CLEVER FOOD

Strengthening the food systems approach in EU research and innovation

POLICY BRIEF

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Executive summary

This is a critical moment in time. The EU and its Member States need to rapidly advance policy action for a sustainable agriculture and food system to ensure competitiveness, fairness, resilience and food security. We believe this requires strengthening the food systems approach in R&I policy and enhancing R&I coordination to give direction and support multi-level governance of R&I efforts. **Hence, we urge the European Commission (EC) to strengthen the food systems approach in EU R&I policies.**

This policy brief is developed by the CLEVERFOOD project, which seeks to support the coordination of the Food 2030 project portfolio. We articulate 10 key challenges and provide 10 recommendations for EU policymakers to advance transformative R&I for the EU agriculture and food system.

Recommendations for strengthening the food systems approach in R&I:

1. Show **decisive leadership** and prioritise transformative R&I actions
2. Ensure **coherence across policy domains** and governance levels
3. Support **long-term R&I** efforts through a strategic portfolio of actions
4. Integrate **relevant expertise** in the development of future R&I policies
5. Advance **place-based approaches** across all EU Member States
6. Balance **social and technological innovations**
7. Do better at **including the non-usual actors** to increase societal impact
8. Incorporate **justice considerations** in R&I funding
9. Support and reward **scaling strategies** for innovation instruments
10. Enhance **capacity building** through education, training and competence centres

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1. Introduction

The EU agriculture and food system face persistent and interconnected challenges in achieving nutritious food security, ecological sustainability, healthy people and diets, economic competitiveness and social justice (SAPEA, 2020; EC, 2023a). Addressing these challenges is even more pertinent given rising global security tensions, accelerating climate change, the need to strengthen the competitiveness of the European Union to deliver on SDGs (IPCC, 2023; FAO, 2024; cf. the Draghi report: EC, 2024a), and the importance of aligning a transformative research and innovation policy with the EU strategic agenda (EC, 2024b). Hence, an urgent and fundamental transformation of the EU agriculture and food system is required to ensure food systems deliver co-benefits for health, economy and the environment (EC Expert Group, 2018; Parsons & Hawkes, 2018).

Current EU policy developments around agriculture and food systems are highly dynamic. There is ongoing policymaking on the new R&I Framework Programme, and a reshuffling of the EU food policy under a strengthened DG AGRI with a new Commissioner for Agriculture and Food. Additionally, there are uncertainties regarding the implementation of the Green Deal and the Farm-to-Fork Strategy. Furthermore, the launch of the FutureFoodS Partnership, the “Food 2030 Pathways for Action 2.0” (EC, 2023b) and a revised agenda of priorities in the SCAR working group on Food Systems are also contributing to these developments. Agriculture and food are listed high on the EU political agenda. This is evidenced by the Strategic Dialogue on the Future of EU Agriculture, which strongly embraced the food systems approach in its final report and also emphasised the need for transformative research and innovation (Strohschneider et al., 2024). In the recently published Vision for Food and Agriculture (DG AGRI), there is a strong push towards technological innovation in agriculture, while systemic considerations for food systems (and the interconnections of production with consumption and health) are lacking. With the development for the new Framework Programme for R&I ongoing, there are significant opportunities to strengthen the food systems approach in R&I, and to reconnect health, environment and agricultural production to the development of future-proof policies.

Research and innovation (R&I) can play a key role in accelerating food system transformation (Den Boer et al., 2021a; Herrero et al., 2020). The European Commission (EC) has been a strong driving force for food system transformation through the R&I Horizon framework programmes. Since the launch of the Food 2030 Policy Framework in 2015, a plethora of R&I projects have sought to contribute to food system transformation by targeting the four Food 2030 priorities: (1) Nutrition for sustainable and healthy diets; (2) Food systems supporting a healthy planet; (3) Circularity and resource efficiency; and (4) Innovation and empowering communities. These R&I efforts aim to be transformative, as they not only seek to develop knowledge but actively contribute to developing solutions and transition pathways (Regeer et al., 2024; Caniglia et al., 2021). Although the work and impacts of transformative food systems R&I projects are increasingly well-documented (Scaramuzzi et al., 2023; Achterbosch et al., 2019; EC, 2021; Kok et al., 2023), significant challenges persist in the design, implementation, and evaluation of these initiatives, which are essential for effectively steering and tracking societal change (Schafer et al., 2024). To support R&I, transformative and mission-oriented innovation policies (see Box 1) are rapidly gaining traction in (EU) science and policy (Mazzucato, 2018; Hekkert et al., 2020). These can support R&I efforts through providing directionality, enhancing inclusive growth,

supporting multi-actor engagement, and coordinating multi-level governance (Haddad et al., 2022; Janssen et al., 2021; Wanzenböck et al., 2020; Klerkx & Begemann, 2020). While flagship EU missions related to food (such as A Soil Deal for Europe and Restore our Oceans and Waters by 2030) have recently been established, there must be a dedicated R&I approach supporting food system transformation. We therefore urge the EC to strengthen the food systems approach in R&I policies, including EU Missions.

This policy brief was developed by the CLEVERFOOD project (see Box 2) that seeks to support the coordination of the FOOD 2030 project portfolio. In this policy brief, we articulate 10 key challenges to transformative food system R&I. We then provide 10 recommendations for EU policymakers that could help advance mission-driven R&I policies that embrace the food systems approach.

#01

Food systems approach in research and innovation

Contemporary **food systems are complex** and globally interconnected, while interventions aiming to transform components of the food systems often face interdependencies across scales and sectors (Moragues-Faus et al., 2017). For example, an increase in demand for animal protein in one part of the world can contribute to deforestation in another, while a rise in non-communicable diseases such as obesity and diabetes can be connected with high consumption of ultra processed food. Through such interactions, current food systems negatively impact the environment and put pressure on healthcare systems. Attempting to resolve one challenge without recognizing its integration into the wider system can have adverse social, political, or economic consequences.

