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Exploring methods for researching shifts in knowledge production for agroecology transition

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When more knowledge is not enough: Leveraging critical social science and red flags for agroecology transformations

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Abstract:

As agroecology increasingly becomes a focal point for sustainable food system transformations, significant challenges remain in ensuring genuine systemic change, rather than mere adjustments to a failing status quo. In this presentation, I argue for two essential strategies to enable a thoroughgoing agroecological transformation: (1) more knowledge alone is insufficient—critical social sciences must play a leading role in transdisciplinary efforts to break down barriers to action; and (2) strong frameworks clarifying what agroecology truly entails are vital to safeguard against the cooptation of this radical transformation of food and farming systems.

The first part critiques the persistent reliance on the knowledge deficit model and the limitations of 'thin' participatory methodologies. While stakeholder participation in knowledge generation is crucial, the who, what, and how of participation determine its effectiveness and the transformative potential of the knowledge produced. As participatory processes become mainstream, they often become watered down, tokenistic, or disconnected from the diversity of experiences on the ground. Moreover, the issue is not that we need more knowledge to move forward, but rather that despite the wealth of knowledge we already possess, meaningful action remains elusive. Critical, qualitative social sciences are particularly adept at uncovering contextual specificities, dynamic processes, hidden inequalities and the multi-dimensional challenges inherent in social transformation. These disciplines can articulate transdisciplinary knowledge and provide robust analyses of systemic barriers and opportunities. For example, ethnography excels at analyzing complex social situations and non-linear change processes. Related co-creative methodologies, such as outcome harvesting, participatory monitoring and evaluation, and action research, are singularly capable of accompanying open-ended policy experiments and evaluating complex outcomes that resist reduction to quantifiable indicators. However, social sciences and humanities (SSH) remain, at best, an add-on in AKIS-oriented research projects, including living labs, with their scope often limited to consumer behaviour studies. More critical social science-led living labs have the potential to foster deeper paradigmatic change by directly addressing structural barriers and identifying systemic leverage points.

Building on this foundation, the second part introduces the Agroecology Assessment Framework, developed by a multi-sectoral community of practice focused on financing agroecological transformation. This qualitative framework operationalises the 13 principles of agroecology (HLPE 2019) and introduces “red flags” as a necessary safeguard against the co-optation and dilution of agroecology. Red flags serve as critical markers, identifying practices fundamentally incompatible with agroecological principles—such as the promotion of GMOs, monocultures, or extractive value chains. Through these red flags and other mechanisms, the framework ensures that agroecological initiatives remain aligned with transformative goals, rather than being reduced to incremental improvements within existing systems. It also offers a practical tool for navigating the complex landscape of agroecology transitions, enabling researchers and practitioners to maintain the integrity of their efforts while adapting to diverse European contexts.

These two approaches—critical social science as a central building block to break down barriers to action, and the Agroecology Assessment Framework to ensure transformative ambitions—come together to drive the paradigm shift that is often discussed but rarely realized. This contribution to the symposium aims to advance the dialogue on AKIS, living labs, and the barriers and enablers of agroecology, offering actionable insights for researchers, policymakers, and practitioners alike.

Addressing the heterogeneity of perceptions of living labs in relation to agroecology transition across Europe

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Abstract:

Agroecology represents a transformative approach to agricultural practices. Central to the understanding and application of agroecology is the High-Level Panel of Experts (HLPE) on Food Security and Nutrition's 13 principles of agroecology. These principles provide a context-specific framework that positions agroecology as a critical response to the unsustainable practices prevalent in contemporary food systems. However, the application of agroecology faces significant challenges, particularly due to diverse interpretations of its core concepts, which can lead to fragmentated approaches that hinder broader transitions, for instance at the European level.

Within the HLPE framework, knowledge (co-creation) is the central and unifying principle that connects all 13 principles. HLPE emphasizes knowledge primarily in operational terms, highlighting the importance of co-learning, participatory processes, and the knowledge-intensive and place-specific nature of farming practices. However, understanding the HLPE knowledge principle at the structural level is equally important. Perceptions of agroecology and transition concepts can act as structural enablers within broader knowledge systems, influencing the effectiveness of Agricultural Knowledge and Innovation Systems (AKIS) in supporting agroecology transitions.

AKIS play a central role in fostering agroecology transitions by facilitating collaboration between farmers, researchers, policy makers, and other stakeholders while also ensuring that agroecological knowledge is relevant, accessible, and responsive to local contexts. However, the European AKIS landscape is highly heterogeneous, with variations in the strength AKIS across countries. Stronger AKIS typically feature national-level actors who help integrate and sustain knowledge co-creation and exchange, while weaker AKIS are marked by fragmentation and lack of effective coordination among actors.

Our study investigates how national-level AKIS actors in 18 European countries perceive agroecology and the role of living labs in relation to agroecology transition. We use a barriers and enablers framework alongside the HLPE framework, with a specific focus on knowledge as the central principle for propelling transitions. We find that the actors have limited understanding of key agroecology concepts, and that perceptions of transition concepts also vary considerably across Europe. These variations reflect deeper structural

differences in how knowledge is shared, valued, and integrated within national AKIS, acting as enablers or barriers to agroecology at the national level. These varying perceptions also highlight the conceptual ambiguity and directional uncertainty surrounding European policy on farmer-driven innovation and the need for a better understanding of the enablers and barriers to agroecology transition, suggesting that policies must be more context-sensitive to be effective. Thus, this heterogeneity underscores the need for a more nuanced understanding of how policies aimed at fostering agroecology transition can be effectively implemented across diverse contexts.

