International Journal of Innovation Studies 10 (2026) 100200

Contents lists available at ScienceDirect

International Journal of Innovation Studies

journal homepage: www.keaipublishing.com/en/journals/international-journal-of-innovation-studies

# Innovation, governance, and sustainability in food systems: Structural tensions shaping digital transformation and stakeholder engagement

ARTICLE INFO

*Keywords:*
Sustainable food systems
Digital transformation
Governance
Innovation
AI
Stakeholder engagement

ABSTRACT

Sustainable food systems are now negotiated within a polycrisis defined by climate and biodiversity breakdown, persistent malnutrition, geopolitical fragmentation, and accelerating technological change. However, the prevailing innovation discourse in agri-food systems remains constrained by two recurring simplifications: an economistic framing of 'innovation' as productivity enhancement, and a technocratic framing of 'digital transformation' as inherently progressive. In this editorial, we position the *International Journal of Innovation Studies* special issue on Digital Transformation, Stakeholder Engagement, and Innovation in Sustainable Food Systems as an opportunity to re-politicise the agri-food innovation agenda. Drawing on a socio-technical transition lens and a co-creation perspective, we identify three structural tensions that shape contemporary agri-food innovation: (i) regeneration versus extraction, (ii) participation versus capture, and (iii) data sovereignty versus data enclosure. We argue that the credibility of sustainability-oriented innovation depends less on the novelty of technologies than on how innovation is governed, whose knowledge counts, and how risks, costs, and value are distributed across actors and territories. We also introduce the contributions in this special issue, showing how they illuminate the politics of trust, legitimacy, participation, and public value in digital and institutional innovation across food consumption, governance, and producer engagement. We close with a research agenda centred on ethical experimentation, accountable AI, and mission-oriented governance that prioritizes planetary boundaries, distributive justice, and epistemic pluralism in agri-food transformation.

## 1. Introduction

An unusual thought: what if innovation in food systems might have to be treated as a contested, political project? This special issue on Digital Transformation, Stakeholder Engagement, and Innovation in Sustainable Food Systems highlights the relevance of digital transformation, stakeholder engagement, and innovation as interlinked levers for sustainable food systems. Such a framing is timely, but it is also incomplete unless it explicitly confronts what contemporary food systems research has repeatedly demonstrated: agri-food systems are simultaneously biophysical systems operating under planetary limits and political economies organised through power, concentration, and unequal risk exposure (Steffen et al., 2015; Willett et al., 2019; Clapp, 2021).

Two empirical criticisms should discipline any innovation narrative in this domain. First, food systems are major drivers of environmental harm and climate risk, with emissions distributed across land use change, production, processing, logistics, retail, and

Peer review under the responsibility of China Science Publishing & Media Ltd.

https://doi.org/10.1016/j.ijis.2026.100200
Received 6 May 2026; Accepted 15 May 2026
Available online 25 May 2026

consumption (Crippa et al., 2021). Second, the dominant modes of intensification and value chain organisation have generated persistent trade-offs between yields, ecological integrity, nutritional outcomes, and equity, which cannot be resolved through incremental efficiency gains alone (Foley et al., 2011; Poore and Nemecek, 2018; Willett et al., 2019).

Starting from these criticisms, digital transformation is frequently presented as the next frontier, as AI-enabled advisory tools, platform-based marketplaces, blockchain traceability, precision agriculture, digital twins, and predictive governance are often proposed as technical solutions to food system criticalities. Better decisions, less waste, more transparency, and smart optimisation of scarce resources are proposed as promising strategies for the future of food systems. However, the gap between promise and realised public value is widening. Digital infrastructures may reduce some information friction while simultaneously intensifying others through surveillance, exclusion, proprietary standards, and asymmetric control over data and analytics (Clapp, 2021). However, the result is a paradox: the more food systems become data-rich, the more they risk becoming governance-poor, especially when digital adoption is decoupled from accountability, inclusion, and distributive justice.

In this editorial, we argue that the central question for this special issue is not whether digital transformation will occur but what kinds of socio-technical food futures it will institutionalise. Put bluntly, digitalisation can be either an accelerator of sustainability transitions or a sophisticated mechanism for re-legitimising extraction under a new vocabulary of innovation. Therefore, the conceptual contribution of this editorial is to reframe digital transformation as a governance challenge and stakeholder engagement as a power-sensitive process of value definition rather than as a technocratic procedural checkbox.

The paper is structured as follows: Section 2 positions the special issue within the current debates shaping agri-food systems under conditions of polycrisis. Section 3 develops a conceptual framing anchored in socio-technical transitions and co-creation. Section 4 synthesises and introduces the four accepted special issue papers. Section 5 discusses the implications for theory, governance, and practice, while Section 6 concludes with avenues for future research.

## 2. The polycrisis context of contemporary agri-food systems

*Planetary boundaries, nutrition, and the limits of optimisation*. The agri-food debate has shifted from production scarcity to the sustainability and health consequences of how food is produced, distributed, and consumed. The planetary boundaries clarify that food systems operate within biophysical thresholds that are already being transgressed in multiple dimensions (Steffen et al., 2015). Meanwhile, the EAT-Lancet Commission synthesised evidence on the need for dietary and production shifts to reconcile human health and environmental sustainability (Willett et al., 2019; Rockström et al., 2025).

In parallel, life cycle evidence highlights that environmental impacts vary dramatically among producers for the same produce, implying that both producer-side and consumer-side interventions are necessary but not sufficient unless embedded in structural change (Poore and Nemecek, 2018). The significance here is conceptual because if impacts are heterogeneous and systemic, then optimisation cannot be a substitute for transformation. Digital tools may help identify leverage points, but they cannot define the normative direction of change or resolve distributional conflict.