Therefore, applying a food systems approach in R&I means that R&I efforts need to (1) recognize the context of the food system in which particular challenges arise; 2) integrate various types of knowledge that support addressing challenges (e.g. multidisciplinary collaboration between health, law, social fields as well as integration of local knowledge of farmers and citizens); 3) collaborate effectively with the policymakers and other actors in developing transformative innovations. In this way, European R&I policy can support crossing boundaries between science, policy, and society to ensure a transformative approach for the European food system (Den Boer et al, 2021a).

EU food systems R&I needs to be supported by transformative innovation policies (see Schot & Steinmueller, 2018). Transformative innovation policies are increasingly taken up by science and policy domains and seek to address grand societal challenges through directing and coordinating transformative innovation. Based on a review of literature on mission-oriented innovation and sustainability transitions, Haddad et al. (2022) define **five key characteristics** of transformative innovation policy:

1. Focus on grand challenges and inclusive growth
2. Provide directionality for change to R&I portfolios
3. Multi-faceted policy intervention (using diverse policy mixes)
4. Involve multiple actors and global networks in missions
5. Vertical and horizontal coordination of multi-level governance

Relatedly, ‘Missions’ are seen as key instruments to deliver transformative innovation (Mazzucato, 2018). In Europe, the **EU Missions** (such as Mission on a Soil Deal for Europe, managed by DG RTD) are a coordinated effort by the Commission to pool the necessary resources in terms of policies and regulations, as well as other activities (EC, 2024c). They also aim to mobilize and activate public and private actors, such as EU Member States, regional and local authorities, research institutes, farmers and land managers, entrepreneurs and investors to create real and lasting impact.

#02

The CLEVERFOOD project

CLEVERFOOD is a Coordination and Support Action (CSA) project **facilitating the mobilization of various societal stakeholders to transform the European food system** in line with key European policies related to food. It does so through two overarching instruments: Developing and deploying a Pan-European FOOD 2030 Multi-actor and Public Engagement Mechanism, establishing the FOOD 2030 Networks with targeted support for projects, partnerships, and networks in the FOOD 2030 Project Collaboration Network, and corresponding support for Policy Labs and Living Labs in the FOOD 2030 Connected Lab Network.

These two overarching instruments are applied to implement the following interventions:

1. Facilitating **cross-project collaboration** on policy, innovation, business development, education, public engagement and dissemination to maximise the impact of R&I projects working on transforming the food system
2. Developing **new models for transformative multi-level food system governance** in Policy labs through peer-learning programs for cities, national policy dialogues and European and international roundtables
3. Accelerating **social and technological innovations to support sustainable food system transition** in Living Labs by co-creating strategies on removing lock-ins, mobilizing impact investors, and promoting uptake of new technologies.
4. Improving **food system competences of citizens, including children and youth** by supporting food system education activities in Policy Labs and Living Labs and establishing a network on food system transformation in higher education.

Maximize **public engagement, citizen empowerment, and mobilization** by supporting public engagement and citizen science activities in Policy Labs and Living Labs, working with influencers, deploying a pan-European food systems exhibition, and designating permanent competence centers.

#03

FOOD 2030 Networks and FutureFoodS

FOOD 2030 Networks (www.food2030.eu) are two networks established and supported by the CLEVERFOOD project funded by the Horizon Europe Programme. They include the **FOOD 2030 Project Collaboration Network** for projects, partnerships and networks that are working on different aspects of transforming the food system through social, technological and governance innovation, and the **FOOD 2030 Connected Lab Network** for Living Labs, Communities of Practice and other co-creation practices that are working on transforming the food system at the local, regional and national level. Through FOOD 2030 Networks the CLEVERFOOD project is **breaking down silos** and **maximizing the collective impact** of projects and living labs by:

- Showcasing individual results and connecting initiatives with similar goals
- Facilitating the sharing of successful practices and exploring synergies
- Initiating collaboration on concrete actions and organisation of joint events
- Providing targeted support and dedicated training to increase competencies
- Coordinating the collection of relevant input for evidence-based policymaking

FutureFoods (https://www.futurefoodspartnership.eu) is a European Partnership co-funded by the Horizon Europe Programme, bringing together 86 partners from 29 countries, including national and regional authorities, funding agencies, universities, research institutes, foundations, and competitiveness clusters.

FutureFoodS aims to mobilise European research and innovation to accelerate the transition from linear food chains towards circular food systems, functioning within planetary boundaries. The actions of the partnership span four transversal actions:

- Pooling research and innovation resources and programming to harmonise efforts
- Launching an observatory to track the state of the food systems transition
- Establishing a knowledge Hub of Living Labs to maintain a participative approach
- Sharing knowledge to strengthen the food systems community

Over the next 10 years, six external project-funding calls will be organised, with topics prioritised based on the Strategic Research and Innovation Agenda (SRIA), which is continually updated according to recent research.

With 86 existing projects having a total budget of more than 550 million euro and more than 90 living labs, the FOOD 2030 Networks will together with FutureFoodS, which is expected to launch calls with a total budget of 500 million euro over the next 10 years, have a strong potential for supporting the development of transformative and mission-driven food systems R&I.

2. OVERCOMING KEY CHALLENGES IN EU FOOD SYSTEMS RESEARCH & INNOVATION

While current EU R&I systems seek to promote transformative change in food systems, R&I projects and practitioners face many challenges in 'doing' transformative R&I. We believe 10 key challenges should be overcome, and we provide recommendations that could help to do so. These recommendations can then be seen as concrete steps in bringing the food systems approach centre stage in EU mission-driven and transformative R&I policies.

Challenge 1:
Limited coordination and alignment between the European Commission Directorates-General

While the importance, merits and challenges for EU agriculture and food are at the centre of political debates both in the EU and within its Member States, there is limited coordination and alignment between the different EU Directorates-General (DGs) to ensure a stable and ambitious political agenda for food system transformation. Key policy instruments regarding food and agriculture are scattered across different DGs (CAP, CFP, F2F, Public Procurement Directive), often mainly supporting incremental R&I with limited impact, and policy lock-ins make meaningful reform of, for instance, the CAP difficult. Reforms, let alone the transformation of the agriculture and food system, are highly contested, and the political stakes are high. Whereas most stakeholders agree on the need for 'sustainability', diverse public and corporate interests clash in light of concretising transition pathways. Polarisation across the EU, notably on debates on agriculture, nitrogen and environmental regulations, adds to the lack of clear political ambition. While the EC deployed its Vision on Food and Agriculture, we believe stronger political leadership and a clear vision for how food system transformation can be supported through R&I are crucial to overcome the challenges EU food systems face.