Researching Participant Experiences: Lessons from Agriculture and Agri-Food Canada's Network of Agroecosystem Living Labs

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Abstract:

In 2018, recognizing that urgent action was needed to accelerate its response to climate change and other agri-environmental challenges, Agriculture and Agri-Food Canada (AAFC) began building a nationwide network of living labs to help accelerate the development and adoption of sustainable practices and technologies by Canadian farmers. In parallel to its six years of real-world implementation experience, AAFC has engaged in extensive international knowledge exchange to develop and refine the conceptual grounding of the "agroecosystem living lab" (McPhee et al., 2021). Now, the nationwide network consists of 14 living labs totalling more than 1,000 participants undertaking more than 100 innovation and research activities practices under the new, 10-year $185 million Agricultural Climate Solutions – Living Labs program, which is focused on developing on-farm climate solutions that will increase carbon sequestration carbon and reduce greenhouse gas emissions, all while providing environmental and socio-economic benefits. This presentation will focus on methodological efforts to better understand progress with a desired knowledge-production shift toward more collaborative innovation and research activities within AAFC and with its partner organizations, industry, and agricultural producers. Results will be shared from a recent qualitative, interview-based study with 49 participants from AAFC's original four living labs, representing a range of roles (e.g., farmers, scientists, and partners) to document their experiences with the living labs approach and from efforts to document both direct and indirect impacts. The findings explore the practical outcomes but also the challenges in unleashing the full potential of the approach, resolving divergent expectations and needs, and adapting to a new way of working. Finally, the presentation will put a critical lens on some of the key obstacles, levers, and enablers to innovation and knowledge production using the agroecosystems living lab approach.

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An AKIS perspective on authorities' regulation of agriculture: Insights from a better-regulations project

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Abstract:

The last decades have seen a change in the conception of the working practices of farm advisors; from linear technology transfer towards interactive and participatory practices. This includes a change in advisors' focus, from production-related advice to encompass a broader set of issues. Such a broadened perspective relates to agroecological understandings of agri-food systems as holistic systems that integrate biological, technological, economic, political, and cultural dimensions of provisioning (Gliessman, 2014). One issue exemplifying the relevance of such a holistic perspective is on-farm legal compliance. Between 1996 and 2021, the number of regulations related to farming activities increased by 134% in Sweden, despite politicians and authorities on EU and national levels claiming to be working for "better regulations", i.e., simpler and more precise legislation.

Regulation is likely necessary for realising a more equitable and sustainable food system. Nevertheless, such regulation must be appropriate in terms of realising its intended farm-level effects. While advisory services conventionally include helping farmers with regulatory compliance, Swedish agricultural advisors have recently sought to also influence regulation and associated audit practices on part of the farmers' interests. This change suggests a novel set of advisory practices and prefigures a novel vocational role of advisors in the agri-food system. Moreover, such practices call for novel methods to study agricultural knowledge and innovation systems (AKIS), in which authorities and regulation are given a previously little studied role within the AKIS context; as regulating and auditing bodies.

To engage with said issues, this paper studies a group of advisors who started a "better-regulations project", aimed towards a reduced regulatory burden for farmers. To shed light on how authorities' regulation and auditing of farmers relates to the AKIS perspective, it asks the questions: how do advisors develop their practices and knowledge-use to deal with issues of better regulations, and how do advisors attempt to broker between the perspectives of authorities and farmers?

To answer these questions moreover requires an approach that appreciates advisors not only as individual actors but also as a practice community who organise to change advisory practices and farming regulations collectively (Wenger, 1998).

Research approach

The paper draws on 22 semi-structured interviews with participants, and meeting notes, from a better-regulations project running 2020-2024. The interviewees included agricultural advisors, regulatory authorities, and farmers' associations. The analysis involved structural coding and analytical memo-writing.

Results and implications

Normally, advisors' work is directed solely at farmers. In this project, however, the advisors came to direct their work also towards regulating authorities. This highlight advisors' evolving role in identifying issues related to legal compliance, and the importance of advisors' ability to cooperate and form communities of practices with advisors and other stakeholders to develop new knowledge and knowledge practices (Wenger 1998; Blackmore 2010). Furthermore, the implications emphasise the role of authorities as regulating and auditing bodies in an AKIS perspective, and the acknowledgement of this role for achieving a holistic agroecological perspective of farming. The results show how the advisors challenged the authorities to review the quality of their governance, rather than question their legitimacy. The results of this study do not only suggest that advisory services might have a new role to play in the future development of an equitable and sustainable agri-food system in general, but also that regulation and auditing of authorities should be included in a holistic farm perspective.

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The role of farm advisors in agroecological AKIS

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Abstract:

Since the accession of Greece to the EU in 1981, farmers' needs for advice were mainly covered by private agronomists who, adapting to the prevailing CAP tendency to subsidise production, primarily acted as input retailers with advice being a service "accompanying" sales. The only exception have been organic farming advisors who, nevertheless, due to the certification system were rather limited to the promotion of input substitution rather than a transition to agroecology.

On the other hand, growing awareness of European citizens concerning food safety, environmental degradation and climate change begun to be increasingly reflected in the EU agrifood policy agenda. A first response by the private sector (retail chains, multinational food companies, etc.) was the promotion of a series of private food standards. A common characteristic of such standards has been that, on the one hand, the costs incurred burdened in their entirety farmers while, on the other hand, there was no real assessment of their environmental effectiveness. In parallel, a series of public or mixed type initiatives emerged in order to enable farmers to address the new scene: issues such as food safety, environmental protection and quality became the keys to competitiveness and sustainability of farms.

We argue that, first, agroecology should be taken as a response to both input substitution version of organic agriculture and the multiplicity of standards which increase consumers' confusion, creating doubts in society at large. Second, drawing from the experience gained by working for more than a decade with private farm advisors in collaborative research projects, we suggest that an AKIS aiming to contribute to a transition towards agroecology would gain from acknowledging pluralistic advisory landscapes; in widening horizontally the network due to the trust accumulated through years of effective collaboration with farmers; and, in scaling up local, dispersed initiatives. Third, academics and various experts can also contribute to the endeavor with their knowledge, expertise and skills within a participatory framework, as well as with the promotion of linkages to EU level networks.

In Greece, the first group of actors that reacted to this new reality, has been private farm advisors in close collaboration with those co-operatives which attempted to overcome the

inertia created by relying solely on EU subsidies and academics. Such co-operations have been initially triggered by negative events with farmers and farmers ´ co-operatives being at a critical point, due to an abrupt change in EU fruit and vegetables sectoral policy. During this initial phase certain needs became apparent: the need for 'independent' advice , but at the same time for co-operation with input providers; the introduction of organizational innovations; and the essential role of targeted training and rapid information dissemination. In the creation of this Community of Practice, academics also faced new challenges, i.e. the involvement of advisors and co-ops in research process, and the building of the institutional capacity of FBOs to become engaged in of policy making processes.