*Corporate concentration, legitimacy, and the political economy of innovation*. Food systems are increasingly shaped by concentrated corporate power, especially in upstream inputs such as seeds and agrochemicals. Concentration affects innovation trajectories by shaping which problems are prioritised, which solutions are scaled, and which risks are externalised (Clapp, 2021). This has direct implications for stakeholder engagement, as when power asymmetries are structural, participation can become performative, while the substantive capacity to influence agendas remains limited.

From an innovation studies perspective, this is not a peripheral concern. It goes to the heart of how innovation systems allocate resources, legitimate pathways, and stabilise dominant regimes. In such contexts, digitalisation can amplify concentration by locking actors into proprietary ecosystems and analytics dependencies, turning data-driven farming into platform-governed farming.

*Trust, misinformation, and risk perception under geopolitical fragmentation*. Recent years have also seen an intensification of food-related risk narratives, ranging from safety anxieties to supply insecurity and geopolitical disruptions. Digital media ecosystems can amplify risk perception, polarise trust, and undermine the legitimacy of institutions. For innovation in food systems, legitimacy and trust are not soft variables. They shape adoption dynamics, compliance, and the social licence required for transition policies (Cacciolatti et al., 2024).

This special issue is thus situated at a critical intersection of a digital transformation that is expanding, while social trust is contested. Stakeholder engagement is celebrated, but power asymmetries persist, and although innovation is demanded, sustainability requires restraint, redistribution, and regenerative logics. This increases the complexity of food systems and makes innovation a highly political choice, hence our initial question in the introduction to this special issue.

## 3. Conceptual framing: socio-technical transformation and co-creation

In this section, we develop a critical conceptual lens for interpreting digital transformation and stakeholder engagement in sustainable food systems as socio-technical transition dynamics rather than as discrete technology deployments or managerial best practices (Cacciolatti et al., 2026). In Section 3.1, therefore, we situate digitalisation within a multi-level transition perspective, emphasising that technologies co-evolve with institutions, infrastructures, and practices, and that technology adoption is an insufficient proxy for sustainability impact. In Section 3.2, we then reframe stakeholder engagement as a legitimacy and governance mechanism that can either enable democratic co-creation or reproduce asymmetries through value capture and procedural participation (Cacciolatti and Lee, 2025), drawing attention to decision rights, accountability, and public value. Likewise, in Section 3.3, we operationalise these arguments through three structural tensions that recur across contemporary agri-food innovation debates, i.e.,

regeneration versus extraction, participation versus capture, and data sovereignty versus data enclosure, which together clarify the conditions under which digital transformation becomes genuinely transformative rather than merely a more efficient vehicle for continuity.

### 3.1. Digital transformation: a socio-technical transition rather than technology rollout

Innovation in food systems is best understood as a socio-technical transition in which technologies co-evolve with institutions, markets, cultural meanings, user practices, and infrastructures (Geels, 2002; Cacciolatti et al., 2026). Transition framing matters because it avoids two common mistakes: (1) treating technologies as exogenous drivers and (2) treating technology adoption as the primary success metric. Instead, a transition framing focuses our attention on how regimes stabilise, how niches scale, and how rules and power relations shape transformation trajectories.

Within this theoretical lens, digital technologies are not neutral instruments. They are governance-bearing artefacts that embody assumptions about what counts as value, what is measurable, who is authorised to decide, and how accountability is operationalised. When digital transformation is framed as efficiency, it often privileges what is led to platforms, e.g., quantifiable outputs, standardised practices, and short-cycle optimisation, while undervaluing ecological regeneration, local knowledge, and relational coordination.

Crucially, digital transformation becomes a socio-technical transition precisely because it requires (and subsequently induces) complementary changes beyond the artefact itself. Examples include new decision rights over data, revised standards and compliance routines, reconfigured advisory and extension infrastructures, new skill profiles, and redesigned organisational processes for sensing, verification, and enforcement.

Evidence from the broader IT and organisational change literature shows that performance effects arise less from standalone technology acquisition than from bundles of complementary organisational investments, such as redesigned work practices, new coordination routines (Cacciolatti and Lee, 2022), and capability upgrading (Bresnahan et al., 2002). In food systems, the parallel is direct and smart tools only produce sustainability-relevant outcomes when embedded in credible governance arrangements and institutional capacities that determine what is measured, what is rewarded, and what is sanctioned. This is why digitalisation should be theorised as part of transformative change frames (Cacciolatti and Lee, 2025) rather than treated as an operational rollout (Schot and Steinmueller, 2018). To do so, we need a mechanism of legitimation, and we posit that stakeholder engagement lies at its heart.

### 3.2. Stakeholder engagement as a legitimacy mechanism and a site of contestation

Our call for papers for the special issue positioned stakeholder engagement as foundational. Yet stakeholder engagement can operate as either a legitimacy mechanism or a democratic practice. In many sustainability domains, engagement is mobilised to create acceptance rather than to share control over problem definition and value distribution.

Co-creation refers to the process through which value is jointly produced by multiple actors (e.g., firms, customers, public agencies, communities) through their interactions, resource integration, and shared practices, rather than being unilaterally delivered by a single provider. In this view, value emerges in use and in context as actors contribute complementary resources (knowledge, data, capabilities, relationships) and negotiate meanings, goals, and rules that shape what counts as valuable and for whom (Vargo and Lusch, 2016). Co-creation, therefore, goes beyond participation as input and instead emphasises interactive processes and governance arrangements through which offerings are designed, enacted, and evaluated, including how roles, responsibilities, and benefits are distributed across stakeholders (Payne et al., 2008; Prahalad and Ramaswamy, 2004).

A co-creation perspective distinguishes between co-creation as ‘value extraction through participation’ and co-creation as ‘public value formation through shared governance’. Service and marketing scholars have long argued that value is co-created through interactions among actors embedded in institutional contexts (Vargo and Lusch, 2016). If we transpose this into food systems, it implies that value is co-defined by farmers, consumers, public agencies, and communities and that the rules of the game shape whose value counts.

