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# Conceptualizing the governance challenges for food system transformation

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Approaches to food systems are receiving increased attention because they provide a more holistic perspective on the organization of food production and supply and on how to promote food safety, environmental sustainability, and equity. While the structure and complexity of food systems are widely acknowledged, efforts to understand their governance and possible challenges are just starting. We contribute to conceptualizing these challenges by harnessing the conceptual insights of multiple system governance frameworks. Conceptual and empirical lessons from these frameworks help to understand the possible challenges that may emerge when dealing with key features of modern globalized food systems. These include cross-spatial and temporal dynamics, managing common trade-offs across food system goals, and integrating narratives and policies when dealing with diverse stakeholders, sectors, and knowledge communities. We discuss the implications of addressing challenges that may arise in one or more of these key features, especially under the new governance paradigm in which modern food systems are embedded and in the presence of diverse paradigms and power asymmetries.

## KEYWORDS

food systems, governance challenges, trade-offs, cross-spatial governance, temporal mismatches, integration

## 1 Introduction

In the multiple food system crises of deteriorating health, water resources, and climate (Rockström et al., 2020; Springmann et al., 2018; Swinburn et al., 2019), the demand for transforming food systems has grown internationally [FAO, IFAD, UNICEF, WFP, and WHO, 2018; High Level Panel of Experts on Food and Nutrition (HLPE), 2017]. Recognizing the failure of conventional policy-making to address these interconnected syndemic crises through siloed sectoral interventions (Swinburn et al., 2019), authors and practitioners are calling for more integrated approaches to food system challenges (e.g., De Brauw et al., 2019; Fanzo et al., 2013; Galluzzi et al., 2010; Leach et al., 2020; Ruben et al., 2018). However, despite increasing efforts to define, describe, and propose frameworks to analyze and/or design food system governance (e.g., Candel, 2014; High Level Panel of Experts on Food and Nutrition (HLPE), 2017; Delaney et al., 2018; Termeer et al., 2018; van Bers et al., 2019), the governance challenges that might be faced when engaging with the actual transformation of current food systems remain less defined. To contribute to addressing this knowledge gap, in the following section, we start by taking stock of a widely shared understanding of food systems and propose a working definition for analyzing governance challenges in the context of the systemic interconnections of globalized food systems. Despite existing suggestions for the way forward (e.g., adopting common indicators, Delaney et al., 2018; proposed governance

arrangements, [Termeer et al., 2017](#); or analyzing the politics of transformation, [Béné and Abdulai, 2024](#)), the possible governance challenges to achieve concrete food system transformation remain under-conceptualized. Our paper contributes to previous efforts to conceptualize food system governance challenges (e.g., [Hospes and Brons, 2016](#); [Van Bers et al., 2019](#)) by using concepts and insights from the system governance literature that focus on complex systemic challenges in a variety of fields (e.g., water, energy, environmental policy, etc.) and by referring to real-world examples.

## 1.1 Food system governance

Food systems are defined by the High Level Panel of Experts (HLPE) as ‘all the elements and activities that relate to the production, processing, distribution, preparation, and consumption of food, and the outputs of these activities, including socio-economic and environmental outcomes’ [[High Level Panel of Experts on Food and Nutrition \(HLPE\), 2017](#), p. 11]. This definition draws inspiration from the literature on systems ([Bertalanffy, 1972](#); [Rapoport, 1986](#)) and its application to various domains, such as the environment ([Hornberger and Spear, 1981](#)), finance ([Mayer, 1990](#)), and management ([Wilkinson and Dale, 1999](#)). The concept of governance refers to the range of social processes and practices involved in ‘solving societal problems and creating societal opportunities through interactions among civil, public and private actors’ ([Kooiman et al., 2008](#), p. 17). Building on both definitions, food system governance consists of the ‘processes and actor constellations that shape decision-making and activities related to the production, distribution and consumption of food’ ([van Bers et al., 2016](#), p. 10).