Conceptually based on the notion of micro – AKIS defined as the knowledge systems that farmers personally assemble, including the range of individuals and organisations from whom they seek services and exchange knowledge, and the processes involved in the formation and working of the system (Sutherland and Labarthe, 2022)1, the creation of a platform/community is envisaged; in the framework of a common knowledge and information pool, farmers, advisors, co-ops and other interrelated actors/ stakeholders will contribute reliable farm level data, information and insights with academics providing validation and novelties.

Such an approach advocating a bottom-up (micro-AKIS) approach to agro-ecology, further calls for the reinforcement of cross-disciplinarity in academia along with the development of a different ethos among current and future advisors and experts. One cannot ignore the role of Universities (and research institutions) in instigating such a process by reorienting and integrating their curricula, providing students with so skills, in order to become able to take active part and facilitate collective bottom up initiatives/ interactive innovation, and actively promoting the new collaborative ethos.

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Exploring multilevel and territorial dynamics of AKIS through a mixed-methods approach based on social network analysis

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Abstract:

As the conceptualisation of Agricultural Knowledge and Innovation Systems (AKIS) has evolved within European Union (EU) policy, AKIS are now viewed as networks of organisations and actors from various sectors that shape agri-food systems (EU SCAR AKIS, 2019). Despite this, guidelines and policies for aligning AKIS with Sustainable Development Goals (SDGs), ecosystem integrity, and climate adaptation while accounting for decentralised structures remain limited (Laurent et al., 2022). Thus, scholars suggest advancing mission-oriented, territory-based AKIS, such as those focusing on agroecological transitions, to better integrate place-based dynamics (Brunori et al., 2020; Klerkx & Begemann, 2020; Miller et al., 2022). However, most research has concentrated on national and regional AKIS structures (Klerkx et al., 2012), often overlooking farmer-assembled networks – 'microAKIS' – and bottom-up mechanisms for institutional change (Sutherland et al., 2023).

This paper is part of a Marie Skłodowska-Curie Actions (MSCA) Postdoctoral Fellowship project (101146631 — AETERAKIS), starting in January 2025, which aims to address these gaps by developing a framework for territorialised AKIS for agroecological transitions. For this, the study will employ a hybrid mixed-methods approach, integrating Actor-Network Theory (ANT) and Social Network Analysis (SNA) within a broader framework of participatory-action research (PAR) in four Spanish case studies. In particular, the hybrid ANT/SNA approach maps, visualises, and analyses informational and resource flows within knowledge systems, incorporating non-human actors such as technologies, natural resources, and material objects (Vicsek et al., 2016), which are increasingly recognised for their influential role in agri-food innovation (Sutherland et al., 2023). Data will be collected through actor-network mapping to identify the current regional AKIS infrastructure, and semi-structured interviews with agroecological-oriented farmers to map individual networks for knowledge exchange and innovation (microAKIS), aiming to uncover inconsistencies between these levels.

This contribution will explore the benefits of such a multilevel approach to studying AKIS from a methodological perspective. It will discuss how actor-network mapping, carried out

through participatory workshops with local collaborators, can identify diverse AKIS actors – formal and material (e.g., digital platforms) – that shape knowledge development and application for agri-food redesign at the territorial scale. In doing so, we will emphasise the importance of situating microAKIS within this broader territorial AKIS infrastructure for understanding the discrepancies between knowledge sources and processes that farmers use to territorialise innovations, and traditional regional AKIS networks, such as advisory services (Sutherland et al., 2023). Throughout this discussion, we will highlight how translating actor-network mapping and farmer-level data into SNA can uncover ties, communication patterns, and knowledge-sharing dynamics often missed when focusing solely on identifying actors within AKIS but not their interconnections.

Specifically, the hybrid ANT/SNA mixed-methods approach offers a novel perspective for AKIS research by integrating relational and quantitative analyses to illuminate the varying and contested AKIS internal dynamics. It can identify central actors serving as innovation intermediaries operating at the intersection between formal and regional AKIS and microAKIS by centralising resources or bridging information and resource flows across levels. Additionally, it can uncover whether actors' characteristics or other actor-relation variables influence the formation of specific AKIS networks through statistical models, notably Exponential Random Graph Models (ERGMs), which uncover patterns affecting the tendency to seek advice or knowledge from certain actors over others (Agneessens, 2021). Such analysis is valuable for detecting power imbalances between actor groups and determining whether these imbalances arise from formal power structures, such as being an advisory service, or relational dynamics, such as through new roles defined materially and discursively through network interactions (Faul, 2016; Ingold & Leifield, 2014) – mechanisms yet to be fully explored in AKIS research.

Through this focus, this contribution advances the symposium's goal of bringing into discussion new methodological approaches to unpacking the complexities of strengthening AKIS' role in agroecological transitions. It helps guide the development of living labs and decentralised research infrastructures by identifying non-traditional AKIS actors and highlighting gaps in current infrastructures that fail to address the needs of agroecological farmers.

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Limits to Living Labs: Conditions for adopting sustainable soil management by strategic decision-support

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Abstract:

Living Labs (LL) is emphasized as a cornerstone in the European agroecology transition, highlighted as an opportunity for applied learning and taking end-users perspectives when addressing a wide array of agro-environmental problems. Although farmers are often willing to change farming practices, structural factors such as farm machinery, knowledge, power asymmetries, and market imperfections often impede opportunities for a successful transformation (ensuring long-term productivity while minimizing the environmental impacts of production). Transformation thus requires strategic decisions that enable the farmer to make sustainable short-term decisions. This presentation synthesizes the ongoing work in five LL across Europe which have worked to co-design a strategic decision support tool. This tool was designed to support farmer's long-term decision-making regarding field management and equipment purchase, rather than short-term field traffic planning. Findings indicate that farmers' decision-making regarding field traffic is driven by a number of complex drivers, epitomizing the need for broad representation and long-term strategic orientation for successful mitigation. Although farmers are important decision-makers when it comes to soil management, they do not make decisions in isolation. Ensuring long-term soil health requires a thorough structural reorganization at the food system level, broadening the boundary of sustainable soil management as an issue that is not exclusively within the realm of farmer's agency. In this process, LL can help to develop new techniques, build capacity, raise concern, and coordinate the need for innovation at the system level, but when working at farm scale LLs in and of itself cannot change the underlying structural causes for unsustainable practices. As farmers are not in control the conditions under which they operate, this calls for more relational approaches to understanding transition dynamics in farming systems, as opposed to actor-centrics ones. It is thus important to coordinate long-term decision support to farmers with structural reorganization across the food system to mitigate long-term threats and ensuring that LL are not seen as a panacea for food system transformation.