This is also highlighted in the stakeholder engagement literature; for instance, in the case of living labs, they become relevant as a governance form for experimentation and stakeholder engagement. Cacciolatti et al. (2025) conceptualise living labs as ethical spaces where experimentation can be organised around sustainability and justice rather than merely around adoption and scale.

Stakeholder engagement becomes a legitimacy mechanism because it can generate pragmatic, moral, and cognitive legitimacy for an innovation programme, meaning that participation itself can be mobilised as evidence that a pathway is acceptable, appropriate, or taken for granted (Suchman, 1995). The same process also makes engagement a site of contestation because legitimacy claims are continuously negotiated and can be withdrawn when stakeholders perceive manipulation, misrecognition, or unfair distribution of costs and benefits. The presence of a mechanism of stakeholder engagement makes the agri-food system democratic. Consider a concrete example: a retailer-led digital traceability scheme invites smallholders to co-design reporting requirements but retains non-negotiable performance indicators, mandates proprietary data formats, and reserves exclusive rights to aggregate analytics. In such a configuration, engagement can appear participatory while functioning as a token, placing stakeholders on a lower level of participation where voice is permitted but power is not transferred (Arnstein, 1969).

Contestation then emerges around who owns data, who bears compliance costs, and whose knowledge is treated as authoritative, thus transforming engagement from consensus-building into an arena where the governance terms of innovation are disputed. This is but one of the areas of potential tension. In what follows, we explain the main tensions that shape digital transformation and stakeholder-led innovation in food systems.

### 3.3. Three structural tensions shaping digital and stakeholder-led innovation in food systems

We build on these lenses and propose three tensions that should guide the interpretation of contributions to this special issue and inform future research.

#### 3.3.1. Tension 1: regeneration versus extraction

Sustainable food innovation requires regenerative outcomes, e.g., soil health, biodiversity, water stewardship, and resilience. However, many innovation models remain extractive, prioritising output growth and cost minimisation. Digital tools can support regenerative monitoring and adaptive management, but they can also institutionalise extraction by intensifying input optimisation without changing underlying land use and dietary patterns (Foley et al., 2011; Willett et al., 2019).

This tension becomes concrete when digital sustainability is operationalised primarily through efficiency metrics that preserve a productionist baseline. For instance, variable-rate application and sensor-driven optimisation can reduce fertiliser losses per hectare while still enabling expansion, intensification, or higher stocking densities, shifting the system toward what is considered 'less bad' rather than genuinely regenerative trajectories. Similarly, rapidly growing carbon farming and soil carbon Measurement, Reporting and Verification (MRV) schemes can create incentives for monitoring and management changes. Yet, they can also encourage narrow, credit-driven interventions that privilege short-term measurability over long-term ecological integrity and local livelihood priorities.

The literature on soil carbon addresses both the scale of mitigation opportunity and the difficulty of realising it without robust design, permanence safeguards, or systemic alignment. Soil carbon is a meaningful component of natural climate solutions, but it is also slow, reversible, and highly contingent on context (Bossio et al., 2020; Amelung et al., 2020). In other words, digitalisation can enable regeneration only when it is coupled with governance that prevents carbon accounting from becoming an alibi for continued extraction agriculture.

#### 3.3.2. Tension 2: participation versus value capture

Stakeholder engagement can democratise innovation or be captured by dominant actors. Digital platforms often structure participation while retaining control over data, algorithms, and monetisation. Then, we raise the following question: who captures value generated by digitally mediated engagement, and who bears the risks? The participation versus value capture tension is especially visible in platform-mediated reforms that promise inclusion but reshape value distribution through rules embedded in infrastructure.

Consider digital agricultural marketplaces or e-platform reforms that connect farmers to wholesale markets. These can improve price discovery, reduce some forms of intermediation, and raise realised prices for producers, for example, the Unified Market Platform reform in Karnataka, India (Levi et al., 2020), i.e., a pioneering e-trading system that connects all the state's primary agricultural produce markets to a single online platform, increasing transparency, efficiency, and farmer incomes. However, the same platform dynamics can centralise control over access, rankings, verification standards, and transaction data, enabling platform operators or large buyers to appropriate informational advantages and impose compliance costs on smaller producers.

A parallel pattern occurs in retailer-led traceability or sustainability platforms, where farmers may be invited to participate in data collection and reporting, but the platform typically determines the KPIs, owns the analytics, and determines how insights are monetised or used in procurement decisions. In this sense, participation can be real and still asymmetric because actors may co-produce data and legitimacy while value capture and decision rights are concentrated elsewhere. This risk is amplified by unequal connectivity and capabilities, where smallholders and remote regions face structural disadvantages in accessing the very infrastructures that define participation (Mehrabi et al., 2021). This lays the groundwork for the final tension we identified: data sovereignty.

#### 3.3.3. Tension 3: data sovereignty versus data enclosure

Food system digitalisation generates unprecedented volumes of data, but data ownership, access, and governance remain unsettled. We need robust data sovereignty frameworks; otherwise, digital transformation can become data enclosure, where farmers, food producers and processors, and communities supply data while firms accumulate proprietary analytics and bargaining power. This tension is directly linked to concerns about corporate concentration (Clapp, 2021).

Data enclosure (i.e., a digital process in which platforms restrict user data access, making it proprietary for competitive advantage) is not only an abstract concern but is also routinely produced through contractual terms, technical standards, and default architectures. For instance, equipment telemetry and farm management software can automatically stream agronomic and operational data into vendor-controlled clouds, where data are aggregated, modelled, and repackaged as subscription intelligence, benchmarking, or risk scoring, often with limited transparency about downstream use. Similar dynamics are emerging in green finance and carbon markets, where farm-level MRV data can become a strategic asset for intermediaries who can price risk and allocate capital while farmers receive limited compensation for the informational value they generate.