Our conceptual contribution is organized around four challenges that emerge from the need for food system governance efforts to address temporal and spatial scales, trade-offs, and the call for integration of goals ([Delaney et al., 2018](#); [Pahl-Wostl et al., 2021](#)). More specifically, this implies that food system governance challenges may emerge from tensions between their short-term operational characteristics (e.g., providing food daily around the globe) and the demand for a long-term horizon to ensure environmental, social, and economic sustainability ([Parsons and Hawkes, 2018](#)). The second challenge refers to the need to address cross-spatial scale dynamics given the teleconnectivity in food value chains. A concrete example of this is that activities to boost production in a specific landscape may be accompanied by environmental pollution in that area while, at the same time, generating negative or positive externalities in distant locations ([D’Odorico et al., 2018](#)).

Related to the above system dynamics, the third characteristic of modern globalized food systems is the presence of divergent values of stakeholders that prioritize different interventions, which may lack win-win opportunities and even result in difficult trade-offs. For example, some stakeholders may prioritize food system activities that perform well in terms of emission reductions for future generations but poorly in terms of other outcomes, such as employment generation, which may be a highly valued priority for another stakeholder. A final fourth characteristic refers to the complexity that emerges from the need for multiple and diverse stakeholders to negotiate, find compromise, and/or integrate decisions, policies, or activities to minimize trade-offs and conflicts and/or maximize synergies and investments that produce shared desirable outcomes.

An example of such integrative efforts is those of stakeholders focused on sustainable dietary transformative interventions, which bring together narratives, problems, and possible solutions from diverse policy areas such as agroecology, nutrition, biodiversity conservation, climate change mitigation and adaptation, and food value chain businesses. In the following section, we draw on different frameworks to conceptualize the governance challenges emerging from each of these four food system characteristics.

## 2 Food system governance challenges

### 2.1 Cross-spatial dynamics

Cross-spatial dynamics involve mobile social actors, border-crossing material flows ([Herring, 2015b](#); [Oosterveer, 2007](#)), economic and administrative transactions across scales (e.g., from the local to the global), and the global distribution of economic, environmental, and social outcomes of food production and consumption ([Mac Donald et al., 2015](#)). In spatially-distributed modern food systems, food value chain activities (i.e., production, distribution, transformation, and consumption) happen in distant regions and often in different countries. This may pose significant challenges in identifying which legitimate authority (e.g., to establish and enforce rules, resources, etc.) can address negative food systems externalities (e.g., obesity, water pollution, unemployment, etc.). The literature on Multi-Level Governance (MLG) suggests that initiatives to manage cross-spatial scale system dynamics may face two types of tensions ([Hooghe and Marks, 2003](#); [Piattoni, 2009](#)). First, tensions between the national state and sub-national levels arise as, depending on the level of centralized control over resources, the former may dictate uniform rules and regulations across all sub-national landscapes, thus de facto overlooking the specific concerns of locally affected inhabitants. An example of this is the tensions that emerged around the 1972 Federal Insecticide, Fungicide, and Rodenticide Act, which gave regulatory authority to the US federal government, thus hampering the ability of local authorities to respond to local health concerns regarding soil and water pollution ([Centner and Heric, 2019](#)). Second, tensions between the national state and the international level, as the former is mandated to protect its citizens from the negative externalities of international trade ([Keleman et al., 2009](#)), although it may face (legal) obstacles imposed by international trade agreements. A concrete example is the trade barriers and/or subsidies that a country may adopt to protect the national market for crops that represent key national dietary staples, but which might be imposed at international level by organizations like the World Trade Organization (WTO). An example of this struggle for authority between national governments and international organizations is the tensions that emerged between national priorities set in the WTO Doha Round of international agricultural trade negotiations ([Farsund et al., 2015](#)). National tensions emerged between demands for national protective measures to ensure internal food security, on one side, and pressures to maintain the global integrity of free trade principles and eliminate trade barriers and subsidies, on the other ([Margulis, 2014](#)). In this respect, the MLG literature suggests that locating authority to address negative externalities (e.g., pollution, food insecurity) of the food system can be challenging because of uncertainties and conflicting interests or paradigms regarding what is the most effective institutional design in

terms of optimizing the use of public resources at a specific administrative level, but also in terms of ensuring accountability to respond effectively and timely to the concerns of affected parties (e.g., water users affected by pollution in a specific landscape or food insecure communities). A concrete example of how these tensions have been addressed in international trade comes from the reconfiguration of the locus of authority that the G20 countries have led by creating the G20 agriculture ministerial groupings as an additional institutional space that gathers their national authorities to set global priorities in agricultural reform and food security beyond the international role of the WTO (Margulis, 2014).

