

Exploring integrative collaborative governance in SME-based agri-food supply chains: mixed-methods insights from Indonesia

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Abstract— Sustainability challenges in agri-food supply chains (AFSCs) are particularly pronounced in emerging economies, where small- and medium-scale enterprises (SMEs) dominate production yet operate within fragmented, institutionally plural, and power-imbalanced coordination environments. Prevailing approaches—ranging from firm-centric compliance regimes to techno-solutionist digitalisation narratives—offer limited explanatory value in such contexts, as they often abstract sustainability from governance dynamics and political-economic conditions. This study advances an integrative collaborative governance perspective to examine how sustainability emerges not from isolated technical or organisational interventions, but from the interaction among relational governance, institutional facilitation, coordination processes, and technological enablers. Adopting a pragmatist mixed-methods design, the study combines survey data from 120 SME actors with 32 semi-structured interviews conducted across peri-urban agri-food clusters in East Java, Indonesia. The findings indicate that sustainability outcomes—economic, social, and environmental—are collective, emergent, and politically mediated, rather than the direct result of any single governance mechanism. Relational trust provides a necessary social foundation for cooperation; however, in the absence of institutional mediation and structured coordination, trust often stabilises asymmetrical dependencies rather than enabling transformative outcomes. Coordination processes emerge as the operational mechanism through which governance integration becomes actionable, while digital technologies function not as autonomous drivers of sustainability, but as governance amplifiers, reinforcing either inclusive collaboration or exclusionary practices depending on how data access, accountability, and decision-making authority are governed. By foregrounding interaction, power, and context, this study contributes to a Southern epistemology of sustainability governance that challenges depoliticised and technology-centric models of agri-food transformation. The findings offer actionable insights for policymakers and practitioners seeking to design inclusive, resilient, and contextually grounded AFSC governance arrangements in the Global South.

Index Terms— Integrative collaborative governance; Sustainable agri-food supply chains; SMEs; Power asymmetries; Emerging economies

I. INTRODUCTION

Agri-food supply chains (AFSCs) occupy a central place in contemporary debates on sustainability and development, not merely as channels of food provision but as institutional arenas in which economic viability, social equity, and ecological integrity intersect—and frequently come into tension. These tensions are particularly pronounced in emerging economies, where small- and medium-sized enterprises (SMEs) and smallholder producers constitute the backbone of food systems while operating within fragmented, institutionally plural, and power-imbalanced coordination environments. In such contexts, sustainability cannot be reduced to technical efficiency, market access, or compliance with standards alone. Rather, it is fundamentally shaped by governance arrangements that determine whose voices are recognised, how risks and rewards are distributed, and which actors are empowered to shape collective outcomes (Gómez & Lee, 2023; Dammak et al., 2025).

Prevailing approaches to sustainability in AFSCs have largely been dominated by two analytical paradigms. The first is firm-centric governance, which assumes that sustainability objectives can be transmitted through supply chains via lead-firm authority, contractual compliance, certification schemes, and audit mechanisms (Hassini et al., 2012; Seuring & Müller, 2008). The second is a techno-solutionist narrative that positions digital tools—such as blockchain, traceability systems, and digital platforms—as neutral enablers of

transparency, efficiency, and trust (Kamble et al., 2020; Saberi et al., 2018). While these paradigms have delivered measurable improvements in highly formalised, capital-intensive, and vertically coordinated supply chains, their explanatory and practical value remains limited in SME-dominated systems characterised by informality, weak enforcement capacity, and entrenched power asymmetries.

Empirical evidence from the Global South increasingly challenges the assumptions underpinning both paradigms. Firm-centric governance often relegates SMEs to the role of price-takers rather than value-shapers, reinforcing dependency and constraining opportunities for collective upgrading (Nugroho et al., 2025). Similarly, digitalisation initiatives introduced without inclusive governance arrangements frequently reproduce—or even intensify—existing inequalities, particularly where data ownership, platform control, and algorithmic decision-making are concentrated in the hands of intermediaries or external actors (Otter & Robinson, 2024). In such settings, technology does not neutralise power relations; it reconfigures and amplifies them.

These limitations are especially evident in Indonesia, where more than 90 per cent of agri-food actors are micro, small, or medium enterprises embedded in dense informal networks and institutional hybrids. SMEs are increasingly expected to comply with evolving sustainability standards and participate in digitally mediated coordination systems, often without commensurate institutional support, bargaining power, or voice in rule-setting processes. As a result, sustainability outcomes hinge less on individual firm capabilities than on the collective capacity of heterogeneous actors—including farmers, processors, cooperatives, local governments, and civil society organisations—to coordinate, negotiate, and co-create value under conditions of asymmetry and uncertainty.