Recent work explicitly frames the need to treat farmer data as an asset requiring sovereignty protections and credible valuation approaches, precisely to prevent small, non-digitally native operators from losing control over the value embedded in their data (Gans Combe and Camaréna, 2025).

Policy-oriented scholarship shows that agricultural data-sharing regimes remain immature, unevenly implemented, and often rely on voluntary codes, resulting in substantial gaps in enforceability and in farmers' bargaining power (Ryan, 2024). The implications are clear. We realise that without enforceable governance for consent, portability, interoperability, and benefit-sharing, stakeholder engagement risks becoming a pipeline for data extraction rather than a pathway to equitable innovation.

## 4. Contributions to the special issue: advancing digital transformation (and stakeholder engagement) in food systems

This special issue positions digital transformation and stakeholder engagement as enabling conditions for sustainable food systems across consumption, governance, traceability, and farmer-state interaction. The accepted papers collectively shed light on four problem areas: (1) imported food risk perception and the negotiated relationship between food security and food safety under digitally mediated information environments (Malik, 2026), (2) AI adoption and government support as mechanisms shaping government-farmer value co-creation and the institutional conditions of farmer-facing digital innovation (Zhao et al., 2026), (3) AI-enabled participatory governance through food councils as an institutional architecture for deliberation and policy learning (van Vliet and Turk, 2026), and (4) a digital health intervention that mobilises platform-enabled parental engagement to influence children's vegetable consumption and dietary routines (Gvamichava and Tewfik, 2026).

These studies respond to the call for papers by operationalising digital tools and engagement logics at three interlocking levels: (a) households and consumption practices, (b) producers and public sector interfaces, and (c) governance and policy learning infrastructures. Together, these studies advance the conversation on digital transformation, but they also expose the need for stronger theorisation of power, legitimacy, and public value in food systems. The contributions collectively clarify how sustainability innovation is shaped by the interplay between regeneration and extraction, participation and value capture, and data sovereignty and data enclosure. In doing so, they move the conversation beyond generic claims about digital agriculture and toward the institutional and behavioural mechanisms through which sustainable transformation can be enacted.

### 4.1. *Risk perception, social media, and the politics of food insecurity*

The first paper, *'Food security concerns moderate safety concerns in the risk perception of imported agricultural and aquatic products'* by Malik (2026) advances a crucial, and frequently under-theorised, element of food system innovation in that legitimacy is mediated by risk perceptions that are socially constructed, politically contingent, and shaped by material vulnerabilities rather than by technical facts alone. Using risk perception theory and survey evidence from 505 respondents in the Republic of Korea, the author demonstrates that the effect of food safety importance on perceived imported-food risk weakens when overall food security importance is high, suggesting that affordability and availability pressures can displace safety concerns in consumer judgment (Malik, 2026).

The contribution of this study aligns directly with Tension 2 (Participation versus value capture) because perceived legitimacy becomes a contested outcome produced through information environments, institutional credibility, and consumer sensemaking rather than a simple function of compliance or objective product quality. A concrete implication is that, during supply disruptions, policy actors may face a legitimacy dilemma; those interventions that stabilise prices or ensure supply can increase acceptance even when they do not strengthen safety governance, while safety-focused communication can fail if it ignores lived insecurity and the socio-economic frames that structure trust (Malik, 2026). Thus, this study reframes consumer-facing innovation as a political-economy problem in which legitimacy is negotiated under scarcity, rather than as an informational deficit to be corrected.

### 4.2. *Government-farmers value co-creation and AI adoption*

Zhao et al. (2026), with their paper titled *'Farmers' perceptions and government-farmer value co-creation: the roles of artificial intelligence adoption and government support'*, move the digital agriculture debate away from celebratory narratives of AI for productivity and shift it toward the governance conditions under which AI adoption can support durable value co-creation between states and producers. Drawing on the technology acceptance model and institutional theory, and analysing survey data from 418 Ghanaian farmers, their study shows that perceived usefulness and perceived ease of use are key drivers of AI adoption, and that adoption, in turn, is positively related to government-farmer value co-creation intention (Zhao et al., 2026).

The paper's most policy-relevant insight is that government support can weaken the relationships between perceived usefulness or ease of use and AI adoption, suggesting that poorly designed institutional support can become burdensome or misaligned with farmer realities. This aligns well with Tension 2 (Participation versus value capture) because the same institutional apparatus that claims to enable digital transformation can, in practice, structure participation in ways that shift costs, compliance loads, or dependency risks onto farmers.

A concrete illustration is the common rollout pattern in which subsidies or pilot programmes require data reporting, platform enrolment, or standardised practices that may privilege downstream actors' analytics and procurement needs over farmer autonomy. The authors therefore offer an empirically grounded basis for reframing 'support' as a design variable in socio-technical transitions, with adoption and co-creation hinging on the credibility and fit of governance arrangements rather than on technology availability.

### 4.3. Inclusive food policymaking through AI-powered food councils

With their paper titled *'A feast of knowledge: how AI-powered food councils can transform policymaking in the digital era'*, van Vliet and Turk (2026) contribute to food policymaking through a governance innovation proposition that speaks directly to the democratic deficits of contemporary food system transitions.

If policy is increasingly data-driven, then the institutional vehicles that interpret data and translate it into decisions become the real sites of power. Their paper introduces the concept of 'AI-powered food councils' as a mechanism to support more inclusive policymaking, featuring the possibility that algorithmically enabled deliberation could widen participation and improve how evidence, preferences, and trade-offs are surfaced in decision processes (van Vliet and Turk, 2026).