Knowledge, communication, and change: three AKIS stages to foster the agroecology transition

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Abstract:

Problem addressed

From the knowledge generation perspective, experiential knowledge plays a key role in AKIS approach and agroecology. Professional practice over the years allows the generation of particularly valuable knowledge in a context where environmental solutions and practices must be adapted to the reality of each territory. Farmers are experts in their territory. Historically, traditional agricultural systems in many parts of the world could be considered to be agroecological. To this experience must be added information from other regions and the contribution of scientific knowledge and method as a guarantee of the rigor of the proposals and practices to be implemented. How to achieve the integration of this knowledge, and how to promote collaborative processes of innovation?

Communication is a fundamental link in both the processes of knowledge generation and the dissemination of the results achieved. How can we facilitate the internal communication of innovation processes and promote the dissemination of results?

However, generating knowledge and communicating is not enough; it is necessary to support the transition process towards new practices. What are the measures that allow the change of practices to be implemented?

Answering these questions is essential to promote agroecological transition.

Conceptual, theoretical framework/background, methodology, approach

Agroecology is increasingly seen as a transdisciplinary, participatory, and action-oriented approach (HLPE, 2019). It is the integration of research, education, action, and change that brings sustainability to all parts of the food system: ecological, economic, and social (Gliessman, 2018). Agroecological practices aim to improve agroecosystems by harnessing natural processes, creating beneficial biological interactions and synergies

among their components, and using, in the best way, ecological processes and ecosystem services for the development and implementation of practices (HLPE, 2019). Agroecology involves scientific research but also, traditional agricultural experience.

FAO (2014) considers agricultural innovation to be the process by which individuals or organisations introduce the use of existing or new products, processes, and forms of organisation into society or the economy to increase efficiency, competitiveness, resilience to shocks, or environmental sustainability, thereby contributing to achieving food and nutrition security, economic development and sustainable natural resource management.

The AKIS approach details the process for achieving such innovation. It shares the holistic vision of agroecology by integrating all links in the chain. It also shares the value of traditional knowledge and the collaborative approach to innovation processes. The challenge is to adapt it to each territory, and sector. To this end, this communication details three critical stages and two very useful tools that allow addressing.

The three critical moments that need to be investigated and improved are the knowledge (co)generation phase, the communication phase, and support for change. Two tools that are considered very useful in fostering an agroecological innovation process are knowledge maps and living labs.

The merits of the above in relation to results, and the symposium objectives

The contribution of this paper is the presentation of some Spanish experiences and empirical analysis where knowledge mapping and the living-lab approach have enabled the co-generation of knowledge (linking traditional and scientific knowledge). This communication also deal with some barriers in these co- generation processes, the communication, and dissemination of results, as well as the development of complementary measures to support change. Finally, it points to bottlenecks where further research is needed to ensure that the synergies between the AKIS approach and agroecology are translated into the transition towards a more sustainable food system.

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Data sharing on Living labs enhancing agriculture's transition

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Abstract:

Agricultural living labs have gained increasing interest among Finnish Agricultural Knowledge and Innovation System (AKIS) actors. However, concept of living labs could be adopted more strongly to the field of agriculture in Finland. This requires collaborative discussion to form a common understanding of this concept and how to take benefit of this co-creative concept. Currently, on the LivingLabData project, the agricultural actors work together with researchers from the fields of geospatial research and artificial intelligence research to support the living lab concept in Finland. The focus is heavily on the data sharing and good practices of sharing agricultural data. This brings other aspects to the discussion of living labs supporting agroecological transition – how the agricultural data can support validation of the agroecological practises and transition? And what kind of knowledge and skills are required in near future? As a technology-oriented nation, Finland has naturally interest on looking for tools from technologies to support various development paths. Therefore, it is natural to combine technological aspects into the agricultural research, which already is efficient on adopting technological developments. While farming faces manifold requirements, including more sustainable practices and proving them, the digitalization can be a tool supporting these. Currently, the data sharing, and implementing fair principles are a core discussion within the agricultural data discussions. There is a common understanding among agricultural data researchers that agricultural data can be used as a validation tool ensuring the production practices and measuring agriculture's sustainability. Major change driver of climate change needs to be tackled. During the previous European Commission period the twin-transition of green and digital development needs have been major political drivers for Europe. This twin-transition has a natural touch point on agriculture, which has a long history of adopting new technologies and changing production practices. We are living on transition phase where disruptive technologies are expected to change production practices as increasingly amount of data is collected constantly. These data and data sources opens up new possibilities for agricultural actors to provide more detailed, measured, and validated data of production practices. However, there is still need to invest on research. Furthermore, involving wider arable areas on agroecological transition research aside the actual

research infrastructures, can require collaboration with various actors and setting up living labs. Within this framework, our national project, LivingLabData, is focusing on collecting, sharing, and utilizing agricultural data from the potential agricultural living lab with the research bodies. Additionally, major goal of the project is to support development of agricultural living labs in Finland. The baseline is to understand the concept of living labs and the potential of adopting this co-creative approach to the applied research in the field of agriculture. The project has organized a series of workshops, both online and face-to-face. During these meetings the common understanding of living labs has been under discussion. Frameworks of Agricultural Knowledge and Innovation System (AKIS) and digitalization supporting agroecological transition are the larger scopes of the project. In Finland, the AKIS system has various stakeholders with different measures guiding their work. We have approached this development challenge with participatory methods where various AKIS stakeholders, both core actors as well as complementary actors, have participated. Results have outlined demand for even more discussions and understanding of practical aspects of living labs within the co-creation framework of this concept. Contractual aspects and reimbursements have been seen as critical points for setting up living labs and supporting the bottom-up research actions.

Do living labs strengthen the AKIS and vice versa? Conceptual considerations and findings for Agroecological Transition

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Abstract:

1 Introduction

By providing a central place to the Agricultural Knowledge and Innovation System (AKIS), policies aim to address a range of goals that imply shifts in knowledge production. Due to the generic breadth of the system concept, the AKIS approach readily entails both a comprehensive, holistic understanding as well as an analytical vagueness of the issue under consideration. Given that AKIS has become a prominent term in recent research and development policies and programmes, both in the EU and in international research associations, this calls for conceptual grounding to ensure that academic dialogues and analytical approaches may build on each other's work conclusively, and be consistent particularly when aiming at supporting and guiding interventions for a balanced agroecology transition.