In this context, collaborative governance emerges not as a normative aspiration but as a practical necessity. Collaborative governance refers to processes of shared problem-solving, mutual accountability, and joint stewardship among interdependent actors who cannot achieve desired outcomes unilaterally (Ansell & Gash, 2008). Prior research suggests that collaborative arrangements can enhance resilience, learning, and adaptive capacity in agri-food systems, particularly where trust, repeated interaction, and informal norms partially substitute for weak formal enforcement (Dentoni et al., 2016; Dania et al., 2018). However, much of this literature remains anchored in Global North settings or large-scale value chains, offering limited insight into how collaboration unfolds in SME-dominated systems where power relations, institutional mediation, and informal hierarchies structure everyday coordination.

More critically, collaboration is frequently treated as inherently benign. Recent development scholarship cautions that, without explicit attention to power and institutional asymmetries, collaborative arrangements risk becoming sites of symbolic inclusion or “governance washing,” where participation is visible but decision-making authority remains concentrated among elites (Lin, 2025; Vásquez Neyra et al., 2025). Evidence from emerging economies further suggests that relational trust may stabilise cooperation while simultaneously entrenching asymmetric dependencies, particularly when SMEs lack institutional backing to contest prices, standards, or data control (Bidarti & Irwanto, 2025). These insights challenge depoliticised narratives of collaboration that equate participation with equity.

Parallel debates have emerged around the role of digital technologies in AFSC governance. While digital tools are widely promoted as mechanisms for transparency and traceability, empirical studies indicate that their effects are highly contingent on governance conditions. Where institutional mediation and inclusive coordination are present, digitalisation may enhance information sharing and reduce transaction costs. Conversely, in asymmetrical settings, digital tools often become new sites of exclusion, enabling data gatekeeping and reinforcing intermediary power (Otter & Robinson, 2024). Treating technology as an autonomous driver of sustainability therefore obscures the governance architectures within which digital tools are embedded.

Taken together, these strands of literature point to a critical gap. Sustainability in SME-based AFSCs rarely emerges from isolated governance mechanisms—whether trust, institutional support, coordination routines, or technology—considered independently. Instead, sustainability outcomes are produced through the interaction of multiple governance mechanisms within specific political-economic contexts. Yet existing

studies tend to examine these dimensions in isolation, offering fragmented explanations that struggle to account for persistent unevenness in sustainability outcomes across the Global South.

Against this backdrop, this study advances an integrative collaborative governance perspective to examine how sustainability is produced, contested, and stabilised in SME-dominated agri-food supply chains. Rather than treating governance mechanisms as additive or functionally equivalent, the study conceptualises sustainability as an emergent outcome of conditional interdependence among four governance dimensions: relational governance, institutional facilitation, coordination processes, and technological enablers. This perspective foregrounds process over prescription, context over universal templates, and power over partnership rhetoric.

The paper makes three interrelated contributions to debates on sustainability governance in agri-food systems, particularly within Global South contexts. First, it reconceptualises sustainability not as the outcome of firm-level compliance or technological optimisation, but as a collective, emergent, and politically mediated governance outcome shaped by interactions among relational dynamics, institutional mediation, coordination practices, and power-laden technological arrangements. Second, drawing on mixed-method evidence from SME-based agri-food supply chains in Indonesia, the study demonstrates that relational trust—while necessary—does not in itself generate equitable or ecological sustainability. Sustainability-oriented practices become more durable only when trust is actively mediated through institutional facilitation and structured coordination mechanisms that redistribute voice, stabilise expectations, and discipline opportunistic behaviour. Third, the study reframes digital technologies as conditional governance amplifiers rather than neutral drivers of sustainability, advancing a context-sensitive, Southern epistemology of sustainability governance.

The remainder of the paper is organised as follows. Section II introduces the integrative collaborative governance framework. Section III outlines the research design and methodology. Section IV presents the findings, followed by a discussion of theoretical and policy implications in Section V. Section VI concludes with reflections on limitations and directions for future research.