This contribution aligns primarily with Tension 2 (Participation versus value capture) and Tension 3 (Data sovereignty versus data enclosure) because inclusion is not secured by adding stakeholders to a forum if the agenda, evidence base, and decision rules are already shaped by proprietary models, restricted datasets, or opaque optimisation logics. A concrete example is the policy use of AI-generated optimal dietary or procurement scenarios that appear neutral but embed assumptions about price elasticity, labour, or land use that marginalise smallholders or low-income consumers. If we position councils as socio-technical institutions rather than tools, we place the burden of proof where it belongs, meaning, on governance design, transparency, and accountability for the data and models that shape collective choices (van Vliet and Turk, 2026).

### 4.4. Digital platform and healthy food consumption

Gvamichava and Tewfik (2026), with their paper titled *'Leveraging digital health platform to enhance children's veggies consumption: a parent-focused approach'*, extend the special issue's remit beyond production-side digitalisation by demonstrating how food system innovation also operates through consumption practices and public health infrastructures, where digital platforms increasingly mediate behavioural interventions. Their study develops and tests a digital health platform intervention to increase children's vegetable consumption in Georgia, addressing a persistent gap between nutritional guidance and everyday eating practices (Gvamichava and Tewfik, 2026).

Their contribution aligns with Tension 1 (Regeneration versus extraction) because dietary shifts are a structural lever for sustainability transitions. Yet they are often reduced to individual-choice narratives, while the political economy of food environments remains unchallenged. It also aligns with Tension 3 (Data sovereignty versus data enclosure) because digital health interventions frequently rely on granular behavioural data, and the governance of children's data is ethically and institutionally sensitive.

A concrete implication of their work is that platform-mediated consumer nudges can scale rapidly through schools and parents, without robust safeguards. It can also normalise surveillance logics and commercial data capture in the name of wellbeing. The paper's value to the discourse is therefore twofold: it legitimises demand-side innovation as food system innovation, and it invites a stricter governance conversation about who owns, controls, and benefits from behavioural data generated in nutrition and health contexts (Gvamichava and Tewfik, 2026).

Table 1 presents a summary of the papers' contributions to the tensions arising from the agri-food system polycrisis.

**Table 1**
Summary of papers' contributions to the tensions arising from agri-food system polycrisis.

| Papers \| Tensions | Regeneration (−) versus extraction (+) | Participation (−) versus value capture (+) | Data sovereignty (−) versus data enclosure (+) |
|---|---|---|---|
| Malik (2026) | Indirect (−). It shows how availability and affordability pressures shape acceptance conditions for safety and sourcing decisions, influencing the feasibility of sustainability measures | Direct (+). It positions legitimacy as negotiated public sensemaking under insecurity, shaping which narratives and actors influence acceptance | Indirect (−). Social media exposure structures information visibility and agenda-setting power in risk narratives |
| Zhao et al. (2026) | Indirect (−). Adoption via usefulness can be oriented either to optimisation or sustainability, depending on programme design | Direct (+). It models co-creation and shows how government support structures participation, burdens, and perceived value | Direct (+). AI adoption is coupled with data generation and analytics dependency, raising questions about rights and benefit-sharing |
| van Vliet and Turk (2026) | Indirect (−). Councils can surface trade-offs and shift policy directionality toward regenerative priorities | Direct (+). It proposes deliberative governance as an institutional design to broaden participation and reduce capture | Direct (+). Councils depend on evidence and models; legitimacy hinges on transparency, contestability, and control of data infrastructures |
| Gvamichava and Tewfik (2026) | Direct (+). Demand-side dietary change supports sustainability and health pathways through altered consumption practices | Direct (+). Parental engagement is operationalised as capability-building participation, enabling behavioural change | Direct (+). Digital health platforms generate sensitive behavioural data; governance determines protection versus enclosure |

## 5. Discussion and implications

Taken together, the four contributions in this special issue operationalise a core claim of our conceptual framing: digital transformation in agri-food systems is not a technology rollout but a socio-technical transition whose directionality and legitimacy are negotiated through institutions, markets, cultural meanings, and infrastructures (Geels, 2002; Schot and Steinmueller, 2018). These studies span household consumption (Gvamichava and Tewfik, 2026), consumer risk perception in cross-border food flows (Malik, 2026), producer-facing digital innovation at the state-farmer interface (Zhao et al., 2026), and deliberative governance design (van Vliet and Turk, 2026). Read through the polycrisis conditions described in Section 2. These studies are analytically valuable because they shift attention from narrow productivity discourse toward the governance problems that actually determine whether digitalisation supports sustainable outcomes within planetary limits (Steffen et al., 2015; Crippa et al., 2021; Willett et al., 2019; Rockström et al., 2025).

### *5.1. From digital adoption to governed transformation in the food system polycrisis*

The first insight concerns 'legitimacy and trust' as transition variables rather than as contextual noise. The analysis of imported food risk perception makes clear that food security and food safety are not interchangeable categories in public cognition, and that material anxieties about availability and affordability can reweight how safety is judged (Malik, 2026). This matters for innovation studies because the legitimacy of sustainability interventions is frequently built (or eroded) through public sensemaking in digitally mediated environments. Stakeholder engagement is not only about formal participation but also about the institutional capacity to sustain moral and pragmatic legitimacy under uncertainty and contested narratives (Suchman, 1995).

In the current geopolitical context, where supply shocks, inflation, and misinformation interact, digital transformation can intensify this legitimacy challenge by accelerating the circulation of risk narratives and politicising expertise. The implication is that a credible transition lens for food systems must treat trust, perception, and legitimacy as mechanisms that co-determine adoption trajectories and governance feasibility, not as downstream communication problems.