2 Problem statement, purpose of the paper and guiding questions

Living labs (LL), understood as social entities that address real-life challenges with a participatory, problem- and user-oriented approach, are considered as key conducive elements to agro-ecology transition. How can LL be conceptually connected and associated with AKIS approaches? As there is limited clarity associated with the AKIS concept, it is necessary to systematically explore its various analytical perspectives in relation to the key features of a LL. In a similar way, it remains unclear whether and how operational LLs should contribute to a strengthened and more effective AKIS, designed to drive the agroecological transition. In order to study and operationalise these (possible) interdependencies and interactions, we critically discuss several conceptual approaches and current debates on the roles and functions of LLs as part of AKIS and in turn on AKIS-related interventions conducive to fostering agroecology transition.

Hereby, we pursue the following questions:

- How can different analytical perspectives of the AKIS be used to analyse the interactions with LL at different scales?

- What opportunities and limitations result from the different perspectives and scales?

- How does this generic question of conceptual interfaces relate with a paradigmatic orientation towards agroecological transition?

The contribution has the aim to advance the conceptual understanding of AKIS-related measures and mechanisms within the current research and development policy context in the EU and international cooperation.

3 Concepts, theoretical framework and methodology

We ground our contribution on system thinking, innovation studies, science and technology studies and key concepts in sociology and social psychology. This generic approach allows to identify conceptual interfaces between AKIS and LLs: first, we elaborate on the concepts of AKIS and LLs and their analytical implications. As a second step, we characterise the interfaces with respect to interdependencies and interactions and discuss whether and what kind of strengthening impact from one side or the other possibly emerges. Finally, we illustrate our discussion with examples from three Horizon Europe (HEU) projects, namely CANALLS, CODECS and trans4num. These projects have in common that they were set up to introduce and scale up transformative agroecology and sustainability-related solutions for agricultural production. By conducting a cross analysis of selected project features, the diverse epistemic perspectives in relation with participatory characteristics of living labs for agroecological transition are disentangled. Moreover, the potential contribution of new dynamics and relationships from these participatory approaches into AKIS will be discussed.

4 Conclusion

Our contribution concludes on conceptual fits and misfits and develops recommendations for analytical approaches to the study of the AKIS/LLs interface.

The next generation of living labs: A critical review of European agroecological transition potential at the science-society-policy nexus

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Abstract:

Food system transformation has become an important European policy initiative due to the host of negative environmental and social impacts and the disconnection between production and consumption across scales. Given the complexity, uncertainties and structural lock-ins inherent to food systems, transformation demands both methodological and institutional alterations. A growing body of evidence supports the importance of engaging multiple actors in co-creating innovative and sustainable pathways to foster transformative governance for an agroecological transition in Europe. The subsequent accelerated adoption of living labs as the central innovation model by policy makers makes it important to employ state-of-the-art methodologies oriented to deliver the desired outcomes. Positioned at the science-society-policy nexus, we examine the use of living labs as a means for researchers to foster an agroecological transition and as a political means to ultimately transform food systems toward sustainability. By critically reviewing literature, we harness the expertise of the Agroecology Partnership to 1) explore the historical and present research based approaches to understanding co-creation in the European agroecological transition, 2) translating the policy initiative of living labs into practice by highlighting windows of opportunity for the next generation of living labs in this context, and 3) deliver a comprehensive framework to help deliver an agroecological transition in Europe. We argue that three key research approaches support the development of European living labs. Agricultural Knowledge and Innovation Systems (AKIS), Sustainable transition and Innovation theories have all shaped and influenced living lab methodologies. We found three windows of opportunity that could support the transformative potential of living labs. The first involves supporting wider participatory models, the second involves aligning research infrastructures, the third involves designing place-based approaches to food system transformation amid heterogeneity. In Europe where living labs are the primary method adopted for participatory action research at the science-society-policy nexus, we propose a comprehensive framework that could lead to the desired agri-food system transition toward agroecology and suggest that future research utilize the co-creation methods identified in this literature review.

European Science-Society-Policy Interface: Inquiry into (Dis)connections Among AKIS Actors

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Abstract:

The present abstract is the result of a study that is currently carried out as a part of the Horizon Europe AGROECOLOGY Partnership's 'Science-Policy' work package. Specifically, the study has been a joint effort across two of its tasks: 'Benchmarking and assessing the implementation of current research and sectoral policies relevant for agroecology (AE) transition' (T2.1); and 'Improving capacity and governance of science-based policy advice at national and trans-European level' (T2.2); both under the responsibility of Aarhus University (AU-ICROFS/AU-DCA). We conceptualised these two tasks as feeding into each other, and clarified the main objectives in a Concept note. In this vein, we are convinced that gaining an understanding of how relevant and science-based current research and sectoral policies are for agroecology transition is fundamental for then improving the capacity and governance of science-based policy advice. To this end, we developed a Survey that is currently being piloted on national/ regional levels and through sectoral networks in Europe. Beginning by establishing a common understanding of the practices and policies that can be considered as contributing positively to agroecology transitions, we cover the extent to which sectoral policies are in line with agroecological principles, we examine the current forms of scientific advice used by policy actors, and finally, we explore the variety of ways in which the AKIS are part of current science-policy interfaces regionally and nationally. Some of the relevant questions that we will address reflect the dilemma of the actual relevance and inclusion of science-society-policy interfaces when developing AKIS, and vice versa. We ask: Is research translated into policy when setting the targets on agroecology transition? How may research be translated into policy (and be upscaled) and change? Through what linkages and mechanisms? Which conceptual framework(s) would contribute to gaining insights and understandings for agroecology transition? While our study indicates that there some is attention being paid to Science-Society-Policy interfaces in relation to AKIS frameworks, it seems that a number of disconnections remain both on the conceptual level and among the AKIS actors. Hence, with a present

presentation we advance the critique that, to date, the science-policy-society proposition is a relatively neglected area among AKIS actors. In the interpretation of our Survey results we push this critique by seeking out those connections that do exist and exploring how they could be expanded by asking: How will it take place? Through what linkages and mechanisms?