## 2.2 Cross-temporal dynamics

Two types of cross-temporal dynamics can emerge from governance efforts to transform food systems, namely, temporal misalignment in socio-ecological systems and temporal (mis-) alignment in societal change dynamics. The misalignment between social and ecological systems arises from the mismatch between the temporal discounting preferences (i.e., “preference for immediate gains at the expense of future outcomes”; Ruggeri et al., 2022) that different social groups have for food system outcomes, such as ensuring daily food provisions for growing (short- and medium-term) demand (Herring, 2015a; Nguyen et al., 2019; Porkka et al., 2013), and the imperative to ensure the long-term sustainability of natural ecosystems. This becomes entangled in governance challenges as some social groups may be more aware and share values that prioritize nature cycles and support activities that conserve the long-term natural dynamics of ecosystem functioning (e.g., agroecology or agrobiodiversity conservation movements; Gliessman, 2013) or because their livelihoods are strictly dependent on nature’s services (Vignola et al., 2015). In contrast, other social groups may share values and prioritize short-term (financial) benefits (Frederick et al., 2002) and activities that promote a faster rate of land exploitation *in situ* (Smith et al., 2016) or to replace land depletion in one area by sourcing from distant landscapes (Burgers and Susanti, 2011; Hall, 2011; Margulis et al., 2013). In the latter case, however, preferences for short-term financial benefits may promote ecosystem degradation and, as a consequence, increase the burden of these unsustainable activities on future generations.

This discount rate mismatch permeates modern, highly-financialized food systems (Clapp, 2017) as, on one side, social movements call for and promote food system alternatives for a sustainable future, and on the other side, powerful food trade corporations operate in the financialized food system narrative in which time is money, so that the more resources are extracted, transformed, and marketed per time unit, the greater the perceived benefits. The consequences of this economic benefit-based temporal mismatch are clearly exemplified by the increasing adoption of the Discounted Cash Flow (DCF) model in African (Ducastel and Anseeuw, 2013), European, and US (Clapp and Isakson, 2018) investments. As shown by these authors, this financialization trend has been accompanied by, on one side, a transformation of agricultural products into financial assets to be valued based on Present Value Discount Rates and risk assessment of cash return flows, and, on the other side, a significant increase in the vulnerability of ecosystems, food workers, consumers and producers.

The second *temporal (mis-)alignment in societal dynamics* emerges from the temporal misalignment between the maturity level of an innovation introduced to promote food system transformation, and the time needed to create the enabling conditions and windows of opportunity to mainstream it at the scale required. The literature on sustainable transition theory has conceptualized this temporal dynamic of structural system transformation (Geels, 2011), suggesting the importance of synchronizing investments to scale up innovations (e.g., new technologies, ideas, new framings of problems, etc.) with the identification of opportunity windows offered by increasing societal demand (e.g., for healthy and sustainable food) and the presence of enabling conditions and a sufficient level of maturity of the innovation. The maturity of a potentially transformative food system innovation may depend on whether (i) learning processes for its uptake are well established and supported by powerful actors, and (ii) there is evidence of an expectation for further improvement and sufficient adoption in the system (Geels and Schot, 2007). An example of this dynamic is the growing demand for organic food from health and environmentally conscious consumers, who are urging markets to expand the supply of safe, healthy and/or environmentally sustainable food (Sahota, 2009; Smith et al., 2016; Spaargaren et al., 2012). This offered a window of opportunity for an alternative and relatively small food niche led by bottom-up movements to be upscaled and captured by powerful actors in food distribution and retail systems (e.g., supermarket chains) that could provide well-established enabling conditions (logistics, labeling, marketing) for fast scale-up (Reardon and Hopkins, 2006; Spaargaren et al., 2012).