A second insight consists of 'participation versus value capture' as the defining political economy question of digitalisation. Zhao et al. (2026) show that farmers' perceived usefulness and ease of use shape AI adoption, and that adoption is associated with government-farmer value co-creation intentions, with government support playing a consequential role in structuring these dynamics. This is precisely the kind of mechanism that a socio-technical account predicts, which is that performance and uptake hinge on complements such as institutional support, extension infrastructures, and capability development rather than on artefacts alone (Bresnahan et al., 2002).

However, the deeper contribution is conceptual, as the paper highlights co-creation as a governance relationship rather than a rhetorical aspiration. When support is configured as compliance-heavy platform enrollment, data reporting mandates, or standardisation imposed without meaningful decision rights, it can function less as enabling infrastructure and more as a channel for shifting costs and risks onto farmers. This is the practical manifestation of participation versus value capture tension, i.e., when actors may be formally included in a digital programme while remaining structurally excluded from control over value definition and appropriation (Arnstein, 1969; Vargo and Lusch, 2016). The contribution here is not only that adoption is conditional but also that adoption is politically produced through programme design choices that allocate burdens, benefits, and agency.

A third insight comes from van Vliet and Turk's (2026) proposal for AI-powered food councils, which brings the governance argument into sharp relief. They reposition AI as an institutional capacity for deliberation, sensemaking, and policy learning rather than as a farm-level optimisation tool (van Vliet and Turk, 2026). Their contribution aligns simultaneously with participation versus value capture and data sovereignty versus data enclosure. Councils can widen participation and make trade-offs discussable, but only if the evidence base and modelling assumptions are transparent, contestable, and not effectively privatised through proprietary data, closed models, or opaque optimisation routines.

This is where the special issue's discourse intersects with the corporate concentration concern described in Section 2, because when market power is concentrated, digital governance can become a mechanism through which dominant actors stabilise preferred pathways and present them as data-driven inevitabilities (Clapp, 2021). In this sense, AI councils represent more than a participatory innovation device. They are a governance design proposition for restoring public value amid platformisation and technocratic drift.

Fourth, digital nutrition intervention (Gvamichava and Tewfik, 2026) extends this special issue beyond familiar production and supply chain emphasis by demonstrating how digital platforms can influence dietary routines and nutritional outcomes through parent-focused engagement. This contribution is particularly relevant to the debate between regeneration and extraction because sustainability is not secured by production efficiency alone. It also depends on dietary shifts and health outcomes that reduce pressure on land, emissions, and biodiversity while addressing malnutrition and diet-related disease burdens (Willett et al., 2019; Rockström et al., 2025).

The study offers a concrete illustration of innovation as capability-building at the household level, rather than technological upgrading at the farm level. Moreover, it indirectly stresses the importance of data sovereignty versus data enclosure in a sensitive domain because digital health interventions tend to generate granular behavioural data, often involving children, which raises acute questions about consent, governance, and downstream use. Even when a programme is designed for public benefit, the data infrastructures through which it operates can be repurposed for surveillance, commercial profiling, or non-transparent evaluation logics unless governance is explicit. Thus, this paper reinforces the editorial's argument that digital transformation is inseparable from institutional design, particularly when interventions are aimed at wellbeing and equity.

Across the four contributions, the special issue advances the discourse on digital transformation and stakeholder engagement in

sustainable food systems, directly addressing the polycrisis context outlined in Section 2. Studies demonstrate that sustainability innovation is shaped less by the novelty of digital tools than by the governance architectures that decide what is optimised, whose knowledge is authoritative, and how value and risk are distributed (Steffen et al., 2015; Crippa et al., 2021; Poore and Nemecek, 2018; Clapp, 2021). In that sense, the special issue can be read as an empirical and conceptual elaboration of a broader claim: sustainability transitions in food systems require institutional innovation at least as much as technological innovation, and the two cannot be disentangled without obscuring power and politics.

### 5.2. Implications for theory development

*Re-specifying digital transformation as transition governance and not adoption.* These studies collectively support a theoretical shift from adoption-centric explanations to governance-centric explanations. A socio-technical transition lens directs attention to regime rules, complements, and directionality (Geels, 2002; Schot and Steinmueller, 2018), while the papers show that legitimacy (Malik, 2026), institutional support design (Zhao et al., 2026), and deliberative architectures (van Vliet and Turk, 2026) shape whether digitalisation supports sustainability outcomes. Future theory building should treat digital transformation as 'governed digitalisation', meaning a transition process in which institutions allocate decision rights, define metrics, and stabilise pathways.

*Bringing legitimacy and trust into the centre of food systems innovation studies*. Malik's (2026) findings imply that legitimacy is not a soft outcome but a causal mechanism affecting policy feasibility and system stability. This attracts stronger integration between innovation studies and legitimacy theory (Suchman, 1995), particularly under conditions of contested expertise and polarised information environments. In practical terms, the transition literature would benefit from specifying how legitimacy is produced, withdrawn, and reconstituted in digitally mediated food systems, especially during shocks when food security and affordability dominate public attention.

*Extending co-creation theory to account for value capture and data enclosure*. The special issue reinforces the need to operationalise co-creation with explicit attention to decision rights and appropriation. Service-dominant logic offers a vocabulary for value co-creation under institutional constraints (Vargo and Lusch, 2016). Still, the tensions explained in Section 3.3 suggest that co-creation in food systems is frequently threatened by capture dynamics, particularly where data and platforms mediate coordination. From a theoretical point of view, we would therefore need to connect co-creation theory with political economy questions about platform power, data governance, and concentration (Clapp, 2021) while treating participation levels as variable and measurable rather than assumed (Arnstein, 1969).

*Reframing food system innovation outcomes beyond efficiency*. The digital health intervention paper by Gvamichava and Tewfik (2026) prompts us to broaden our understanding of what counts as innovation outcomes in this domain; for instance, dietary behaviour, nutrition, and wellbeing are central to sustainable food futures and cannot remain peripheral in innovation studies (Willett et al., 2019; Rockström et al., 2025). This implies a more pluralistic outcome space for theory, spanning regenerative ecological indicators, distributive impacts, and health outcomes, rather than productivity and adoption alone. This is already posited by Cacciolatti (2024), whose work on public science, culture, and net zero further supports this broadening by linking sustainability transitions to innovation ecosystems and institutional conditions, not solely to technological deployment.