As we move forward in the work on Science-Policy interfaces for agroecology transition, we will address and seek to understand how best to incorporate social dimensions in these interfaces related to the 'agroecology transition.' For example, initial discussions have revealed an understanding that agroecological transition is a dynamic, complex and circular process that should be reflected in the definition. From both an AKIS and a policy perspective, we need to work on and with approaches that enables us to conceptualise the AE transition in a way that goes beyond the idea of a mere progression from a local level to European level. If we are to understand the transition as a move from the current agrifood systems to more sustainable ones, we must focus on the socio-technical changes that are part of system change. We need to add bottom-up innovations and community-driven approaches more explicitly in the definition as indeed the communities are initiating and supporting agroecological transitions. We must also ensure that efficiency of agroecological systems does not overrule the social and political dimensions, thus including the community is also relevant for the type of evidence-based policy used to promote AE transition. Here there is much room for innovation and creative ways of interfacing science, AKIS, society and policy.

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Potentials and barriers for more Mixed Farming and Agroforestry Systems - shifts needed in knowledge production for agroecology transition in Europe

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Abstract:

The MIXED-project.eu study of conversion to more Mixed Farming and Agroforestry Systems (MiFAS) in Europe contributes with important new perspectives for the exploration of research methods and associated analytical and conceptual frameworks on agricultural knowledge and innovation systems (AKIS) for agroecology transition, and thereby the objective of the current symposium.

Key problems addressed include challenges in the assessment of "mixedness" at different scales (field, farm, landscape, whole value chain and regional studies of agriculture and food production), and relationships to both the resilience and the environmental and socioeconomic efficiency of farming, being core for the promotion of a sustainable agriculture and food system and thereby agroecology in Europe. By example, we show how and why understanding mixedness is thereby important in relation to agroecological transitions to farming systems, combining more crop and/or livestock types and/or other types of land use with trees, bushes or other permanent crops, e.g. in the form of agroforestry systems.

New concepts, methodologies and indicator frameworks have been developed for the sustainability assessment of more mixed and thereby diverse agriculture and food systems, which are also useful for the developments in the upcoming new common agricultural policies of the EU, as for example related to farming with agroforestry, organic farming systems or more mixed farming systems in general, as exemplified for study farms, network of farmers and related food chain actors, and whole landscapes studied across Europe (Accatino et al. 2024, Dalgaard et al. 2024). A special focus is on barriers to transition, where existing schemes in European Common Agricultural Policies (CAP)

design often favor existing specialized production systems and more focus on promotion of mixed systems is recommended.

The real-world examples, in combination with modelling and pan-European databases for the upscaling of results and comparison of bottom-up versus top-down assessments, show significant positive effects from more mixed systems, but also significant challenges for the further AKIS development around MiFAS and thereby agroecology in practice for the achievement of defined policy goals. A challenge is that existing European statistics (Eurostat and e.g. the FADN Farm Accountancy Data Network) do not include documentation of many mixed systems and there effects. As illustrated by the Mixed-project.eu case studies, there is a need for development of additional data sources for documentations and sustainability impacts assessment (e.g. in relation to the new FSDN Farm Sustainability Data Network of Europe).

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Identifying and addressing farmers' perceived barriers for the agroecological transition in the Madrid region

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Abstract:

The loss of biodiversity, climate change, and the crisis of the agri-food systems are three of humanity's most urgent challenges. Conventional agriculture has contributed to environmental degradation and socioeconomic inequities, highlighting the need for alternative agri-food systems that balance ecological, economic, and social factors. Agroecology emerges as a transformative alternative, fostering resilience and sustainability in agroecosystems. Achieving agroecology requires an "agroecological transition", a shift from productivist, yield-focused agriculture to a model that prioritizes biodiversity and social considerations. Typologies of transition stages help assess the point at which each farm stands along this path. Depending on the stage, different barriers may emerge, making it essential to identify which obstacles are specific to each typology and which are shared across transition stages, ensuring effective strategies to address them. We present the Agrolandscale project, which aims to generate scientific evidence on how farming from an agroecological and socio-ecological perspective can contribute to biodiversity conservation and resilience to climate change. This work has two main objectives: (1) assessing farmers' perceived barriers and enablers in achieving the

agroecological transition, and (2) supporting stakeholders in addressing these barriers by generating essential knowledge, particularly in soil quality practices.

We evaluated the agroecological transition of 26 horticultural farms in the Community of Madrid, through the Tool for Agroecology Performance Evaluation (TAPE). Based on the total score in TAPE's step 1, the Characterization of the Agroecological Transition (CAET), four transition types were stablished: advanced agroecological >70, in transition to agroecology 50-70, incipient transition to agroecology 30-50 and non-agroecological <30. Additionally, barriers to agroecology were identified through farmer interviews tailored to each transition stage. Soil quality was assessed in 25 farms through physicochemical properties, while microbial abundance (DNA extraction and real-time PCR) and microbial diversity (Illumina MiSeq sequencing on 16S rRNA and ITS marker regions) were determined on 15 farms. These assessments will be complemented by earthworm sampling and evaluating the decomposition rate of plant material using tea bags.

In total, 349 barriers were identified and grouped into 35 distinct typologies. Of these, only five were shared by over a quarter of all groups: cooperatives and networking between producers; support to horticulture and alternatives systems; consumer awareness; professional training, and climatic disturbances. In the Agrolandscale project, we focus on generating technical knowledge and supporting networking, as these barriers are both widespread and significant across transition typologies, and essential at both farm and landscape scales. The knowledge barrier is most significant during the efficiency and substitution phases, the initial stages of transition that are foundational for scaling up. Networking becomes essential during the redesign phase, as it supports the leap to an integrated agrifood system. Effective strategies must promote communication channels, so we will conduct participatory workshops grounded in the conceptual framework of the scaling up process in sustainability.

Generating and sharing knowledge is crucial for the agroecological transition. Identifying agricultural practices that enhance biodiversity is essential for policy making, as evidence supports legislation and subsidies that promote environmentally and socially sustainable practices. Practices to improve soil quality and indicators will be shared with farmers to strengthen agroecological knowledge for advancing the transition. Addressing barriers requires a comprehensive approach to multifunctional territories. Therefore, we will work directly with the productive sector to increase visibility, build networks, and share knowledge. The agroecological transition is essential for sustainability, achievable only through resilient networks.