Recommendation 1:
Show decisive leadership and prioritise transformative R&I actions

The only way to achieve a competitive, future-oriented and fair agriculture and food system that ensures European supply-sufficiency is by applying a transformative approach to R&I where all components and stakeholders of the agriculture and food system are mobilised, and where regenerative sustainability is acknowledged as a pre-requisite for achieving long-term resilience and food security. Transformative R&I require strong and dedicated political leadership (Mazzucato, 2018). Revitalizing food systems approaches in EU R&I should complement the leadership of the existing EU Missions, and could benefit from close collaboration between DG RTD, DG AGRI, DG SANTE, DG MARE, DG ENV, DG CLIMA, DG CONNECT, DG REGIO, DG GROW and DG REFORM, overseen by the Vice President

for Clean, Just and Competitive Transition, since it requires extensive cross-DG coordination and a strong taskforce to develop a unified vision that honors the diversity of EU food systems and ensures the sustainability and competitiveness of the farming and food sector (EC, 2024d). We call on political parties in all Member States to put food on the political agenda and to engage citizens around the need for transformative action. This requires developing a shared vision for the future of EU food systems across DGs, while respecting and building on the local diversities of EU food systems.

Challenge 2:
Lack of integration between policy domains and governance levels

Whereas the importance of integrated policy efforts is acknowledged, R&I efforts run into sectoral divisions between policy domains at local, national and EU levels. In particular, there is a disconnect between the agriculture, environment and health domains (Den Boer et al., 2021a; Parsons & Hawkes, 2018). This divide becomes apparent at EC level: the food-related policy under the Green Deal (including consumer protection) is embedded within DG Health and Food Safety (SANTE), the FOOD 2030 R&I policy framework with DG Research & Innovation, whereas the Common Agricultural Policy (CAP) and the new Vision on Agriculture and Food are cornerstones of DG Agriculture and Rural Development (AGRI). Transformative R&I often run into these sectoral divides, especially when policy goals, processes or outcomes are not aligned or even competitive. Food policies in the EU (historically) also lack the required coherence (Candel & Pereira, 2017; De Schutter et al., 2020). A key criterion for R&I policy is to develop a strong intervention logic for linking specific R&I investments with expected outcomes in food-related innovation, with co-benefits across multiple environmental, social and economic dimensions while accounting for unintended trade-offs with existing policies and socio-political opposition (see Tsvetkov et al. 2025). Correspondingly, there is a lack of knowledge transfer and alignment between policies at the different governance levels. Coordination challenges arise both horizontally between regions or Member States, as well as vertically between different levels of government. Coordination failures could, for instance, arise as misalignment between policy processes, policy instruments or policy goals, pointing to the need for coherent policy mixes (Rogge & Reichardt, 2016; Zepa & Hoffmann, 2023).

Recommendation 2:
Ensure coherence across policy domains and governance levels

Mission-driven policies for food systems R&I must be strongly embedded in, and linked to, policy instruments in sectoral domains like agriculture, fisheries, health, environment, economic and rural development. This requires cross-sectoral integration. This also requires explicit and financial links with the CAP. For instance, CAP mechanisms could reward innovation actors and initiatives (such as Living Labs and Policy Labs) to help them further strengthen local innovation ecosystems by linking urban and rural communities (Wascher et al., 2023). Strengthening food systems R&I should ensure cross-sectoral integration between the policies on agriculture, food, health, climate, environment, economy, competition and rural/urban development, and support coherence between governance at

the EU, national, regional and local level, by linking policy instruments across sectors and governance levels with financial ties to the CAP for successful implementation.

Challenge 3:
Short-term incentives and a lack of collaboration between R&I projects

EU R&I policy has clear long-term ambitions, such as those laid out in the Food 2030 Pathways to Action 2.0, and as envisioned for instance in the FutureFoodS Partnership. Yet, most R&I funding is short-term oriented (3-4 year projects, or shorter) both in EU framework programmes and within national and regional R&I funding. Studies have indicated that short-term orientation and *projectification* of R&I projects with transformative ambitions hinder both scientific progress as well as societal impact (e.g., Den Boer et al., 2021a; Torrens & Von Wirth, 2020; Gjefsen et al., 2024; Wascher et al., 2023). In addition, partly due to funding competition and projectification, the societal impact of R&I projects at times is overpromised during proposal writing (Chubb & Watermeyer, 2017). Creating synergies between different projects (CSA, RIA, IA) under Horizon Europe is actively promoted, especially through one-off events. Though these events help stakeholders learn about current food system transformation activities, their support for ongoing coordination is limited. A more structured example of coordination support is the CLEVERFOOD project. In particular, CLEVERFOOD outlines various support mechanisms for projects, partnerships, and Policy Labs and Living Labs (see Box 2) and has established the FOOD 2030 Networks to break down silos and facilitate collaboration between different initiatives working on transforming the food system (see Box 3). However, while many food system transformation projects would like to collaborate, effective collaboration remains difficult, due to limited resources allocated for cross-project collaboration and lack of permanent collaboration structures (e.g., Pisacane & Tagliacozzo, 2023; Tenhunen-Lunkka & Honkanen, 2024).