## 2.3 Managing trade-offs

Governance of food systems entails intricate decision-making processes (Hooghe and Marks, 2003; Stoker, 1998) that require the navigation of synergies and trade-offs (Jessop, 2003) between diverse food system objectives and mandates that are stewarded over by stakeholders operating in different food system components (e.g., environmental conservation, public health, value chain segments, etc.). Addressing trade-offs and synergies in food system governance may be a challenging process, not only given the diversity of values and perspectives regarding priorities and solutions (e.g., between advocates of agro-ecological vs. industrial intensification) but also because of different views regarding the principles and norms that should guide the assessment of alternatives. From the perspective of Meta-Governance (MG; Kooiman and Jentoft, 2009), values reflect “the most general and fundamental notions” about what should be prioritized in evaluating the alternatives, while norms and principles reflect the “general notions of what is right or wrong” regarding, respectively, the governance process (e.g., what knowledge should be used, who should participate, etc.) and what rules are considered acceptable (Kooiman and Jentoft, 2009, p. 824).

The extent of the challenge for efforts to transform food system governance may depend directly on the extent to which underlying values are made explicit and shared among actors in a transparent way (IPBES, 2022) and/or are measurable or comparable. For example, when evaluating innovation in agricultural practices, one societal group may prioritize the intrinsic value of nature as a parameter to judge the performance of the practices, while another social group may prioritize other dimensions that may be difficult to compare with

the previous (e.g., employment and/or financial returns) (Piñeiro et al., 2020). From a normative perspective, this requires a reflexive governance process to ensure a collectively shared understanding of what norms and principles are acceptable for the decision process (e.g., in rule setting, location of authority, etc.) to manage plural values regarding alternative food system solutions that are debated and agreed upon. In theory, governments can promote a reflexive process through regulations and/or by supporting the creation and maintenance of social capital and social networks, gathering information and monitoring governance outcomes, and ensuring a power balance in negotiations (Jessop, 2003). In reality, decision-making in multi-stakeholder fora addressing food system issues is often dominated by large corporations and lacks mechanisms to make value differences explicit, address conflicts, and reduce power asymmetries (IPBES, 2022).

According to the governance literature, the willingness of governments and other actors to engage and address complex problems in a transparent, inclusive, and reflexive manner may depend on a variety of institutional, social, and/or cultural contextual conditions. As shown in the literature on food system governance, these conditions may include the extent to which pre-existing conditions facilitate consensus-building processes (e.g., collaborative experiences, trust, conflict, etc.), the presence of adequate leadership, expectations and capacities for engagement with civil society and the private sector, and, finally, the extent to which actors' values regarding food system alternatives are measurable and/or comparable (Ansell and Gash, 2007; Béné et al., 2019; Gillespie et al., 2019a). Examples from the recent IPES-Food (2023) suggest that international and national regulations to curb corporate influence have been insufficient while a variety of bottom-up innovations (e.g., participatory public budgeting, sub-national food councils and cooperatives, municipal food initiatives) around the world provide space to explicitly address diverse values and power asymmetries.

## 2.4 Integration challenges

As suggested by authors focusing on transformative governance for sustainable development (Visseren-Hamakers et al., 2021), transformative food system governance implies addressing integration challenges emerging from the variety of stakeholders involved, the lack of a pre-established shared vision and objectives, and the associated ambiguity regarding causes, priorities and possible solutions (Béné et al., 2019; Edwards et al., 2024). Adopting a food system lens implies that the implementation and the outcomes of a specific food system intervention/activity (e.g., promoting the production of healthy food) should complement and/or be consistent with those of other food system activities (e.g., minimizing the risk of water scarcity) in a way that maximizes synergies and minimizes trade-offs (de Brauw et al., 2019). In the formal policy-making context of an ideal Weberian modern state, sectoral policies set rules, norms, principles, and (dis-)incentives to optimize the use of resources and promote consistent and coherent interventions for the common good (e.g., healthy and climate-resilient food production). However, depending on the formal and/or informal policy-making environments in which these alignment processes are actually embedded in the real world, governance processes to integrate different food system activities can be more

or less challenging. Conceptual insights from the literature on Environmental Policy Integration (EPI; Jordan and Lenschow, 2010) suggest that we can identify at least two major challenges within the formal sectoral policy-making context that may hamper integrative efforts across food system activities.

