Editorial: Transdisciplinary research for understanding and transforming food systems

Alexandros Gasparatos[1]*, Cyrille Rigolot[2] and Laura M. Pereira[3,4]

[1]Institute for Future Initiatives (IFI), University of Tokyo, Tokyo, Japan, [2]UMR Territoires, Institut National de Recherche en Agriculture, Alimentation et Environnement (INRAE), Clermont-Ferrand, France, [3]Global Change Institute, University of the Witwatersrand, Johannesburg, South Africa, [4]Stockholm Resilience Centre, Stockholm University, Stockholm, Sweden

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Editorial on the Research Topic
Transdisciplinary research for understanding and transforming food systems

Fostering the sustainable transformation of food systems is one of the biggest bets for meeting the Sustainable Development Goals (SDGs) (Willett et al., 2019). As diets and food production have radically transformed in the past decades, the industrialized and globalized food systems that are notably prevalent across the global North have become major causes of poor health and environmental degradation (IPES-Food, 2016; Willett et al., 2019). At the same time, malnutrition, food insecurity and underperforming food production systems are still the reality in many parts of the global South (FAO et al., 2023). The expected population growth, accelerated urbanization, and increased affluence in much of the global South are likely to further catalyze unsustainable dietary shifts and food systems transformation in the coming decades (FAO et al., 2023).

However, understanding food systems and transforming them in a sustainable manner is far from straightforward, especially when considering their multiple intersecting economic, social, technological, and cultural dimensions. This typically corresponds to a "wicked problem," without any single individual simple and definitive solution. To further complicate things, food systems encompass different stakeholders operating at different levels with enormously different worldviews and vested interests (UNEP et al., 2023). However, food system transformations must be arguably context-specific, as the production and consumption of food must reflect the socioeconomic, environmental and governance characteristics of their geographical and temporal contexts (Pereira et al., 2020).

In this context, it has been argued that transdisciplinary research (TDR) approaches offer promising opportunities for sustainable food systems transformations. Although there is no single consensual definition of transdisciplinary research (TDR), it is generally agreed that its key characteristics are the integration of multiple disciplinary perspectives (inter-disciplinarity) and the engagement of stakeholders at all stages of the knowledge production process (Lang et al., 2023). In practice, there is a wide diversity of TDR approaches. Yet much remains to be done to better understand their conditions of success (and failure) for food systems transformations, which has become a rapidly evolving research field.

The goal of this Research Topic is to offer a forum for gathering and critically synthesizing new up-to-date insights on how TDR approaches, methods and processes can be mobilized to understand better and transform sustainably and inclusively food systems. The Research Topic collects nine papers that mobilize very diverse TDR approaches for equally diverse applications in Asia, Africa, the Americas and Europe (Table 1).

Berthet et al. report the initial experiences gained from the implementation of a large-scale and long-term transdisciplinary project in France. The study focuses particularly on four types of actions within this project, namely backdrop, targeted, assessment, and communication and dissemination actions. It critically discusses how these actions aim to co-produce knowledge, raise awareness about challenges in the local food system, envision new interactions between stakeholders, and collectively generate innovative ideas and catalyze actions toward agri-food system transformation.

Calla et al. present the experiences gained from the implementation of transdisciplinary approaches such as the Community Voice Method (CVM), film-making, Transformation Labs (T-Labs) and stakeholder engagement processes. In particular the study focuses on how such approaches can be used to elicit and convey the perceptions of very diverse stakeholders, with the overall aim of reducing pesticide use and related conflicts in France.

Dernat et al. study the outcomes of a participatory foresight exercise, in the context of a Protected Designation of Origin (PDO) cheese area in France. The study argues that the continuous engagement of farmers in the collective dynamic needs to be continuously re-negotiated over time in order to overcome the risks and insecurity that farmers have to face in the transformation process.