### 5.3. Implications for policymakers and practitioners

The main implications for policymakers are as follows.

1. *Adopt mission-oriented governance with explicit directionality and distributional criteria.* The polycrisis context implies that food system innovation must be directional, not only enabling. Policymakers should define sustainability innovation portfolios that explicitly prioritise planetary boundaries, nutrition, and equity, rather than relying on generic digital agriculture funding. This supports transformative innovation policy arguments that emphasise directionality and societal missions (Schot and Steinmueller, 2018), and agrees with the EAT-Lancet emphasis on integrated health and sustainability outcomes (Willett et al., 2019; Rockström et al., 2025).
2. *Treat data governance as core food system governance.* If digitalisation can become data enclosure, then data governance must be treated as a public interest concern, not a purely contractual matter. Policymakers should move beyond voluntary codes toward enforceable provisions for consent, portability, interoperability, and fair benefit-sharing in agricultural and food-related data infrastructures (Ryan, 2024). This is particularly urgent when public programmes subsidise platforms or mandate digital reporting because the state can unintentionally underwrite private value capture while exposing farmers and communities to asymmetric dependencies.
3. *Design participatory governance infrastructures that are transparent and contestable.* AI-powered councils and similar deliberative mechanisms can help people navigate trade-offs, but only when modelling assumptions, data sources, and value judgments are explicit and contestable (van Vliet and Turk, 2026). Policymakers should adopt transparency and accountability standards for AI in public decision processes, ensuring that data-driven decisions do not become a substitute for democratic justification.

Similarly, there are several practical implications for food system actors.

4. *Reorient innovation KPIs toward regenerative and health outcomes.* For producers, processors, retailers, and technology providers, the tension between regeneration and extraction implies that efficiency gains alone should not be presented as sufficient evidence of

sustainability. KPIs should incorporate biodiversity, soil health, emissions integrity, and health-aligned consumption outcomes. This resonates with the empirical reality that food system impacts are systemic and heterogeneous (Poore and Nemecek, 2018; Crippa et al., 2021), meaning that actors need more credible measurement regimes than narrow efficiency metrics. This is partially done in some domains by innovative start-ups like Net0 for carbon accounting and sustainability, and for governmental digital transformation.

5. *Co-design digital participation with real decision rights and fair value allocation.* Platform operators and lead firms should treat stakeholder engagement as a governance commitment, not a reputational instrument. Practical steps include transparent rules for data use, shared analytics where feasible, participatory KPI definition, and fair compensation for data value, particularly when participation generates commercially valuable insights. Without such practices, engagement risks sliding into perceived tokenism and triggering legitimacy loss (Suchman, 1995; Arnstein, 1969).

## 6. Conclusions

In this paper, we argued that innovation in agri-food systems must be treated as a contested, political project rather than a benign, technical pathway to efficiency. The special issue in general and this editorial in particular contribute to the theoretical repositioning of digital transformation as a socio-technical transition shaped by institutional complements, legitimacy dynamics, and distributional choices, consistent with the transition scholarship that emphasises co-evolution between artefacts, rules, infrastructures, and practices (Geels, 2002; Schot and Steinmueller, 2018; Cacciolatti and Lee, 2022). We built on the initial observation of the polycrisis conditions that define contemporary food systems, namely planetary boundary transgression, diet-related ill-health, corporate concentration, and contested trust. We introduced three structural tensions that provide a parsimonious but analytically demanding lens for future work: (i) regeneration versus extraction, (ii) participation versus value capture, and (iii) data sovereignty versus data enclosure (Steffen et al., 2015; Willett et al., 2019; Clapp, 2021; Rockström et al., 2025). These special issue papers collectively demonstrate how these tensions are enacted in practice across consumption interventions, public risk perception, government-farmer co-creation, and AI-enabled governance design. This advances the discourse beyond generic claims about digital agriculture toward concrete socio-institutional mechanisms.

The knowledge gap addressed by this editorial is the persistent under-theorisation of power, legitimacy, and public value in the digital transformation of food systems. Much of the prior work has treated adoption as the main empirical endpoint and technology as the main explanatory driver. In contrast, this editorial consolidates a governance-centred view in which the success or failure of digitalisation depends on how decision rights are allocated, how metrics define value, and how risks and benefits are distributed across actors and territories. This framing also complements previous research arguing that ethically governed experimentation, for instance, through living labs as ethical spaces, is essential if sustainability innovation is to avoid reproducing extractive trajectories under a new vocabulary of progress (Cacciolatti et al., 2025).

Future research should focus on two priorities. First, scholars should develop empirically testable models of legitimacy formation and withdrawal in digitally mediated food systems, including the role of platforms in shaping risk narratives, trust, and compliance under supply shocks. Second, research should theorise and test data sovereignty arrangements as institutional innovations, examining how alternative governance models, such as cooperative data trust, interoperability mandates, and benefit-sharing contracts, affect farmers' and food producers' agency, innovation directionality, and distributive outcomes.

## References


Amelung, W., Bossio, D., de Vries, W., et al., 2020. Towards a global-scale soil climate mitigation strategy. Nat. Commun. 11 (1), 5427.

Arnstein, S.R., 1969. A ladder of citizen participation. J. Am. Inst. Plan. 35 (4), 216–224.

Bossio, D.A., Cook-Patton, S.C., Ellis, P.W., et al., 2020. The role of soil carbon in natural climate solutions. Nat. Sustain. 3, 391–398.

