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Title : Governance process and knowledge creation in research-driven Agro Living Labs: the case of the TETRAE program in France

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Highlights

- Agro Living Labs (ALLs) are diverse, territorially embedded open innovation initiatives, adapting to local contexts and actor networks.
- Their governance combines openness with coordination, often in hybrid forms balancing inclusivity and strategic coherence.
- ALLs thrive on collective engagement, bringing together actors with varied knowledges, backgrounds, and interests to address shared challenges.
- Knowledge co-production in ALLs is shaped by both methodological choices and strategic positioning, requiring trust and reflexivity.
- Territorial embeddedness is both a resource and a constraint, influencing innovation trajectories and scaling potential.

Agri-food systems are at the crossroad of today's most pressing ecological and social challenges, entangling land use, natural resource management, and territorial economies (Coenen et al., 2024; Gava et al., 2025; Hinrichs, 2014). Over the past decade, a growing number of scholars has stressed the urgency of systemic transitions towards more sustainable, equitable, and resilient food systems (Berriet-Sollicet et al., 2023; Wezel et al., 2009). Agroecology has gained prominence as a transformative framework, combining sciences, social movements, and situated practices, to address the key struggles around food sovereignty and territorial development (Cardona et al., 2021; Gliessman, 2014; Wezel et al., 2009). It is increasingly recognized as a socio-technical and institutional pathway, capable of reconfiguring power relations and fostering participatory governance (Anderson et al., 2019). Agro Living Labs (ALLs) have emerged in France as hybrid spaces connecting research, practice, and local actors to support agroecological transitions.

The literature review makes it possible to identify four main findings.

- **ALLs operate under a hybrid governance regime.** ALLs operate under a hybrid governance regime in which formal coordination mechanisms must be complemented by informal relational dynamics in order to support innovation (Gava et al., 2025).
- **Organizational adaptive capacity is essential to remain responsive in uncertain and constantly evolving contexts.** The ability of ALLs to adapt their organizational structures over time is a key condition for remaining relevant and responsive in uncertain and continuously evolving territorial environments (Aare and Hansen, 2024).
- **The diversity and complementarity of the knowledge involved shape co-production processes and the types of outcomes.** The nature of the knowledge co-produced within ALLs is shaped by the diversity of actors and forms of expertise involved, as well as by the capacity to articulate and integrate complementary forms of knowledge in ways that foster collective learning (Beaudoin et al., 2022).
- **The evolution of the territorial embeddedness of ALLs determines their modes of coordination and transition potential.** The territorial embeddedness of ALLs evolves alongside changes in territorial structures, which in turn shape their modes of coordination and their transition potential, depending on how these structures interact with existing territorial dynamics (Engels et al., 2019).

On this basis, our study examines their diversity and organizational dynamics within TETRAE, a participatory research program established in 8 French regions. A mixed-methods approach combined a questionnaire addressed to key resource persons involved in open innovation initiatives (n=49) with three contrasting case studies: a dynamic territorial food network, a collaborative marketplace platform for forest ecosystems services, and agricultural systems climate change adaptation foresight workshops. The analysis identifies four main configurations. (1) Research-led initiatives, where scientific teams coordinate collective action, (2) Transformative ALLs, aiming at systemic transformation through multi-actor governance, (3) Technical participatory initiatives, focused on solving specific technical or sectoral challenges, and (4) Collaborative networks, fostering exchange and shared understanding among diverse stakeholders. Results show that ALLs do not follow a single model but evolve along a maturity continuum. Governance arrangements shift between openness and strategic steering. Organizational adaptability responds to funding constraints and mismatches between research and local dynamics. Knowledge co-production ranges from open-ended local framing to expert-driven processes, each with trade-offs. Territorial embeddedness strengthens trust and legitimacy but can also constrain renewal. Overall, ALLs are evolving frameworks enabling experimentation, dialogue, and incremental change. This typology and comparative analysis refine the conceptual understanding of ALLs and offer insights to guide future research for food system territorial transitions.

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