First, efforts to promote integration across important food system policy domains (e.g., nutrition, agriculture, land and water management, climate change mitigation and adaptation) may have to face significant resistance to change, as diverse stakeholder values and interests may determine how the distribution of benefits and costs is perceived to be (un-)evenly distributed across society. A clear example of governance challenges emerging from undealt-with diversity of values and interests is the mass protests by farmers in the Netherlands in 2022. These tensions may have resulted from the unresolved conflict (e.g., possibly worsened by poor communication, hidden political interests, etc.) between nature conservation policies and farmers' values regarding the security of their livelihoods and their perception of unfair problem identification and proposed solutions (Resnick and Swinnen, 2023).

Second, cross-sectoral policy integration requires dealing with different epistemic communities, professional languages and narratives. In the case of food systems for example, these differences may emerge between the epistemic communities of nutritionists, water managers, agronomists, and climate experts. Efforts to bring these epistemic communities together to design food system policy integration efforts may face challenges in finding common ground on main problems, investment priorities, and solutions.

EPI literature suggests that in countries with siloed sectoral policy-making traditions, it may be difficult to devise specific cross-sectoral legislation, possibly due to a variety of reasons that may include interests in maintaining sectoral resource control, unaddressed epistemic and semantic differences regarding problem definition and solutions, and how effectiveness indicators are stated and monitored. In such contexts, it may be easier to promote shared, broadly defined cross-sectoral policy statements, for example, on generally defined healthy and sustainable food production than specific cross-sectoral legislation (Bouwma et al., 2018). In this context, overarching formal mandates to promote food system policy integration may face significant challenges to guarantee legitimate authority to address different values and narrative domains across sectors. In this respect, evidence from the food system governance literature suggests the importance of embedding food system transformation efforts within contexts by identifying opportunities within existing institutional structures and cultures and building on existing leadership (e.g., policy champions, entrepreneurs, etc.). For example, evidence from an analysis of efforts to promote inter-sectoral integration between agricultural and nutrition policies in Southeast Asia shows that in the absence of legal frameworks and clear mandates to support formal cross-sectoral authority, collective and individual leadership, political commitment, and accountability can be crucial (Gillespie et al., 2019b).

With the increasing role of non-governmental actors (e.g., private, civil society, academia, etc.) in food policy-making processes under the New Government Paradigm promoted in the 1990s (Durant et al., 2004), informal policy-making (i.e., beyond formal authority institutions; Reh, 2012) in multi-actor networks has become wide spread common in modern globalized food system governance (Oosterveer, 2006). Here, the literature on Network Governance (NG) (Jones et al.,



1997; Provan and Kenis, 2008) can help to understand the types of challenges that can possibly be faced by food system governance efforts. Food system governance networks can be understood as interconnected (groups of) actors engaging in open-ended but socially binding forms of coordination to achieve goals that they cannot achieve on their own. These networks connect a variety of actors (State, NGOs, academics, private sector, etc.) through the exchange of products and services in value chains (e.g., food producers, distributors, transformers, retailers and consumers) and/or because they may have a common stake in certain food system outcomes (e.g., nature conservation, climate change mitigation, nutrition, etc.). Examples are the numerous sustainable food certification schemes in which leading agents invest in building multi-actor networks from diverse social groups (e.g., scientists, policy-makers, and NGOs across scales and countries) and connect actors from production activities all the way to consumers (Oosterveer, 2006; Oosterveer, 2015a). Conceptual insights from the literature on network governance (Provan and Kenis, 2008) highlight the importance of maintaining a good reputation in networks. This implies, for example, that agents leading certification schemes must dedicate significant attention and resources to ensuring and promoting a generalized perception that their network actions are legitimate in the eyes of the consumers while being consistent with norms, values, beliefs, and accepted network definitions (e.g., of healthy and/or sustainable food products).