II. CONCEPTUAL FRAMEWORK AND ANALYTICAL LENS

A. *From fragmented governance to an integrative collaborative perspective*

Sustainability governance in agri-food supply chains has been examined through multiple, often fragmented, analytical lenses. Prior research has focused separately on relational governance mechanisms such as trust and social capital, institutional arrangements including regulations and public–private partnerships, coordination processes embedded in supply chain management practices, and, more recently, the role of digital technologies in enhancing transparency and traceability (Seuring & Müller, 2008; Dentoni et al., 2016; Trienekens et al., 2022). While each strand offers valuable insights, their analytical separation limits the capacity to explain why sustainability outcomes remain uneven—particularly in SME-dominated systems in emerging economies.

This study departs from additive or modular interpretations of governance and advances an integrative collaborative governance perspective. Rather than treating governance mechanisms as independent drivers of sustainability, the framework conceptualises sustainability as an emergent outcome produced through the interaction of multiple governance dimensions operating within specific institutional and political–economic contexts. This shift from isolated mechanisms to interactive processes is especially relevant for SME-based agri-food supply chains, where formal authority is weak, coordination is negotiated rather than imposed, and sustainability objectives are continuously contested among heterogeneous actors.

Building on collaborative governance theory (Ansell & Gash, 2008; Provan & Kenis, 2008) and sustainable supply chain scholarship, the framework positions collaboration not as a static arrangement but as a dynamic and contextually embedded process, shaped by power relations, institutional mediation, and technological configurations. Governance integration, in this sense, refers to the alignment and mutual reinforcement of

relational, institutional, operational, and technological elements toward collectively negotiated sustainability objectives.

B. Relational governance: trust as a necessary but insufficient condition

Relational governance constitutes the foundational layer of collaborative arrangements in SME-based agri-food supply chains. It encompasses trust, norms of reciprocity, informal communication, and repeated interaction among supply chain actors (Gereffi et al., 2005; Dentoni et al., 2016). In contexts characterised by limited formal enforcement capacity, relational ties often substitute for contractual safeguards, enabling coordination under conditions of uncertainty.

However, the framework explicitly rejects romanticised assumptions that trust alone generates sustainable outcomes. While relational governance may stabilise cooperation and reduce transaction costs, it can simultaneously reproduce dependency and asymmetry, particularly where SMEs lack bargaining power or access to alternative markets (Pérez Perdomo & Gómez, 2019). Trust is therefore conceptualised as a necessary but insufficient condition for sustainability—one that requires institutional mediation and structured coordination to prevent opportunism and exclusion.

Within the framework, relational governance enables information sharing and willingness to collaborate, but its sustainability relevance is conditional on how trust is embedded within broader governance arrangements.

C. Institutional facilitation: mediating power and legitimising collaboration

Institutional facilitation refers to the role of public agencies, cooperatives, extension services, and intermediary organisations in enabling, stabilising, and legitimising collaborative governance arrangements. Rather than relying on command-and-control regulation, institutional facilitation emphasises mediation, coordination, capacity building, and the creation of inclusive spaces for collective decision-making (Provan & Kenis, 2008).

In SME-dominated agri-food systems, institutional actors play a critical mediating role by reducing power asymmetries, providing access to resources, and translating sustainability objectives into locally actionable practices. The framework conceptualises institutional facilitation as a stabilising mechanism that anchors relational governance within broader policy and regulatory environments. In its absence, collaboration risks remaining informal, fragile, and vulnerable to elite capture.

Institutional facilitation is not treated as exogenous to relational dynamics. Instead, it interacts with trust-based relationships, either reinforcing collective action through legitimacy and coordination support or, if poorly designed, undermining collaboration by imposing rigid or exclusionary rules.

D. Coordination processes: translating governance into collective action

Coordination processes constitute the operational core of integrative collaborative governance. They include joint planning, shared standards, collective problem-solving routines, and conflict-resolution mechanisms that translate governance intentions into everyday practices (Flynn et al., 1990; Pagell & Wu, 2009).

Within the framework, coordination processes are not conceptualised as neutral managerial tools, but as socially embedded practices shaped by relational trust and institutional arrangements. Effective coordination enables consistency in quality, timing, and sustainability-oriented practices across supply chain actors. Conversely, weak or fragmented coordination undermines collaboration, even where trust and institutional support are present.

Coordination processes thus function as the mechanism through which governance integration becomes observable, linking relational and institutional dimensions to collective sustainability-oriented practices.

E. Technological enablers: governance amplifiers, not primary drivers

Digital technologies—such as traceability systems, data-sharing platforms, and digital communication tools—have gained prominence in sustainability governance debates. While often framed as transformative solutions, the framework deliberately positions technology as a supportive and conditional governance amplifier, rather than a primary driver of sustainability (Treiblmaier, 2018; Saberi et al., 2023).