Recommendation 3:
Support long-term R&I efforts through a strategic portfolio of actions

To support long-term transformative change, R&I funding efforts should develop mission-driven and strategic portfolios of actions that support longer-term R&I projects (5-10 years) and include resources allocated for collaboration facilitated through a continuation of existing collaboration platforms with a clear coordination mandate. Following examples of pioneering funders such as Vinnova (Sweden) or NWO (Netherlands), stages can be built in funding calls, whereby exploratory phases with small amounts of resources allow for consortia to explore the feasibility of their proposal and to strengthen the network. FOOD 2030 Networks and FutureFoodS (see Box 3) could play a key role in fostering and supporting a network equipped to drive these portfolios forward. It is important to link such networks to initiatives in the health domain, such as ERA4Health and the Joint Action PreventNCD. At the same time, funding instruments should support existing local initiatives such as Living Labs, with seed funding to support an innovation ecosystem that accelerates new social and technological innovations. Key to successful implementation and impact maximisation of project portfolios is the development of instruments to coordinate, evaluate and adjust (ex-durante) the interaction between projects. This is crucial to ensure synergies between project resources, activities and outcomes. While current coordination efforts are

successfully deployed through EC Units and the FOOD 2030 Policy Framework, as well as through Coordination and Support Actions (CSAs, such as CLEVERFOOD and FIT4FOOD2030), especially CSAs lack a clear mandate to coordinate 'other' projects. Long-term Platforms could support this coordination. It is advisable to require all Horizon-funded projects within the same portfolio to allocate resources and capacity for collaboration and synergies with the project portfolio.

Challenge 4:
Relevant expertise is not always utilised to its full extent

With more than 90 projects working on transforming the agriculture and food system in the FOOD 2030 Project Collaboration Network, 86 partners in FutureFoodS Partnership and a wide range of expertise present in SCAR Foresight, SWG Food Systems, SWG Agroecology and SWG AKIS, as well as in the Agroecology Partnership, the Urban Agenda Food Partnership, SAPEA and the European Board on Agriculture and Food (EBAF), it is evident that there is wealth of relevant expertise that could be utilized for developing R&I actions on food. However, very often it is only a subset of the relevant expertise that is involved in describing such R&I actions, since consultation processes are not always transparent and the opportunity to contribute is not always communicated effectively to all relevant stakeholders. In addition to challenges in mobilising relevant expertise, R&I projects and outcomes on food systems are often not taken up by policy practice outside of DG RTD, whereas they provide crucial evidence and advice for policy in, for example, DG AGRI and DG SANTE.

Recommendation 4:
Integrate relevant expertise in the development of future R&I policies

As a part of the process towards bringing the food systems approach centre stage in R&I policies, extensive consultations with stakeholders, including EU Member States, experts, and citizens, are conducted to define the mission's objectives and scope and inform the drafting of the new Framework Programme. To ensure that existing scientific knowledge on food systems are fully integrated, it will be crucial to consider relevant expertise on agriculture, food, health, climate, environment, economy, competition and rural/urban development, including expertise from SCAR Foresight, SWG Food Systems, SWG Agroecology and SWG AKIS, the European Partnerships FutureFoodS, Agroecology, and Agriculture of Data, the Urban Agenda Food Partnership, SAPEA and the FOOD 2030 Networks. There is also a crucial role for the new EBAF, which could actively set up exchange with, and draw upon the expertise and knowledge developed in the FOOD 2030 portfolio projects. Expertise and evidence developed by food systems R&I projects should be taken up more actively by different thematic DGs. This could be facilitated by the abovementioned networks as well as, for instance, the Joint Research Centre.

Challenge 5:
One size does not fit all: support for R&I is skewed towards EU-15

Ensuring that R&I policies and projects address local challenges and develop locally anchored solutions is a key challenge. Especially considering the EC's ambition to involve and empower local communities (EC, 2017), and the need for place-based governance of food systems (Sonnino & Milbourne, 2022), the coordination challenges between local needs and EU ambitions become apparent. The EU is composed of member states with varying economic, social, and technological landscapes. Solutions that work well in one member state may not be effective in another due to these differences. Furthermore, each region has its own unique innovation ecosystem, including universities, research institutions, and industries. A uniform R&I policy might overlook the specific strengths and weaknesses of these ecosystems and lead to inefficient resource allocation. By tailoring policies to local contexts, resources can be directed where they are most needed and can have the greatest impact. Despite the EC's commitment to address the issue of widening participation in R&I, there is still a significant gap between the EU-13 and EU-15 countries in terms of participation and success rates in the Framework Programmes. Whereas the EU-13 represent about 20% of the EU population, their participation in FP7 and H2020 projects represented less than 10% of total EU-28 participation and less than 4% of the EC's financial contributions (Initiative for Science in Europe, 2021).

Recommendation 5:
Advance place-based approaches across all EU Member States

Mission-driven R&I should advance local solutions, support regional development and deploy place-based approaches by strengthening R&I actions in both EU-15 and EU-13 member states. For example, work in Horizon-funded FOODCLIC and FUSILLI projects shows the importance of place-based governance for urban food system transformation. Several network partners in the EU (such as SCAR, Eurocities, Slow Food, ICLEI, ENOLL, and MUFPP) are strongly rooted in local and place-based partnerships. Mission-driven food systems R&I can further support local initiatives and governance efforts and coordinate their interaction with EU project portfolios, for instance, through the FOOD 2030 Connected Lab Network. Lessons on the role of place-based interventions and the need to strengthen urban-rural linkages can be learned from several ongoing partnerships in the agriculture and food domain. Through engaging with the Mission on a Soil Deal for Europe, R&I programmes and projects can further support Living Labs and Lighthouses for food system transformation. Deploying such networks to foster translocal learning and empowerment is crucial in advancing the replication and diffusion of place-based innovations and solutions towards systemic impacts.

Challenge 6:
Instrumentalisation of social innovation

In efforts to move beyond technological innovation as a silver bullet for sustainable food system transformation, the role of social and policy innovations and their complementarity to technological innovation for transformative change is considered a key focal area for science and policy (Rogge et al., 2023; Avelino et al., 2019; Hebinck et al., 2018). Social innovations (such as new organization forms, sustainable cooperatives, and policy innovations that strive for adaptive and inclusive policymaking) co-created in Living Labs, Food Labs, Policy Labs or otherwise, are among the key components of FOOD 2030 R&I projects (see e.g., the FOOD 2030 Connected Lab Network, or publications such as EC, 2021; Wascher et al., 2023). Yet, despite their promise, scholars have indicated that in funding calls and in practice, social innovations are often seen as 'nice to have' rather than 'must have'. This is one reason why they are often instrumentalised and considered as useful additions to technological innovation rather than structural ways of rethinking incumbent systems (Wittmayer et al., 2020). This limits the transformative potential of R&I, as scaling and embedding social innovations can address deep leverage points such as organisational routines, cultural values and practices.