Considering the broad and informal policy-making context of large, cross-scale and cross-sector networks of actors in modern food systems, ensuring legitimacy in shaping and/or maintaining the coherence and value identity of a network may be significantly challenging. Largely cited authors in the Network governance literature (Provan and Kenis, 2008) pointed out that the difficulty (especially in large networks) in addressing this challenge may depend on the trust and (tacit or explicit) agreement among network members to achieve common goals through a given collaborative network arrangement for food system governance (e.g., who moderates/leads the network, what value identities and narratives are accepted). More recent reviews of the network governance literature (Wang and Ran, 2023) expand on this by suggesting that with larger and more stakeholders-diverse networks, complexity, and uncertainty increase, affecting network effectiveness in, for example, achieving a desired outcome (e.g., securing the reputational goods of a food certification scheme) and creating and/or maintaining a common identity. This may require food system governance network leaders to invest in efforts to maintain internal and external network legitimacy. This is confirmed by evidence from food policy networks showing how network leaders invest in efforts to build trust and legitimacy internally among food system actors who identify and share goals and values (e.g., as expressed through network identity) (den Boer et al., 2023; Oñederra-Aramendi et al., 2023). Network leaders also invest in building trust and legitimacy to bridge and interact with other networks (e.g., with departments and decision-makers in other sectors or administrative levels) and/or to seek support (e.g., funding, visibility, etc.). Tensions around legitimacy may arise as food system actors have to balance between their desire to keep their values and identity (e.g., corporate reputation; Yeoman and Santos, 2019) on one side, and their need to interact with larger networks (to achieve the intended outcomes) on the other. This may be especially important for large food corporations, given the ongoing trend not only to promote and strengthen their own individual corporate social reputation but

also to expand the demand for reputation to the whole value chain (e.g., the ongoing initiatives of the task force on nature-related financial disclosures<sup>1</sup>). This is to ensure that all its members (i.e., across the value chain) abide by the network identity values and/or do not threaten (e.g., through unacceptable practices that undermine the credibility of food certification schemes) the reputation of the value chain network in the food market (Yeoman and Santos, 2019). This governance challenge may be common in global food systems and it may require building trust and legitimacy in food system governance networks, to support spaces of authority and food network leadership that differ from the current situation.

Indeed, more than 70 % of actors involved in multi-stakeholder network initiatives around the globe belong to the private sector (i.e., transnational corporations, business associations and consulting firms), for which reputational goods are also highly important due to their high centrality in global food governance networks (Van Den Akker et al., 2024). On the other side, although civil society actors are largely under-represented in multi-stakeholder initiatives (Van Den Akker et al., 2024), a recent systematic assessment of transformative food system governance initiatives (Rudnick et al., 2019) shows that they have a higher degree of legitimacy with local communities and, if supported by committed and resourceful local administrations, can embed and build long-term commitment to improving food system performance.

### 3 Discussion and conclusions

The concepts emerging from the various governance analytical perspectives presented above are relevant for understanding food system governance challenges (e.g., cross-spatial and temporal mismatches, trade-offs and integration challenges). However, in order to understand their relevance to food system transformation, it is important to consider that the challenges they help to understand rarely occur in isolation. Rather, many examples in modern food systems show that the closely interrelated nature of these challenges can translate them into concrete obstacles to real transformation. For example, integration across policy domains can imply negotiating with complicated trade-offs as the values of food system policy domains differ greatly and may not be comparable (e.g., conserving biodiversity, generating employment, guaranteeing healthy diets). Similarly, addressing trade-offs may also become difficult and may require significant investment in scientific debates and public deliberations due to competing/conflicting network identities such as, for example, around technically complex issues such as Genetic-Modified-Organisms (Hoppe and Turnbull, 2023), pesticide use (Hauck et al., 2016), and labeling (Guthman, 2007). Recent developments in the transparency, availability, and accessibility of food system data can not only support efforts to identify and address stakeholder value trade-offs but can also open up opportunities to build synergies and even, with adequate leadership and communication, expand networks and build support for transformation (Haddad, 2023).