Empirical studies suggest that technology enhances transparency and efficiency only when embedded within inclusive governance arrangements. In the absence of relational trust and institutional facilitation, digital tools may exacerbate asymmetries by centralising data control and decision-making authority (Otter & Robinson, 2024). Accordingly, technological enablers are conceptualised as contingent mechanisms whose sustainability relevance depends on governance integration rather than technical sophistication alone.

F. Integrative collaborative governance and sustainability outcomes

Bringing these dimensions together, the integrative collaborative governance framework posits that sustainability outcomes in SME-based agri-food supply chains emerge from the interaction among relational governance, institutional facilitation, coordination processes, and technological enablers. No single dimension is sufficient to generate sustained economic, social, or environmental outcomes in isolation.

This interactional logic underpins the study's analytical lens. Sustainability is conceptualised not as a static performance metric, but as a dynamic, collective achievement shaped by governance processes over time. The framework therefore shifts analytical attention from asking which mechanism matters most to examining how governance dimensions interact under specific contextual conditions.

G. Analytical implications and link to empirical strategy

The integrative collaborative governance framework directly informs the study's empirical strategy. Each governance dimension is operationalised through complementary quantitative indicators and qualitative inquiry, enabling systematic identification of patterns alongside contextual interpretation of governance processes. This alignment ensures coherence between theory, methodology, and findings, consistent with IMRAD principles.

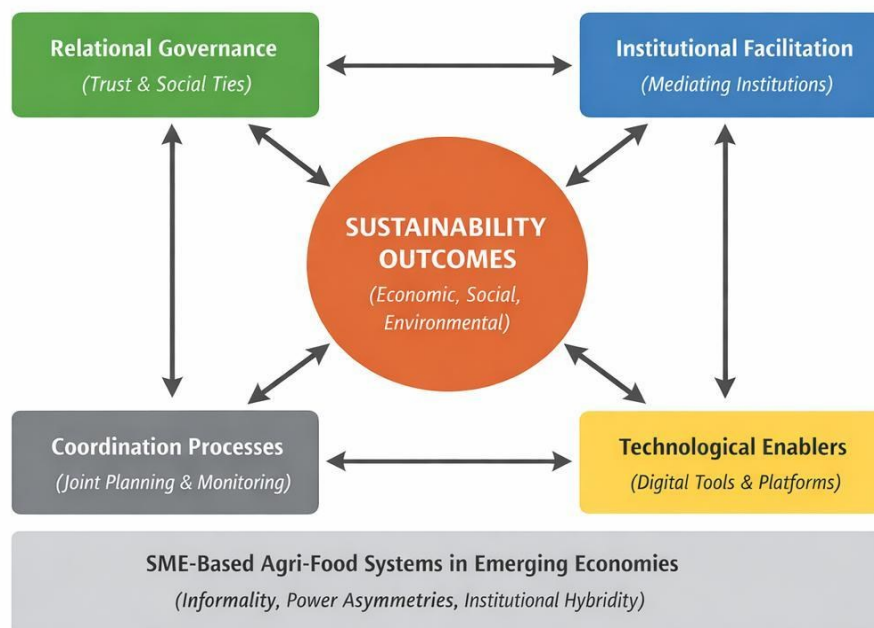


Figure 1: Integrative collaborative governance framework

Figure 1 presents the integrative collaborative governance framework, illustrating the interaction among governance dimensions and their relationship to sustainability outcomes in SME-based agri-food systems in emerging economies. The figure serves as an analytical map, not a causal model, and provides the conceptual foundation for the mixed-methods approach detailed in the following section.

H. Research questions

Guided by the integrative collaborative governance framework, this study addresses the following exploratory research questions:

RQ1: How do relational governance and institutional facilitation interact to shape coordination processes in SME-based agri-food supply chains?

RQ2: How do coordination processes relate to sustainability outcomes under conditions of power asymmetry?

RQ3: Under what governance conditions do digital technologies amplify rather than constrain inclusive collaboration?

III. METHODOLOGY

A. Research design and philosophical orientation

This study adopts a pragmatist mixed-methods research design, which is well suited to examining complex governance phenomena that cannot be adequately captured through a single methodological tradition. Pragmatism prioritises research questions and practical implications over methodological purity, allowing quantitative and qualitative approaches to be combined in a complementary and problem-oriented manner (Tashakkori & Teddlie, 2010; Creswell & Plano Clark, 2018).