Recommendation 6:
Balance social and technological innovations

In line with the recommendations of the Strategic Dialogue on the future of EU agriculture, EU food system R&I should seek to develop and accelerate both social and technological innovation. Mission-driven programmes and project portfolios should develop a balance between these and should more actively promote social and policy innovation developments. For instance, by deploying, funding and supporting Social Innovation Labs and Policy Labs on food systems throughout the EU. Transdisciplinary integration of social sciences, technological sciences, arts and humanities, as well as other forms of knowledge, should further become the norm in R&I funding. The new DG on Start-ups, Research and Innovation should actively stimulate social innovation start-ups. In future EU-funded projects, Responsible R&I (RRI) should remain a key element of ensuring that technological innovation developments aid societal needs and take into account ethical considerations of rapid technological advancement.

Challenge 7:
Business-as-usual stakeholder engagement

Many EU R&I projects are explicitly invited to engage societal stakeholders in food systems R&I, through multi-stakeholder workshops, Living Labs or Citizen Science (see for instance calls for the Horizon Europe framework programme). This might lead to more societal support, more legitimacy for interventions, social learning, and better R&I outcomes (e.g., Schmidt et al., 2020). However, if most stakeholders involved are 'business-as-usual' stakeholders, does that lead to transformative change? Studies have shown that many R&I

projects across the globe do not meaningfully include societal stakeholders, reinforcing incumbent power dynamics (Turnhout et al., 2020). On the EU level, citizen and expert engagement exercises face challenges which are not present on a national level (Gudek et al., 2024). In EU projects, it has also been difficult to involve the 'unusual suspects' due to strict funding criteria—sometimes reinforced by associated national research funders—that prioritize research institutes while potentially prohibiting compensation for stakeholders with practical work commitments, such as farmers, fishers, and chefs (Wascher et al., 2023; Kok et al. 2021). This risks reproducing the status quo, rather than transforming it.

Recommendation 7:
Do better at including the non-usual actors to increase societal impact

R&I projects and supporting funding mechanisms need to do better in including the non-usual actors and perspectives. Importantly, it requires inclusion of practical knowledge, experiential knowledge, Indigenous knowledge and other forms of non-scientific knowledge that are crucial to understand the lived experiences of people and communities, and that help understand how R&I (projects) can contribute (or not) to pathways forward. This requires integrating transdisciplinary practices (and allocating the required resources to include and reward stakeholders for providing time, capacity and knowledge to R&I processes) in R&I project funding structures, and to make sure this can be written into R&I project design and accounted for during implementation. It also requires embedding flexibility into Horizon projects to accommodate emerging needs and contributions from stakeholders during project implementation (Gjefsen et al., 2024).

Challenge 8:
No clear vision on inclusive growth

It is crucial to advance transitions to food systems that are not only ecologically sustainable but also socially just. In science and policy, there are increasing calls to focus on social justice, fairness, equity and ethics in food systems transformation. The EU Just Transition Fund[1] is an example of a policy mechanism to mitigate undesirable side effects of transition processes. EU R&I projects, too, are concerned with issues of social justice and seek to contribute to just EU societies. Examples can be found at the level of EU cities, which, despite valuable support from, for instance, the Milan Urban Food Policy Pact and the Eurocities Working Group Food, face challenges to explicitly implement social justice considerations in urban food strategies Smaal et al., 2020). Other studies have shown that what is meant by ‘justice’ is not clearly operationalised in EU sustainability projects (Luger et al., 2023). In the context of EU food systems R&I, we too observe that while there is a strong focus on ‘justice and inclusive growth’, its operationalisation and implication thereof for R&I projects remains opaque (Wascher et al., 2023).

[1] Just Transition Fund - European Commission

Recommendation 8:
Incorporate justice considerations in R&I funding

EU R&I should explicitly address justice considerations[2] in food systems. R&I can contribute to distributive justice by redistributing the benefits of knowledge and innovations across communities. R&I can contribute to procedural justice by engaging communities and cities in R&I efforts. R&I can contribute to recognition of justice by incorporating pluralities of knowledge on food systems in their activities. Balancing justice considerations with economic and environmental goals in food systems is crucial (Hebinck et al., 2021). R&I funding could explicitly incorporate different justice considerations in project portfolios. This also begs for new ways of evaluating societal impact and KPIs for food systems R&I.

Challenge 9:
Insufficient scaling strategies for identified solutions

In recent years, Living Labs in cities and city-regions have served as an arena for various transformative efforts. This has included work on R&I policy alignment and development of transformative education modules (e.g., FIT4FOOD2030 and FOODPathS); maturing, combining, upscaling, and multiplying food system innovations (e.g., FOODSHIFT2030); and development of integrated food policy in city regions (e.g., FOODCLIC, Food Trails). While these have yielded novel practices and a greater understanding of the transformative dynamics in Living Labs (e.g. Kok et al., 2023), there is a lack of strategies for structurally embedding such learnings into the existing system. While these initiatives offer a concrete problem-solution orientation, a challenge remains in how to translate the short-term and contextual level transition experiments (such as those in Living Labs) to the broader structural context (Turnheim et al., 2015).