Portraying agroecological initiatives to support transformative change

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Abstract:

Transdisciplinary knowledge is increasingly recognized as crucial for driving sustainable transformation of agrifood systems. Collaborations between scientists and practitioners within societal initiatives, such as living labs, offer significant potential to accelerate a transition towards agroecology. To enhance the effectiveness of these collaborations in driving societal change, it is important to develop a shared systemic understanding of the initiative among all participants.

Within the multi-actor project Agroecology-TRANSECT (https://www.agroecology-transect.net/), involving eleven agroecological initiatives, we developed a learning-oriented framework to achieve this goal. The framework comprises an analysis of four pillars: (a) context, (b) actors, (c) barriers/levers and (d) relation to agroecological principles, defined through a combination of quantitative and qualitative characterization and assessment approaches (e.g. Gremler, 2004; HLPE, 2019; Morel et al., 2020; Vanwindekens et al., 2013). More specifically focusing on the barriers and levers analysis (pillar c) to align with the Symposium's theme, the framework adopts a systems perspective, building on cognitive mapping to organize barriers and levers as interconnected nodes in a directed network, reflecting their mutual influences over time.

The framework has been actively applied within the project, benefitting from its overarching learning-oriented approach, building on co-innovation. The eleven agroecological initiatives of the project, with whom the framework has been tested, were selected to cover a diversity of European geographical regions and farming systems. The process of applying the framework involves multiple interactions among participants, i.e. working sessions at project workshops, in-depth interviews with key stakeholders from the initiative and written and online feedback on the results. Through its four pillars, the heuristic framework facilitates the development of a shared understanding among the project participants on each initiative's history and current state, highlighting potential avenues for joint action. While the context analysis outlines the setting of each agroecological initiative within the broader food system, the actor network analysis, the identification of barriers and levers to

agroecological transition, and the characterization of their relation to the 13 agroecology principles (HLPE, 2019) provide actionable knowledge for their development. The four complementary pillars have proved to form a coherent heuristic framework, effectively guiding transformative efforts across diverse contexts. Drawing on interviews with a limited set of diverse actors from each initiative, however, introduces a risk of incompleteness, which we recognize as a limitation. This framework deliberately prioritizes timeliness and actionability of the results over exhaustive comprehensiveness.

Furthermore, building on specific insights from each agroecological initiative, a transversal analysis identifies common trends across the diversity of agricultural systems and socio-ecological contexts represented in our sample of initiatives throughout Europe. By maintaining our focus on the barriers and levers pillar to align with the Symposium's theme, we observe similarities within our sample of initiatives in terms of barriers hindering development and levers facilitating it across a wide range of dimensions (i.e. Policy, Economy and markets, Knowledge and information, Society and culture, Social organization and cooperation networks, Infrastructure and natural environment). Analyzing recurring barriers and levers, along with the connections between them, strengthens learning across transformative efforts. For instance, politically, the inconsistency of EU and national regulations regarding agroecology frequently emerges as a barrier. The analysis of the levers implemented by certain initiatives in our sample to tackle this political barrier is insightful. Similarly, from an economic perspective, the limited profitability of agroecological farmers is a common barrier encountered across initiatives. To tackle this, various levers are introduced, such as closer connections with consumers, the availability of aid funds for agroecological farmers, the growing acceptance and demand for agroecological products from private sector actors, or collective sales by farmers under specific brands.

In conclusion, beyond the direct benefits of supporting co-innovation within multi-actor projects, our framework provides key general insights to support agroecological transition across Europe's diverse contexts.

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Three projects to improve transdisciplinarity and the co-construction of knowledge into the agro-ecological transition

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Abstract:

Our contribution is rooted in three research projects in which transdisciplinarity (Tress et al, 2005) was supported by the implementation of specific tools. These tools reveal, on the one hand, the difficulties of transdiciplinarity according to the various configurations linking participatory action research and interdisciplinarity and, on the other hand, make it possible to apprehend the plurality of co-constructed knowledge.

The first project, Terraé, brings together, within a network, 40 Walloon farms in agroecological transition and 8 support staff from 4 different organisations. The co-constructed knowledge is disseminated, among other things, via a platform (www.terrae-agroecologie.be) and related to HLPE principles. As part of this, we are producing portraits of farms and portraits of farmers. The first aim to explain the agroecological techniques used. The second aim to explain the background, choices and values of the protagonists by immersing ourselves in their daily livesThey provide an opportunity to inscribe practices over a long period of time, and address issues relating to the transmission of the farm and knowledge, intergenerational links, and the maintenance and modesty of facilities. These elements are all invisibilized levers of agroecology favoring the transferability of farms. These hypotheses and their analysis come directly from the field and, in particular, from interviews conducted at the start of the project in 2022. The implementation of this system was the subject of sometimes bitter negotiations between team members, to which we will return later.

The second case is a system experiment set up at one of the experimental stations of the Centre wallon de Recherches agronomiques. It aims to test three forms of mixed crop-livestock system, with a view to maximise food production, reduce greenhouse gas emissions and balance flows, particularly of nutrients. These principles and the structure of the experiment were developed by the engineers on the basis of past experiences and exchanges between peers. Rotation and the choice of varieties or animals were then discussed with local experts, for example in cereals, vegetable sales to local communities, sheep breeding, etc. These stakeholders participate in a project support committee and continue to be mobilized about the systemic strategy, technical itineraries or changes in

professions. To monitor the step-by-step management of these systems, we used a field diary and a chronosystemic timeline (Bergeret, et al., 2015). These tools have enabled us to identify the obstacles to co-construction dynamics and to understand the impact of the institution's history and functions inter-relations on the understanding of the objectives of the experiment and on individual investment motivation.

The third instance focuses on the co-construction of a research system with 8 organic farmers reducing tillage (ABC). Long-term and system experimentations implemented on farms specific plot (ESR) are the subject of multiple discussions. The technical itineraries implemented are negotiated between 2 or 3 neighbouring farmers, an advisor and a bioengineer. Trials are carried out by the researcher and the advisor to highlight the impact of no-till on the crop compared with a control plot. The data collected within each farm are discussed with the farmers, on an individual basis, at the end of the crop year. These results are also discussed within the group to support the emergence of generic knowledge. This co-constructed knowledge is diverse and links science and beliefs. We will analyse the way in which these actors conduct their investigations to produce evidence that 'stands up' (Chateauraynaud, 2004).