The mixed-methods design is explicitly derived from the integrative collaborative governance framework developed in Section II, ensuring coherence between theoretical constructs, empirical operationalisation, and analytical strategy. Quantitative analysis is employed to identify exploratory relational patterns among governance dimensions, while qualitative analysis provides contextual insight into how governance mechanisms are enacted, negotiated, and stabilised in practice. The study follows a convergent mixed-methods logic, with integration occurring at the interpretation stage rather than through the sequential dominance of one method over another (Creswell & Plano Clark, 2018).

B. Research context

The empirical context of this study is Indonesia, where agri-food supply chains are predominantly organised around small- and medium-scale enterprises (SMEs) operating within fragmented institutional environments. SMEs play a central role in production, processing, and distribution, yet face persistent constraints related to coordination capacity, institutional access, and compliance with sustainability standards.

Indonesia constitutes a theoretically relevant case for examining collaborative governance due to its institutional plurality, reliance on informal coordination mechanisms, and increasing policy emphasis on sustainability and digitalisation. In such settings, sustainability outcomes are shaped less by lead-firm authority and more by collective governance arrangements involving farmers, SMEs, cooperatives, and public institutions. The study therefore aims for analytical generalisation, generating insights transferable to other SME-dominated agri-food systems in emerging economies rather than statistical representativeness (Yin, 2018).

C. Data collection and sampling strategy

Primary data were collected through two complementary sources: a structured survey and semi-structured interviews. The survey targeted SME actors actively involved in agri-food supply chain coordination, including producers, processors, and intermediaries. Respondents were selected based on their engagement in inter-organisational coordination rather than firm size alone, ensuring alignment with the governance focus of the study.

Semi-structured interviews were conducted with cooperative leaders, institutional facilitators, and supply chain intermediaries occupying strategic governance positions. Purposeful sampling was used to capture actors involved in coordination, mediation, and rule-setting processes (Patton, 2015). Data collection continued until theoretical sufficiency was reached, indicated by convergence of governance-related themes across interviews (Guest et al., 2006).

D. Operationalisation of governance constructs

Governance constructs were operationalised in direct correspondence with the four dimensions of the integrative collaborative governance framework: relational governance, institutional facilitation, coordination processes, and technological enablers, alongside multidimensional sustainability outcomes. Each construct was measured using indicators designed to capture governance as both a structural pattern and a relational process (Flynn et al., 1990).

Survey items were adapted from established governance and supply chain literature and contextualised to SME-based agri-food systems. Qualitative interview protocols probed how governance dimensions are enacted in practice, including trust formation, institutional mediation, coordination routines, and control over digital tools.

Table 1: Construct operationalization

Construct	Quantitative Indicators (pattern-oriented)	Qualitative Probes	Theoretical & Empirical Anchoring
Relational Governance	Trust, frequency of interaction, information sharing, conflict resolution	"When you disagree with a buyer/supplier, who has the final say? Why?"	Dania et al. (2018) explicitly include Power and Stability alongside Trust—ensuring relationality is not romanticised.
Institutional Facilitation	Perceived support from government/cooperatives, access to training, clarity of regulations	"Has any institution ever helped you challenge an unfair price? How?"	Aligns with Cao & Tao (2025): institutions as active mediators, not neutral enablers.
Coordination Processes	Joint planning, shared quality standards, data exchange routines	"Who sets the quality criteria? Do you have a say?"	Moreno-Miranda & Dries (2024): coordination as the missing link between relational trust and ecological outcomes.
Technological Enablers	Use of e-commerce, traceability apps, digital record-keeping	"Who controls the data from your digital tools? Can you access it?"	Otter & Robinson (2024): technology as potential site of exclusion if governance is weak.
Sustainability Outcomes	Economic (income stability), Social (inclusion, voice), Environmental (waste reduction)	"Has your participation in this supply chain changed your sense of control over your future?"	Framed through multi-capital integration (Dammak et al., 2025): human, social, natural, financial.

Table 1 summarises the operationalisation of governance constructs, illustrating how each theoretical dimension is translated into complementary quantitative indicators and qualitative probes. This dual

operationalisation supports methodological triangulation and strengthens interpretive validity (Denzin, 2012).

E. Data analysis

Quantitative analysis

Quantitative data were analysed using PLS-based exploratory structural mapping, implemented via SmartPLS. This approach was selected for its suitability in exploratory and theory-building research, particularly where constructs are complex and relationships are examined for pattern identification rather than causal inference, and was used solely for pattern visualisation and construct coherence assessment (Hair et al., 2019).