Recommendation 9:
Support and reward scaling strategies for innovation instruments

The recent FOOD 2030 high-level policy brief on Long-term Living Lab Support towards Food System Transformation provides concrete recommendations on supporting and scaling innovation activities through Living Labs (Wascher et al., 2023). These include establishing match-funding mechanisms by institutionalising co-funding with municipalities and the EU; leveraging public-private partnerships to fund long-term Lab activities, with a focus on funding key personnel; and recognising that Living Labs and other innovation instruments are key in delivering the paradigm shift towards new innovation ecosystems for food system transformation. Building on established FOOD 2030 project work in for instance CLEVERFOOD, FOSTER and FoSSNet, long-term support for multi-stakeholder Labs helps to develop beyond incumbent Agricultural Knowledge & Innovation Systems (AKIS) towards mission-driven Food Knowledge & Innovation Systems. Therefore, it is important that impact

[2] Though justice is not easily defined, scholars argue that there are several dimensions of justice in food system transformation, including distributive justice, procedural justice and recognition justice (Kaljonen et al., 2021; Whitfield et al., 2022).

investing and other financing options are available for channelling capital into the incubation and scaling of impact-driven food systems innovation beyond technology-driven innovation (Pamuk et al. 2024).

Challenge 10:
Lack of transformative capacities

In part due to the above-mentioned challenges, 'doing' transformative R&I is difficult for researchers, policymakers, innovators and other food system actors. This requires further building transformative capacities (including the required skills and competencies) needed for food system transformation (Den Boer et al., 2021b; Sonnino, 2023). These include competencies such as food systems thinking, network building and interdisciplinary collaboration. While inter- and transdisciplinary educational programmes on food systems (for students, or for professionals, such as the pan-European learning platform of EIT Food Education) are taking shape in the EU, monodisciplinary and sectoral capacities are still dominant.

Recommendation 10:
Enhance capacity building through education, training and competence centres

Food systems R&I programs should explicitly focus on capacity development in food system professionals, including researchers, innovators and policymakers. This requires further strengthening and supporting a transdisciplinary pan-European Network for Food Systems Science, as is currently being developed by the FoSSNet project. Under the umbrella of mission-oriented project portfolios, education and training programmes on food system competencies could be deployed through establishing Competence Centres (in collaboration with vocational and higher education institutions in the EU). It is crucial to include and engage students and youth (across schools and universities) in educational and awareness-raising activities. This can be done, for instance, through the development and implementation of new (replicable) educational modules. Correspondingly, the development and strengthening of transdisciplinary food system-oriented curricula in higher education can be stimulated through R&I project portfolios. Raising food systems awareness can further be supported through Living Labs in schools and science museums, and through art-based interventions that engage citizens, children, students and youths across the EU.

3. CONCLUSION

R&I efforts can accelerate transitions towards a fair, healthy and sustainable EU agriculture and food system. However, for R&I to become transformative, 10 key challenges need to be overcome. We recommend that the European Commission put the food systems approach centre stage in R&I policies. This can help to coordinate, align and accelerate R&I efforts and to tackle key challenges to transformative food systems R&I. In the design and implementation of such mission-oriented food innovation policies, the EC needs to ensure broad political and societal support. This includes support of Member States, and crucially, local communities of farmers, fishers, citizens and businesses that are key to delivering sustainable, healthy, and just outcomes of EU food systems.

Transforming food systems is a matter of understanding and acknowledging power dynamics (Rossi et al., 2019; Clapp, 2021) and actively mitigating harmful power imbalances that have emerged in recent decades. Which future we envision for our shared and collective food systems, and how we will get there, in the end, remains a political question. Of course, this question cannot be answered by R&I alone. But putting the integrated issue of food high on the political agenda and making the best use of the EU R&I community's potential in helping to bring about transformation in our food systems is crucial. We need a strengthened food systems approach in EU R&I.

REFERENCES

Achterbosch et al. (2019). Synthesis of existing food systems studies and research projects in Europe. Independent Expert Report. DOI: 10.2777/004919

Avelino, F., Wittmayer, J. M., Pel, B., Weaver, P., Dumitru, A., Haxeltine, A., ... & O'Riordan, T. (2019). Transformative social innovation and (dis) empowerment. *Technological Forecasting and Social Change*, *145*, 195-206.

Candel, J. J., & Pereira, L. (2017). Towards integrated food policy: Main challenges and steps ahead. *Environmental Science & Policy*, *73*, 89-92.

Caniglia, G., Lüderitz, C., von Wirth, T., Fazey, I., Martín-López, B., Hondrila, K., ... & Lang, D. J. (2021). A pluralistic and integrated approach to action-oriented knowledge for sustainability. *Nature Sustainability*, *4*(2), 93-100.

Chubb, J., & Watermeyer, R. (2017). Artifice or integrity in the marketization of research impact? Investigating the moral economy of (pathways to) impact statements within research funding proposals in the UK and Australia. *Studies in higher education*, *42*(12), 2360-2372.

Clapp, J. (2021). The problem with growing corporate concentration and power in the global food system. *Nature Food*, *2*(6), 404-408.

De Schutter, O., Jacobs, N., & Clément, C. (2020). A 'Common Food Policy'for Europe: How governance reforms can spark a shift to healthy diets and sustainable food systems. *Food Policy*, *96*, 101849.

Den Boer, A. C., Kok, K. P., Gill, M., Breda, J., Cahill, J., Callenius, C., ... & Broerse, J. E. (2021a). Research and innovation as a catalyst for food system transformation. *Trends in food science & technology*, *107*, 150-156.

Den Boer, A. C., Broerse, J. E., & Regeer, B. J. (2021b). The need for capacity building to accelerate food system transformation. *Current Opinion in Food Science*, *42*, 119-126.

EC (2017). FOOD 2030: Future-Proofing our Food systems through Research and Innovation. European Commission, Brussels, Belgium.

EC 2030 Expert Group (2018). A recipe for Change. An agenda for a climate-smart and sustainable food system for a healthy Europe. European Commission, Brussels, Belgium.

EC (2023a). *Towards sustainable food consumption – Promoting healthy, affordable and sustainable food consumption choices*, European Commission: Directorate-General for Research and Innovation and Group of Chief Scientific Advisors, Publications Office of the European Union, 2023.

EC (2023b). *Food 2030 – Pathways for action 2.0 – R&I policy as a driver for sustainable, healthy, climate resilient and inclusive food systems (*Bizzo, G., Fabbri, K., Gajdzinska, M., Haentjens, W. et al.), European Commission: Directorate-General for Research and Innovation, Publications Office of the European Union, 2023, https://data.europa.eu/doi/10.2777/365011

EC (2024a). *The future of European competitivenes.* Publication Office of the European Union, 2024.