We will conclude our presentation by returning to the brakes and levers of transdisciplinarity and co-construction across projects. Indeed, learning in terms of behavioral skills, methodological approaches, epistemological positioning (the shift) and co-constructed knowledge can be mobilized. Finally, we'll look at how this research relates to the Walloon AKIS.

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Doing co-creation for transformative change. What are the implications for an agroecological living lab approach? A systematic review

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Abstract:

There is a movement toward agroecological transition in Europe that seeks to shift the paradigm in science, practice, and social systems toward more sustainable, resilient, climate-friendly, and just agri-food systems. This change in paradigm will require a shift to evidence-based and systems-oriented innovation schemes that relay on more open, flexible, participatory and risk-sharing governance structures that promote participation of different stakeholders. Co-creation is a new participatory governance structure that has been applied in multiple fields but is still in its infancy in agroecological systems, while having strong roots in participatory research and growing theoretical basis in agroecological transition. In this systematic review, we screen 5666 records of co-creation and its analogues of co-concepts in the context of transitions to more sustainable food systems or transformative change. We examine what tensions arise in applying a co-creative approach with multiple stakeholders and what experiences of mechanisms to manage these tensions for better innovation and governance toward sustainability transitions have been used in transformations in different types of social-ecological systems. We then seek to understand how these mechanisms contribute to transformative change using a leverage points framework and which levers are best positioned to accelerate agroecology transition in Europe. The implications for adopting a co-creation approach in agroecological living labs to accelerate agroecology transition in Europe are discussed.

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

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Abstract:

Agroecology is understood as a 'territory in dispute' – between conformity with the incumbent regime and transformation (Giraldo and Rosset, 2018). Conformative visions of agroecology selectively incorporate agroecological practices, which may attenuate some aspects of the industrial agri-food regime's legitimacy crisis, while leaving the wider foundations of unsustainability intact (Walthall et al., 2024). Transformative visions aim for redesign of agroecosystems and food systems more broadly, and are thus seen to require coinciding changes in society and governance, including shifts in political-economic power (Giraldo and Rosset, 2018; Rivera-Ferre, 2018). As agroecology increasingly enters the 'mainstream' of institutional support, transdisciplinary researchers find themselves at the centre of these 'conformative' and 'transformative' tensions.

A main feature of transdisciplinary science is the (co-)production of actionable knowledge (AK): knowledge that informs the action (i.e. conscious, intentional, reflexive activity) of agents as they work to shape the world (Antonacopolou, 2008). AK is a product of the co-production process, which is "distinct from standard scholarship by explicitly linking theory and practice" through a focus on intervention (Mach et al., 2020, p. 31). In the context of sustainability science, AK often aims or assumes to support actors in their

understanding and pursuit of 'transformative change' (Hölscher et al., 2023). However, while co-production processes often aspire (or assume) to contribute to transformative change, their actual contributions to systemic sustainability transformation remain ambiguous, and several authors highlight associated risks when political dimensions are overlooked (Blythe et al., 2018; Turnhout et al., 2020).

This oversight can, in part, be attributed to a general lack of engagement amongst transition researchers with critical social theory on the relationship between agency (e.g. taking shape in micro-level actions and processes of a research project) with more macro-scale structures that contribute to the stabilization of social-material relations (Feola, 2020). As researchers confront these conformative-transformative tensions, there is a need for stronger integration of (critical) social theory and practice, and a key role for complexity-aware, learning-oriented monitoring and evaluation in transdisciplinary co-production processes aiming to contribute to transformative change (Douthwaite and Hoffecker, 2017; Jagannathan et al., 2020; 2023; Van Mierlo et al., 2010). Put differently, transdisciplinary research endeavours need critical approaches for assessing ex durante whether or not they are contributing to a desired change towards agroecology, or a maintenance of the status quo under a different name.

To address these problems, we draw on a case study of the authors' ongoing collaboration in the Agroecology-TRANSECT (AE-T) project, which both aims for (1) actionable knowledge co-production with 11 territorially-rooted agroecological initiatives (called 'innovation hubs', or IHs hereafter); and (2) the contribution to the transformative systemic change. The paper develops a middle-range conceptual model of how to approach and evaluate AK co-production for transformative change in a science-society collaboration. The main research questions for the paper are:

How can those engaged in science-society collaborations monitor and evaluate contributions of AK co-production to transformative change during their collaboration?

What principles and processes are used to co-produce AK for transformative change in AE-T? To what extent are these 'effective' in terms of contributing to transformative change?

The model and our findings are relevant for learning in AE-T, and also for reuse in other contexts. The conceptual and methodological basis directly address the first research question, as we draw on existing middle-range theory to establish a sociologically-informed model of 'what to look for' and 'where to look' in our assessment. The paper's foundations are inspired by critical realist approaches to social science, and in particular evaluation (Hoffecker, 2021; Jessop, 2005; Pawson and Tilley, 2004).

We follow the context-mechanism-outcome framework of Pawson and Tilley; where the context created by the project's program is assumed to interact with various mechanisms to produce the outcome of actionable knowledge which contributes to transformative change (or not). We assume that when outcomes are observed, they emerge from the combined interaction of the project's guiding principles (which are articulated in the form of organizational narratives) and co-innovation governance processes.

In answering our first research question we develop a middle-range-theory-informed understanding of AK co-production for transformative change. Here we draw on middle-range, complexity-informed debates in social theory (namely debates on structure and agency, e.g. Jessop, 2005) and transformative social innovation (e.g. Pel et al., 2020) to explain how micro-level processes at the level of society-science collaborations can contribute to transformative change in the first place. We use this conceptualization, in addition to literature on agroecological transformation to form the basis of our assessment criteria.

This approach assists in identifying grounded (i.e. relevant, realistic, middle-range) feedback in support of learning about how AK co-production can support transformative change in science-society collaborations. Outcomes observed in AE-T include broadened conceptualizations of agency resulting in new activities by project participants, experimentation with new strategies, incorporation of ideas and practices more aligned with agroecological principles, and amplifying of agency through institutional access.

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