The analysis focused on assessing construct coherence and directional alignment among governance dimensions. Model evaluation prioritised interpretability and stability rather than confirmatory fit metrics or hypothesis testing, and no statistical significance thresholds were interpreted substantively. Descriptive statistics and correlation diagnostics are reported in Appendix A for transparency.

The resulting sample size is appropriate for exploratory, pattern-oriented analysis rather than for confirmatory hypothesis testing, consistent with the study's theory-building and mixed-methods orientation.

Qualitative analysis

Qualitative interview data were analysed thematically using an iterative coding process. Initial coding was aligned with the four governance dimensions, followed by axial coding to examine interactions among governance mechanisms and their implications for sustainability outcomes (Saldaña, 2016). Particular attention was given to processual dynamics, power asymmetries, and institutional mediation.

F. Integration of quantitative and qualitative findings

Integration occurred at the interpretation stage, consistent with convergent mixed-methods designs (Creswell & Plano Clark, 2018). Exploratory quantitative patterns informed areas of analytical focus, while qualitative evidence explained how and why these patterns materialised in practice. Integration is explicitly operationalised through a joint display table presented in the Discussion section (Table 2).

G. Ethical considerations

All participants provided informed consent prior to participation. Confidentiality and anonymity were ensured throughout data collection and analysis, and the study adhered to ethical standards for social science research.

IV. FINDINGS: INTEGRATIVE COLLABORATIVE GOVERNANCE AS A POLITICAL–ECONOMIC PROCESS

The findings indicate that sustainability outcomes in Indonesia's SME-based agri-food supply chains do not stem from discrete technical interventions or isolated governance instruments. Rather, sustainability emerges through interacting dimensions of integrative collaborative governance, embedded within specific political–economic contexts. Consistent with the conceptual framework (Section II) and the analytical strategy outlined in the Methodology (Section III), sustainability is observed as an emergent outcome, shaped by the interaction among relational governance, institutional facilitation, coordination processes, and technological enablers, rather than as the direct result of any single dimension.

Across cases, the operation of these governance dimensions is conditioned by pre-existing power asymmetries, institutional legitimacy, and locally embedded norms of reciprocity and deference. Accordingly, the following subsections present findings for each governance dimension not as isolated variables, but as

interdependent governance mechanisms whose relevance depends on how they intersect within specific configurations.

A. *Relational governance: trust as social currency rather than decision-making power*

Relational governance was consistently observed as a foundational mechanism supporting coordination across the supply chains studied. Exploratory survey patterns indicate high levels of repeated interaction, information exchange, and expressed trust between SMEs and their primary trading partners. Qualitative evidence contextualises these patterns, indicating that long-term relationships reduced uncertainty and transaction-related anxiety, particularly under volatile market conditions.

“If I sell to someone I don’t know, I worry they’ll say my chili is too spicy or too dry. But with Pak Budi, we’ve worked together for ten years—he knows my farm, my process, my family.”

— Ibu Sari, micro-processor of sambal, Gresik

However, consistent with the power-sensitive operationalisation of relational governance specified in the Methodology, trust did not function as an equalising force. Instead, trust frequently operated as asymmetrical social currency, flowing upward from smaller actors toward intermediaries, cooperative boards, or local elites who controlled access to markets, certification pathways, or digital interfaces.

While relational ties stabilised exchange and reduced opportunism, they rarely translated into shared decision-making authority. SMEs commonly reported accepting pricing structures, quality standards, and data arrangements as “given,” expressing appreciation for relational stability while refraining from contestation. In the absence of countervailing governance mechanisms, relational governance tended to reproduce existing hierarchies rather than redistribute voice.

B. *Institutional facilitation: mediation, selectivity, and uneven inclusion*

Institutional facilitation emerged as a critical mediating mechanism shaping whether relational governance translated into broader sustainability-oriented practices. Where government agencies, cooperatives, or extension services acted as active institutional brokers—facilitating dialogue, mediating disputes, and supporting collective problem-solving—SMEs reported enhanced agency and reduced vulnerability.

“The district agriculture office didn’t just give us rules—they asked what we needed. When we said ‘help us talk to the market,’ they arranged a weekly meeting with retailers.”

— Pak Hendra, cooperative leader, Sidoarjo

Although exploratory survey patterns suggest generally positive perceptions of institutional support, qualitative analysis revealed substantial variation in access. Institutional facilitation was frequently filtered through informal networks of kinship, patronage, and political affiliation, resulting in uneven inclusion. SMEs located outside these networks described institutional programmes as selectively accessible and weakly responsive to their needs.