EC (2024b). Align, Act, Accelerate - Research, Technology and Innovation to boost European Competitiveness. Publications Office of the European Union, 2024, https://data.europa.eu/doi/10.2777/9106236

EC (2024c). EU Missions in Horizon Europe. https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe_en

EC (2024d). Mission letter: Teresa Ribera Rodríguez. https://commission.europa.eu/document/download/5b1aaee5-681f-470b-9fd5-aee14e106196_en?filename=Mission%20letter%20-%20RIBERA.pdf

FAO (2024). The State of Food and Agriculture 2024 – Value-driven transformation of agrifood systems. Rome.

Gjefsen, M.D., Kok, K.P.W., & Helliwell, R. (2024). Confronting the Projectification of Transdisciplinarity for Transformation. In *Transdisciplinarity for Transformation: Responding to Societal Challenges through Multi-actor, Reflexive Practices* (pp. 111-134). Cham: Springer International Publishing.

Gudek, L., Kok, K.P.W., & Broerse, J.E.W. (2024). Towards new perspectives of stakeholder engagement in sustainability transitions: Bringing the supranational level into view. Environmental Innovation and Societal Transitions, 53, 100921.

Haddad, C. R., Nakić, V., Bergek, A., & Hellsmark, H. (2022). Transformative innovation policy: A systematic review. *Environmental Innovation and Societal Transitions*, *43*, 14-40.

Hebinck, A., Galli, F., Arcuri, S., Carroll, B., O'connor, D., & Oostindie, H. (2018). Capturing change in European food assistance practices: a transformative social innovation perspective. *Local Environment*, *23*(4), 398-413.

Hebinck, A., Zurek, M., Achterbosch, T., Forkman, B., Kuijsten, A., Kuiper, M., ... & Leip, A. (2021). A sustainability compass for policy navigation to sustainable food systems. *Global Food Security*, *29*, 100546.

Hekkert, M. P., Janssen, M. J., Wesseling, J. H., & Negro, S. O. (2020). Mission-oriented innovation systems. *Environmental innovation and societal transitions*, *34*, 76-79.

Herrero, M., Thornton, P. K., Mason-D'Croz, D., Palmer, J., Benton, T. G., Bodirsky, B. L., ... & West, P. C. (2020). Innovation can accelerate the transition towards a sustainable food system. *Nature Food*, *1*(5), 266-272.

IPCC (2023). IPCC Climate Change 2023: Synthesis Report.

Initiative for Science in Europe (ISE). (2021). Position on Horizon Europe. Retrieved from https://www.initiative-se.eu/wp-content/uploads/2021/07/ISE-position-Horizon-Europe.pdf.

Janssen, M. J., Torrens, J., Wesseling, J. H., & Wanzenböck, I. (2021). The promises and premises of mission-oriented innovation policy—A reflection and ways forward. *Science and public policy*, *48*(3), 438-444.

Kaljonen, M., Kortetmäki, T., Tribaldos, T., Huttunen, S., Karttunen, K., Maluf, R. S., ... & Valsta, L. (2021). Justice in transitions: Widening considerations of justice in dietary transition. *Environmental Innovation and Societal Transitions*, *40*, 474-485.

Klerkx, L., & Begemann, S. (2020). Supporting food systems transformation: The what, why, who, where and how of mission-oriented agricultural innovation systems. *Agricultural Systems*, *184*, 102901.

Kok, K. P. W., Gjefsen, M. D., Regeer, B. J., & Broerse, J. E. (2021). Unraveling the politics of 'doing inclusion' in transdisciplinarity for sustainable transformation. *Sustainability science*, *16*, 1811-1826.

Kok, K. P. W., van der Meij, M. G., Wagner, P., Cesuroglu, T., Broerse, J. E. W., & Regeer, B. J. (2023). Exploring the practice of Labs for sustainable transformation: The challenge of 'creating impact'. *Journal of Cleaner Production*, *388*, 135994.

Luger, J., Kotsila, P., & Anguelovski, I. (2023). The notion of justice in funded research on urban sustainability: performing on a postpolitical stage or staging the political?. *Local Environment*, *28*(1), 8-30.

Mazzucato, M. (2018). Mission-oriented innovation policies: challenges and opportunities. *Industrial and corporate change*, *27*(5), 803-815.

Moragues-Faus, A., Sonnino, R., & Marsden, T. (2017). Exploring European food system vulnerabilities: Towards integrated food security governance. Environmental Science & Policy, 75, 184-215.

Olesen, J.E., Christensen, S., Jensen, P.R., Schultz, E., Rasmussen, C. (Editor); Kjer, K.H. (Editor), Kristensen, T.N. (Editor); Gade, J.J., (Editor), Haslund, S. (Editor), Henriksen, C.B. (Editor), Persson, M. (Editor), Kryger, K., Henricksen, L. (Editor). (2021). AgriFoodTure: Roadmap for sustainable transformation of the Danish Agri-Food system.

Pamuk, H., Verweij-Novikova, I., Mulugeta Negede, B., Desczka, S., Bodnar, Y., Achterbosch, T., & Ofosuah Obeng, R., (2024). Private funding to support radical food system innovation in Europe. Deliverable 4.1, CLEVERFOOD, https://food2030.eu/wp-content/uploads/2025/03/D4.1-Private-funding-to-support-radical-FS-innovation-in-Europe_compressed.pdf

Parsons, K., & Hawkes, C. (2018). Connecting food systems for co-benefits: how can food systems combine diet-related health with environmental and economic policy goals?.

Pisacane, L., & Tagliacozzo, S. (2023). A relations-based evaluation framework to support collaborative research and innovation (R&I) networks. Innovation: The European Journal of Social Science Research, 36(4), 800-821.

Regeer, B. J., Klaassen, P., & Broerse, J. E. W. (2024). *Transdisciplinarity for Transformation: Responding to Societal Challenges through Multi-actor, Reflexive Practices.* Palgrave Macmillan.