<sup>1</sup> <https://tnfd.global/>

Finally, given the blurred spatial boundaries and dispersed decision-making power of globalized food value chain networks, it may be difficult to identify where real authority is or should be located when dealing with environmental problems such as water pollution, deforestation, etc. More specifically, this may be particularly the case for globalized food networks, where authority and centrality in decision-making are strongly influenced by transnational corporations that operate typically from power centers that are distant from where environmental externalities occur (Van Den Akker et al., 2024). However, the environmental governance literature, which focuses on the influence of Global Production Networks on land use planning decisions for the conservation of ecosystem services in the Amazon landscape (Urzedo et al., 2020), shows possible ways to address these challenges. These authors found that despite their influential position in the global food trade, the power of large food corporate networks can be counterbalanced by locating authority at the state level as the ultimate promoter of ecosystem services and by opening up the networks to participation by national unions and environmental movements.

We argue that two additional challenges cut across all the ones we discussed above, namely, paradigm diversity and power asymmetries. As the 'deepest set of beliefs about how' a system works (based on: Meadows, 1999, p. 17), paradigms are important in shaping the perspectives of stakeholders and their ways of managing challenges. In general, paradigms are very difficult to change as they can form part of the identity of actors (Achrol, 1996) and become embedded in the routinized ways-of-doing of existing organizations until they become actual lock-ins to food system transformation (Geels, 2014; de Krom and Muilwijk, 2019; Kay, 2005). Thus, even if alternative paradigms for sustainable food systems are emerging in some food networks (e.g., agroecology, protein transitions, etc.), changing the dominant paradigm of modern and globalized food systems remains difficult (Bush, 2010; Kuokkanen et al., 2017; Parker and Johnson, 2019). Evidence suggests that even in countries where sustainable food system innovations are high on the political agenda and embedded in institutional structures, "business as usual" and "technological optimism" narratives still continue to dominate the debate (de Krom and Muilwijk, 2019; Thompson and Scoones, 2009), leaving little space for profound transformations (e.g., agroecological transitions). Then, governance efforts aimed at transforming food systems may have to contend with the resistance of agent networks that embrace paradigms oriented to maintain important features of the status quo such as, for example, the dominance of large-scale distribution (Burch and Lawrence, 2005), the financialization of food value chains (Clapp, 2017), the distribution of agricultural inputs (e.g., fertilizers, seeds, etc.) or agrochemical-intensive practices (Clapp, 2021).

The challenges of promoting alternative paradigms (e.g., to change the current distribution of benefits and costs) may be directly related to the extent of power asymmetry that exists in a specific food system intervention context (Anderson et al., 2019; De Schutter, 2017; El Bilali, 2019; Leach et al., 2020). Power asymmetries do not only relate to unequal access to economic and administrative resources but also to differences in positions within the (global) flows and networks of globalized food systems (Castells, 2009; Mol, 2010).

In this respect, the four categories of power in a network society (Castells, 2009) provide insights into the possible mechanisms through which power can emerge as a challenge in transforming food systems. The first form is *networking power*, which refers to the power to include

some collectives and individuals and exclude others. This can take the form of a power actor being able to include producers in supply chain networks that are aligned to certain requirements (e.g., use of specific inputs and practices) and exclude others (who do not abide by these requirements) by using their structural power positions in value chain relations (Dicken et al., 2001). For example, organizations that set food standards may impose the adoption of specific requirements and procedures if they do not provide support and resources, de facto excluding producers who, due to contextual conditions, may not be able to abide by these certification requirements (Béné, 2005; Samerwong et al., 2017). The second, *Network power*, refers to the ability to impose rules, narratives, forms, and protocols of coordination and communication such as, for instance, those regarding food quality standards in a particular supply chain (Murdoch et al., 2000) affecting all its actors independently from their location in the network. The third, *Networked power*, is the relative power of one network over another. A particular network may impose its foundational values on another network. For example, in the modern financialized food system (Clapp, 2014), financial network nodes (e.g., banks, fiscal havens, etc.; Galaz et al., 2018) exert tremendous power (e.g., by imposing a monetary return paradigm) over ecosystem management decisions with respect to networks that advocate nature conservation or social equity values through certified (fair, organic, sustainable, etc.) products. Finally, as the ability to actually build networks, organize them, and manage their connections with other networks, *network-making power* is especially relevant when aiming to create new narratives, shift existing goals and paradigms and transform food systems, for example, by engaging other powerful networks.