Importantly, effective institutional facilitation did not derive primarily from regulatory enforcement. Instead, its influence stemmed from brokering and stabilisation functions—creating neutral coordination spaces, collectively standardising expectations, and sustaining commitments over time.

C. *Coordination processes: translating relational trust into collective outcomes*

A central empirical finding concerns the role of coordination processes as the operational mechanism linking relational governance to sustainability-oriented outcomes. Exploratory quantitative patterns indicate that trust and interaction alone show only limited alignment with environmental and collective performance indicators. Qualitative evidence clarifies this pattern: sustainability-related practices materialised only where formalised coordination routines were present.

Supply chains characterised by regular joint planning, shared quality benchmarks, and collective data review reported:

- higher levels of organic waste reuse (e.g., collective composting of rice husks);
- reduced post-harvest losses through aligned harvesting schedules;
- pooled investment in shared infrastructure, such as cold storage facilities.

By contrast, trust-rich but coordination-poor arrangements generated largely individualised sustainability practices, disconnected from system-level change. These findings suggest that relational governance contributes to sustainability indirectly, through coordination-enabled collective action rather than through trust alone.

D. Technological enablers: amplification effects and digital gatekeeping

Digital tools—including messaging applications, e-marketplaces, and basic traceability systems—were widely adopted across cases. Exploratory quantitative patterns suggest a positive alignment between digital tool usage and income stability. However, qualitative findings reveal that these patterns were highly contingent on governance arrangements.

Interviews consistently highlighted practices of digital gatekeeping, whereby intermediaries or cooperative elites controlled access to platform accounts, data interpretation, and communication with buyers.

“I asked to see the online sales report, but the cooperative chair said, ‘Don’t worry, I’ll tell you if something’s wrong.’ I never saw the numbers.”

— Ibu Lina, dried fruit vendor, Surabaya outskirts

Rather than functioning as autonomous drivers of inclusion or transparency, digital tools often amplified existing relational and institutional hierarchies, particularly where digital literacy was uneven and governance safeguards were weak. Technology therefore acted less as an independent solution and more as a multiplier of prevailing power relations.

E. Sustainability outcomes as emergent and non-linear

Across cases, sustainability outcomes were observed as emergent, multidimensional, and non-linear, rather than additive. Economic stability, social inclusion, and environmental improvements were most pronounced where all four governance dimensions interacted synergistically.

Governance configurations characterised by strong technological adoption but weak institutional facilitation experienced rapid abandonment of digital tools. Trust-rich but coordination-poor arrangements remained oriented toward short-term survival strategies. Only configurations combining relational foundations, institutional brokering, structured coordination processes, and equitable technology use generated durable sustainability-oriented practices.

F. Exploratory structural representation of governance interactions

To enhance transparency regarding the exploratory quantitative analysis, Figure 2 presents a PLS-based exploratory structural map illustrating patterns of statistical alignment among governance dimensions and sustainability outcomes. Consistent with the study’s pragmatist and exploratory orientation, Figure 2 is not interpreted as a causal or confirmatory model. Rather, it serves as a descriptive visualisation of how governance dimensions are empirically connected at the construct level, complementing the qualitative process evidence reported in this section.

Interpretation of sustainability dynamics is therefore undertaken through integrative analysis, combining exploratory quantitative patterns (Figure 2) with qualitative explanations and joint interpretation (see Table 2), rather than through direct reading of structural paths or coefficients.

