Ciaccia, C., et al. (2025). Agroecology living labs to transform food systems: a critical review at the science-policy-society nexus in Europe. *Agroecol. Sustain. Food Syst.* 49, 1–42. doi: 10.1080/21683565.2025.2560915
- Stone, T. F., Nichols, V., and Thorsøe, M. H. (2024). Exploring the position of farmers within the European green transition: transformation for whom? *Front. Sustain. Food Syst.* 8:1456987. doi: 10.3389/fsufs.2024.1456987
- Sutherland, L.-A., Adamson-Fiskovica, A., Elzen, B., Koutsouris, A., Laurent, C., Stræte, E. P., et al. (2023). Advancing AKIS with assemblage thinking. *J. Rural. Stud.* 97, 57–69. doi: 10.1016/j.jrurstud.2022.11.005
- Thorsøe, M. H., Stone, T. F., and Berg, T. R. (2024). “Limits to living labs: conditions for adopting sustainable soil management by strategic decision-support,” in *European Partnership AGROECOCLOGY Symposium: Exploring Methods for Researching Shifts in Knowledge Production for Agroecology transition*, (Brussels).
- Timpanaro, G., Cascone, G., and Foti, V. T. (2025). Enabling technologies in citrus farming: a living lab approach to agroecology and sustainable water resource management. *Bio-Based Appl. Econ.* 14, 67–84. doi: 10.36253/bae-17357

- Trkulja, I., and Loconto, A. M. (2024). "European science-society-policy Interface: inquiry into (dis)connections among AKIS actors," in *European Partnership AGROECOCLOGY Symposium: Exploring Methods for Researching Shifts in Knowledge Production for Agroecology transition*, (Brussels).
- Vlahos, G., and Koutsouris, A. (2024). "The role of farm advisors in agroecological AKIS," in *European Partnership AGROECOCLOGY Symposium: Exploring Methods for Researching Shifts in Knowledge Production for Agroecology transition*, (Brussels).
- Wezel, A., Bellon, S., Doré, T., Francis, C., Vallod, D., and David, C. (2009). Agroecology as a science, a movement and a practice. A review. *Agron. Sustain. Dev.* 29, 503–15. doi: 10.1051/agro/2009004
- Wezel, A., Herren, B. G., Kerr, R. B., Barrios, E., Gonçalves, A. L. R., and Sinclair, F. (2020). Agroecological principles and elements and their implications for transitioning to sustainable food systems. A review. *Agron. Sustain. Dev.* 40:40. doi: 10.1007/s13593-020-00646-z
- Zerbian, T., and López-García, D. (2024). "Exploring multilevel and territorial dynamics of AKIS through a mixed-methods approach based on social network analysis," in *European Partnership AGROECOCLOGY Symposium: Exploring Methods for Researching Shifts in Knowledge Production for Agroecology transition*, (Brussels).
- Zerbian, T., Moragues-Faus, A., López-García, D., and García-García, L. (2024). Territorialising knowledge-policy interfaces: lessons from urban food governance spaces. *Environ. Sci. Pol.* 161:103883. doi: 10.1016/j.envsci.2024.103883