Rogge, K. S., & Reichardt, K. (2016). Policy mixes for sustainability transitions: An extended concept and framework for analysis. *Research policy*, *45*(8), 1620-1635.

Rogge, K. S., Stadler, M., de Geus, T., Hielscher, S., Wittmayer, J., Broich, A., ... & Vernay, A. L. (2023). Fit for social innovation? Policy reflections for EU energy and climate policy making. *Oxford Open Energy*, *2*, oiac010.

Rossi, A., Bui, S., & Marsden, T. (2019). Redefining power relations in agrifood systems. *Journal of Rural Studies*, *68*, 147-158.

SAPEA (2020). A sustainable food system for the European Union (Evidence Review Report; No. 7). https://www.sapea.info/wp-content/uploads/sustainable-food-system-report.pdf

Scaramuzzi, S., Gerini, F., Gabellini, S., & Casini, L. (2023). Research and innovation needs and gaps for sustainable food systems–A portfolio analysis of EU funded projects. In *Research and innovation needs and gaps for sustainable food systems–A portfolio analysis of EU funded projects* (pp. 1-85). European Commission.

Schafer, L. J., Anthouli, A., Schmidt, A., Beblek, A., Fruehbeisser, A., Walthall, B., Mingolla, C., Rogozan, C., Petruzzella, D., Wascher, D., Volpe, F., Ruggeri, G., Arciniegas, G., Vicente-Vicente, J. L., Riviou, K., Valta, K., Wenzel, L. M., Labellarte, L., Crivits, M., ... Henriksen, C. B. (2024.). Transforming European food systems with multi-actor networks and Living Labs through the FoodSHIFT approach. Open Research Europe.

Schmidt, L., Falk, T., Siegmund-Schultze, M., & Spangenberg, J. H. (2020). The objectives of stakeholder involvement in transdisciplinary research. A conceptual framework for a reflective and reflexive practise. *Ecological Economics*, *176*, 106751.

Smaal, S. A., Dessein, J., Wind, B. J., & Rogge, E. (2021). Social justice-oriented narratives in European urban food strategies: Bringing forward redistribution, recognition and representation. *Agriculture and Human Values*, *38*(3), 709-727.

Sonnino, R. (2023). Food system transformation: Urban perspectives. *Cities*, *134*, 104164.

Sonnino, R., & Milbourne, P. (2022). Food system transformation: a progressive place-based approach. *Local Environment*, *27*(7), 915-926.

Sonnino, R., Callenius, C., Lähteenmäki, L., Breda, J., Cahill, J., Caron, P., Damianova, Z., Gurinovic, M., Lang, T., Lapperière, A., Mango, C., Ryder, J., Verburg, G., Achterbosch, T., den Boer, A., Kok, K., Regeer, B. J., Broerse, J. E. W., Cesuroglu, T., & Gill, M. (2020). Research and Innovation Supporting the Farm to Fork Strategy of the European Commission. (Policy Brief; Vol. 3). https://doi.org/10.13140/RG.2.2.10891.23840

Strohschneider, P., et al., (2024). Strategic Dialogue on the Future of EU Agriculture: A shared prospect for farming and food in Europe. Strategic Dialogue on the Future of EU Agriculture

Tenhunen-Lunkka, A., & Honkanen, R. (2024). Project coordination success factors in European Union-funded research, development and innovation projects under the Horizon 2020 and Horizon Europe programmes. *Journal of Innovation and Entrepreneurship*, *13*(1), 7.

Tsvetkov, B., Matthijssen, T., Giesbers, E., Aramyan, L., Beekman, V., Bondarenko, T., Geerling-Eijff, F., Loeber, A., Magalhães, H., & Achterbosch, T., (2025). R&I policy support options for furthering food systems science at national, regional and local level in the EU. Deliverable 4.1, FOSTER, EU grant agreement no. 101059954.

Turnheim, B., Berkhout, F., Geels, F., Hof, A., McMeekin, A., Nykvist, B., & van Vuuren, D. (2015). Evaluating sustainability transitions pathways: Bridging analytical approaches to address governance challenges. *Global environmental change*, *35*, 239-253.

Turnhout, E., Metze, T., Wyborn, C., Klenk, N., & Louder, E. (2020). The politics of co-production: participation, power, and transformation. *Current opinion in environmental sustainability*, *42*, 15-21.

Van den Bosch, S. (2010, September 16). Transition Experiments: Exploring societal changes towards sustainability. Retrieved from http://hdl.handle.net/1765/20714

Wanzenböck, I., Wesseling, J. H., Frenken, K., Hekkert, M. P., & Weber, K. M. (2020). A framework for mission-oriented innovation policy: Alternative pathways through the problem–solution space. *Science and public policy*, *47*(4), 474-489.

Wascher, D., Schafer, L., Eyre, P., Henriksen, C. B., Parente, S., Walthall, B., Beblek, A., Bouillon, C., De Cunto, A., De Marchi, M., Frühbeißer, A., Plebani, E., Riviou, K., Steines, A. K., Vaska, S., & Wehner, R. (2023). Long-term living lab support towards food system transformation: Policy recommendations for long-term support of living labs contributing to food system transformation. A joint initiative from the EU FOOD 2030 Project Family. Horizon Results Booster. https://foodshift2030.eu/wp-content/uploads/2023/11/HRB_EUFood20230_Oct2023.pdf

Whitfield, S., Apgar, M., Chabvuta, C., Challinor, A., Deering, K., Dougill, A., ... & Vincent, K. (2021). A framework for examining justice in food system transformations research. *Nature Food*, *2*(6), 383-385.

Wittmayer, J. M., de Geus, T., Pel, B., Avelino, F., Hielscher, S., Hoppe, T., ... & Härtwig, A. (2020). Beyond instrumentalism: Broadening the understanding of social innovation in socio-technical energy systems. *Energy research & social science*, *70*, 101689.

Zepa, I., & Hoffmann, V. H. (2023). Policy mixes across vertical levels of governance in the EU: The case of the sustainable energy transition in Latvia. *Environmental Innovation and Societal Transitions*, *47*, 100699.

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