Gasparatos et al. critically discuss how participatory engagement processes can help introduce transdisciplinary research elements, using insights from five research projects on commodity crop production in Sub-Saharan Africa. In particular, they show how such participatory processes can help (a) identify research priorities, knowledge gaps, and underlying phenomena, (b) formalize impact mechanisms and develop methodology, and (c) interpret data and validate findings.

Guzman Luna et al. present the experiences gained from a 3-year participatory action research (PAR) project with coffee smallholders in Mexico and Nicaragua that leverage diversification practices for a transformative agroecology. They critically discuss how this project helped achieve change through capacity-building, co-creation of questions/knowledge, farmer-to-farmer sharing of pedagogies and co-production of popular education material.

Hermesse et al. outline the experiences gained from the implementation of six research projects using different transdisciplinary research approaches and the concept of co-creation. These projects collectively sought to create more sustainable urban agri-food systems in Brussels (Belgium). Notably the study illustrates how these projects brought together different actors in Brussels, creating a shared awareness about the need for change of the city's agri-food system.

Jarzebski et al. discuss the process, thematic focus and lessons learned from the design and implementation of six SDG-Labs that developed biodiversity-based solutions for sustainable food systems transformations in Armenia, China, Japan, Madagascar, Thailand, and Uganda. The study argues the great potential of SDG-Labs to develop solutions at the biodiversity-food-climate nexus, reflecting critically their strengths, weaknesses, opportunities and threats.

Juri et al. report the process and lessons learned from an international transdisciplinary community of practice that co-designed and implemented a 3-year multi-stakeholder process for food system transformation in Uruguay. The study describes the design, structure, and facilitation of this transdisciplinary process through the principles of knowledge co-production, as well as its potential for uptake in other contexts.

McGreevy et al. argue how soft scenarios can contribute to transdisciplinary processes for sustainable food system transformation. The study draws from a 5-year transdisciplinary action research project in different parts of Asia and critically discusses how soft scenarios can (a) question widely held assumptions about the future, (b) be inclusive to multiple perspectives/worldviews, (c) foster receptiveness to unimaginable futures and (d) develop futures literacy.

Some of the studies in this Research Topic focus on the in-depth analysis of one or several TDR project(s) in a single national context (Berthet et al.; Juri et al.; Hermesse et al.; Calla et al.; Dernat et al.), while others draw lessons after critically synthesizing insights from case studies in different countries (Gasparatos et al.; Jarzebski et al.; McGreevy et al.; Guzman Luna et al.). Whereas, some studies consider food systems (and related solutions) as a whole in a given locality or national context (e.g., Berthet et al.; Juri et al.; Calla et al.), others focus on specific value chains (Guzman Luna et al.; Gasparatos et al.; Dernat et al.), aspects of food systems (Hermesse et al.) or response options (e.g., biodiversity-based solutions) (Jarzebski et al.). The studies also focus on different time frames within the TDR cycle, ranging from the initiating stages of TDR projects (Calla et al.) or their recent conclusion (Juri et al.; Jarzebski et al.), to the reflexive analysis following the conclusion of TDR processes (Berthet et al.; Gasparatos et al.; Hermesse et al.; McGreevy et al.).

Each study within the Research Topic proposes a unique, situated TDR approach to connect researchers and stakeholders for food systems transformations. Depending on the timing and stage of the TDR process, different methodological innovations are discussed in each study. Some of these methodologies are rather forward-looking such as soft scenarios (McGreevy et al.) and the co-creation of visions and transition pathways (Juri et al.). Calla et al. link a visioning exercise ("miracle questions") with other TDR methodologies (Community Voice Method, Film-making and T-Labs) to address conflicts between stakeholders as a preliminary step to a lasting transdisciplinary process. But what happens after shared visions have been designed, and some consensus has been reached (or not)? Dernat et al. show that the link between participatory foresight and action is far from linear, and explore the "New World Kirkpatrick Model" as a framework for monitoring and adjusting agri-food system transitions in the making. Finally, some papers propose a broader reflexive view on the whole TDR process, from system diagnosis to actions' implementation, assessment and dissemination (Berthet et al.; Guzman Luna et al.; Jarzebski et al.; Gasparatos et al.).