Bresnahan, T.F., Brynjolfsson, E., Hitt, L.M., 2002. Information technology, workplace organisation, and the demand for skilled labor: firm-level evidence. Q. J. Econ. 117 (1), 339–376.

Cacciolatti, L., 2024. Public science and environmental sustainability: a national culture framework for innovation ecosystems en route to net zero. Digit. Econ. Sustain. Dev. 2, 7.

Cacciolatti, L., Christodoulou, I., Christof, M., Lee, S.H., 2026. Enabling sustainable food systems through AI and metaverse technologies: a socio-technical perspective. Technol. Soc. 85, 103781.

Cacciolatti, L., Lee, S.H., 2022. Collective knowledge and social innovation in communities of practice: the case of the slow food movement in Italy. In: Massaro, P., Dumay, D., Bagnoli, R. (Eds.), The Routledge Companion to Knowledge Management. Routledge, pp. 271–288.

Cacciolatti, L., Lee, S.H., 2025. Food sovereignty, stakeholder engagement, and co-creation in alternative food networks: a Post-Schumpeterian economics perspective. In: Handbook on Post-schumpeterian Innovations. Edward Elgar Publishing, pp. 303–324.

Cacciolatti, L., Lee, S.H., Christodoulou, I., et al., 2025. Living labs as ethical spaces: fostering innovation and sustainability in food systems. J. Bus. Ethics 1–21.

Cacciolatti, L., Lee, J., Sacchi, G., et al., 2024. Guest editorial. Revisiting the slow food movement: three cases of heritage, innovation, and sustainability in alternative food networks. Econ. Agro-Alimentare 26 (2). https://doi.org/10.3280/ecag2024oa18190.

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

Crippa, M., Solazzo, E., Guizzardi, D., et al., 2021. Food systems are responsible for a third of global anthropogenic GHG emissions. Nat. Food 2 (3), 198–209.

Foley, J.A., Ramankutty, N., Brauman, K.A., et al., 2011. Solutions for a cultivated planet. Nature 478, 337–342.

Gans Combe, C., Camaréna, S., 2025. Data sovereignty and valuation model for sustainable agriculture innovation and equity. NPJ Sustain. Agric. 3, 61.

Gvamichava, R., Tewfik, I., 2026. Leveraging digital health platform to enhance children's veggies consumption: a parent-focused approach. Int. J. Innov. Stud. Advance online publication.

Geels, F.W., 2002. Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. Res. Pol. 31 (8–9), 1257–1274.

Levi, R., Rajan, M., Singhvi, S., et al., 2020. The impact of unifying agricultural wholesale markets on prices and farmers' profitability. Proc. Natl. Acad. Sci. 117 (5), 2366–2371.

Malik, T.H., 2026. Food security concerns moderate safety concerns in the risk perception of imported agricultural and aquatic products. Int. J. Innov. Stud. 9, 417–431.

Mehrabi, Z., McDowell, M.J., Ricciardi, V., Levers, C., Martinez, J.D., Mehrabi, N., Wittman, H., Ramankutty, N., Jarvis, A., 2021. The global divide in data-driven farming. Nat. Sustain. 4, 145–155. https://doi.org/10.1038/s41893-020-00631-0.
Payne, A.F., Storbacka, K., Frow, P., 2008. Managing the co-creation of value. J. Acad. Market. Sci. 36 (1), 83–96.
Poore, J., Nemecek, T., 2018. Reducing food's environmental impacts through producers and consumers. Science 360 (6392), 987–992.
Prahalad, C.K., Ramaswamy, V., 2004. Co-creation experiences: the next practice in value creation. J. Interact. Market. 18 (3), 5–14.
Ryan, M., 2024. The future of agricultural data-sharing policy in Europe. Hum. Soc. Sci. Commun. 11, 19.
Rockström, J., Thilsted, S.H., Willett, W.C., et al., 2025. The EAT–lancet commission on healthy, sustainable, and just food systems. Lancet 406 (10512), 1625–1700.
Schot, J., Steinmueller, W.E., 2018. Three frames for innovation policy: R&D, systems of innovation and transformative change. Res. Pol. 47 (9), 1554–1567.
Steffen, W., Richardson, K., Rockström, J., et al., 2015. Planetary boundaries: guiding human development on a changing planet. Science 347 (6223), 1259855.
Suchman, M.C., 1995. Managing legitimacy: strategic and institutional approaches. Acad. Manag. Rev. 20 (3), 571–610.
van Vliet, M., Turk, I., 2026. A feast of knowledge: how AI-powered food councils can transform policymaking in the digital era. Int. J. Innov. Stud. 10 (2), 100169.
Vargo, S.L., Lusch, R.F., 2016. Institutions and axioms: an extension and update of service-dominant logic. J. Acad. Market. Sci. 44, 5–23.
Willett, W., Rockström, J., Loken, B., et al., 2019. Food in the anthropocene: the EAT–lancet commission on healthy diets from sustainable food systems. Lancet 393 (10170), 447–492.
Zhao, S., Zhang, J., Zhao, Y., et al., 2026. Farmers' perceptions and government-farmer value co-creation: the roles of artificial intelligence adoption and government support. Int. J. Innov. Stud. 10 (2), 100165.

Luca Cacciolatti[a,*], Soo Hee Lee[b], Xiaoyu Yu[c]
[a] *School of Organisations, Economy, and Society, University of Westminster, London, W1B 2HW, United Kingdom*
[b] *Kent Business School, University of Kent, Canterbury, CT2 7 NZ, United Kingdom*
[c] *School of Management, Shanghai University, Shanghai, 200444, China*

[*] Corresponding author.
*E-mail addresses:* l.cacciolatti@westminster.ac.uk (L. Cacciolatti), s.h.lee@kent.ac.uk (S.H. Lee), yuxiaoyu@shu.edu.cn (X. Yu).