Two types of network positions, defined in terms of the degree of centrality and the extent of cross-network brokering, can be important for network-making power, namely: programmers and switchers.

Programmers can be agents of any type who have a highly central position in a network and the ability to (re-)program narratives, goals, and standards that are accepted by a network in the making (Castells, 2009: 45). Switchers are agents who have a cross-bridging power to connect and ensure 'cooperation with other networks (e.g., by linking goals and combining resources; Castells, 2009: 45) while excluding other competing networks. An illustration of network-making power in global food systems is the Roundtable on Sustainable Palm Oil (RSPO), which defined (i.e., as a programmer) sustainability requirements for producing and trading this commodity, which ensured greater private sector control over the social and environmental standards to be followed. At the same time, given the lack of bridging agents (switchers) in the RSPO network, it remained difficult to link this private sector-dominated network with government networks in Indonesia and Malaysia (Oosterveer, 2015b).

The complexity, inter-relation, co-occurrence, and inherent context-dependency of the different challenges that may emerge (Juri et al., 2024), suggest that food system transformation can be understood as a complex and non-linear process of disruptive change over a period of several decades (Loorbach et al., 2017). This also suggests the importance of moving away from the naïve belief in one-size-fits-all type initiatives that focus on the effectiveness and efficiency of a specific technological solution or standard models of policymaking. Rather, it suggests the need to recognize the multifaceted nature of food systems (e.g., often global value chains coexist with local markets; Gaitán-Cremaschi et al., 2018) and that food system transformation should happen through multiple

pathways (Scoones et al., 2020), not all of which are equally feasible or acceptable to all parties (Weber et al., 2020). According to some scholars (Singh et al., 2023), an important pathway to transform current food systems at scale requires a dynamic science-policy- society interface, global-spanning networks, and knowledge brokering nodes to promote learning, reflection, dialog, and address power struggles at and across local and global scales (Singh et al., 2023). These authors call for strengthening multilateral institutions and creating global coordination and task forces for a global “network of networks” with a clear mandate to engage across food sectors and scales. This may require significant political will and convergence among global private and public food system actors to mobilize the institutional and financial resources needed for such large-scale investments.

Thus, while food system governance scholars may propose possible ways forward and provide normative guidance or aspirational perspectives (e.g., on how food system integration could happen; Edwards et al., 2024), the nature of the real-world challenges demands a different approach. More specifically, rather than a management problem with a clear beginning and end, governing food system transformation demands a continuous and long-term process accompanied by an in-depth understanding of food system dynamics, the presence of pluralistic understandings of causality (‘as a web of interlocking factors’; Middlemiss, 2018, p. 207) and the values and power positions of the different stakeholders involved. Learning becomes a key activity to invest in, along with flexibility (Termeer et al., 2015) and reflexivity (Grin, 2006; Neufeldt et al., 2013). Being a deeply political process (Gillespie et al., 2019a; Meadowcroft, 2007; Scoones et al., 2020; Swinburn, 2019), promoting a shared and inclusive vision for the transformation of food systems will require engaging and making the most of power struggles (Caron et al., 2018). This may already be happening as a growing number of NGOs are taking on new roles in food democracy through participation in multi-stakeholder platforms (MSPs) aiming at transforming food systems (Van Den Akker et al., 2024). However, as found by these authors, private sectors still hold central positions of power in these MSP networks, while NGOs are still largely underrepresented at only 10 and 4% of the 813 MSP actors mapped in high-income and low-income countries, respectively. In order to address the food system governance challenges discussed above, a recent review of alternatives found in the literature on food system transformation (Kraak and Niewolny, 2024) suggests that efforts may be needed to support a variety of strategies to drive social and political change and promote the participation and inclusion of civil society actors with different food system visions, narratives and values in transparent deliberative decision-making processes and the engagement of global to local food system networks. Examples of possible alternatives mentioned in this review include political consumerism that embraces market-driven processes, building alliances across diverse constituencies, electoral advocacy activities, and collective protest politics to influence public policy- making spaces.

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