TABLE 1 Main characteristics of the studies included in the Research Topic.

Study	Countries	Target food systems	Transdisciplinary approaches and methods	Transdisciplinary research outcomes
Berthet et al.	France	Food systems (local), Food practices	Place-based Research, Real-World lab ("Zone Atelier")	- Raise awareness; - Envision new interaction between stakeholders; -Develop innovative ideas; - Catalyze action
McGreevy et al.	Japan Thailand	Food systems	Futures literacy, Soft scenario, "Learning, Playing, Experimenting"	- Question widely held assumptions about the future; - Enhance inclusiveness to multiple perspectives and worldviews; - Foster receptiveness to unimaginable futures
Juri et al.	Uruguay	Food systems (national)	Bridging organizations, Knowledge co-production, Community of practice, Multi-stakeholder processes	- Generate a language of collaboration, dialogue and imagination
Hermesse et al.	Belgium	Food systems (urban, peri-urban)	Participatory Action Research, Co-creation	- Place agri-food system transitions on the political agenda; - Identify future challenges for food systems transformations
Calla et al.	France	Food systems (local)	Community Voice Method, Film-making, "Miracle Question", T-Labs, Workshops	- Understand the complexity of food systems transformations from conflictual perspectives; - Build long-term trust between researchers and other stakeholders; - Open up dialogue; - Develop long-term solutions
Guzman Luna et al.	Mexico Nicaragua	Smallholder coffee production systems (local)	Participatory Action Research	- Build capacity with community facilitators; - Co-create relevant knowledge for strategic planning; - Share farmer-to-farmer and popular pedagogies across territories
Gasparatos et al.	Eswatini Ghana Guinea Kenya Malawi Mozambique Kenya	Commodity crop production systems (local)	Participatory methodologies	- Identify research priorities; - Develop methodologies; - Interpret data and validate findings; - Enhance research credibility, relevance, legitimacy, and effectiveness
Dernat et al.	France	Dairy-cheese value chains (local)	Foresight, Participatory observation	- Encourage farmers into action; - Maintain engagement over time; - Overcome the risks and insecurity facing farmers in transition
Jarzebski et al.	Armenia, China Japan Madagascar Thailand Uganda	Biodiversity-based practices (local)	SDG-Labs	- Accumulate knowledge from local communities; - Leverage local biodiversity for food security and income generation; - Raise awareness; - Foster stakeholders' participation in decision-making processes

Some of the common major TDR outcomes observed in the nine studies include (albeit to different extents) building trust between stakeholders (including researchers) and raising awareness. In some studies, stimulating the imagination among actors appears to be a major component of TDR, with imagination being essential for finding innovative ideas, enhancing inclusivity to multiple perspectives and increasing openness to disruptive futures (Berthet et al.; McGreevy et al.; Juri et al.; Calla et al.). Other studies highlight the interest of TDR processes to foster tangible actions on the ground (Dernat et al.), play an advocacy role by placing agri-food system transitions on the political agenda (Hermesse et al.), assist strategic planning and capacity-building

(Guzman Luna et al.), enhance the credibility, relevance legitimacy and effectiveness of research (Gasparatos et al.) or harness knowledge from local communities for developing solutions and fostering stakeholders' participation to decision-making (Jarzebski et al.).

Collectively the nine studies collected in this Research Topic highlight the major opportunities that TDR processes offer for understanding and transforming food systems, but also the multiple challenges affecting their effective design and implementation. Some of the commonly articulated challenges include the long timescales necessary for effective TDR implementation and the constraints posed by the

prevailing sociotechnical and governance landscapes. However, all studies agree that TDR processes can indeed become a springboard for the co-design of innovative solutions for food system transformation, not the least by empowering multiple stakeholders to engage more deeply in transformation processes.

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