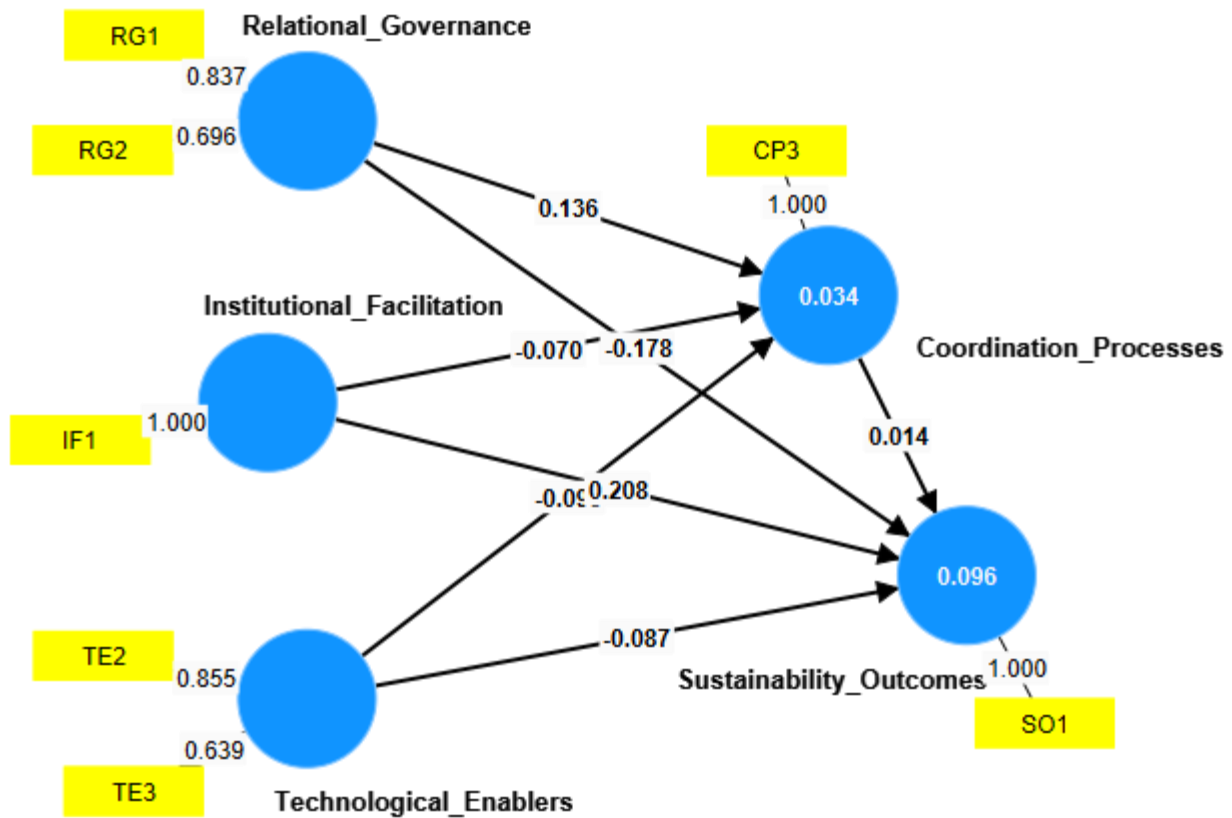


Figure 2: Exploratory PLS-based structural map of governance interactions

Presented for heuristic and transparency purposes only. The figure provides a non-causal visualisation of exploratory quantitative patterns at the construct level and is not interpreted as a confirmatory or explanatory model.

V. DISCUSSION: TOWARD A POLITICAL ECONOMY OF INTEGRATIVE COLLABORATIVE GOVERNANCE

This study advances development-oriented sustainability scholarship by demonstrating that sustainability in SME-based agri-food supply chains is best understood as a governance outcome, rather than as the product of firm-level compliance, technological optimisation, or isolated sustainability instruments. By tracing how relational governance, institutional facilitation, coordination processes, and technological enablers interact in practice, the findings directly address long-standing critiques of depoliticised sustainability narratives that abstract governance from power, context, and institutional mediation (Leach et al., 2018; Scoones et al., 2020).

Rather than operating as independent levers, these governance dimensions form configurational mechanisms whose implications are contingent on pre-existing power asymmetries and institutional legitimacy. This configurational perspective aligns with and extends critiques of partnership-based development interventions, which caution that collaboration without attention to power may stabilise inequality rather than transform it (Mosse, 2005; Leach et al., 2018; Hafer et al., 2022; Scoones et al., 2020). By grounding these debates empirically in SME-dominated agri-food systems, the study contributes a political-economic reading of collaborative governance rooted in Global South realities.

To integrate exploratory quantitative patterns with process-level qualitative evidence, Table 2 presents a joint display illustrating how governance dimensions interact to shape sustainability outcomes, consistent with the interactional logic depicted in Figure 1.

Table 2: Joint display of exploratory quantitative patterns and qualitative interpretations

Governance Dimension	Exploratory Quantitative Pattern (PLS-based, pattern-oriented)	Qualitative Interpretation (Process & Context)	Integrative Interpretation (Non-causal)
Relational Governance → Coordination Processes	Modest positive alignment; no dominant pattern	Trust and repeated interaction reduce uncertainty but operate within asymmetric power relations, often limiting SMEs' ability to influence collective decisions.	Relational governance provides social stability, but requires institutional and coordination mechanisms to translate trust into collective action.
Institutional Facilitation → Coordination Processes	Weak and inconsistent alignment	Institutional support varies widely; effective facilitation depends on mediation, brokerage, and inclusivity rather than formal authority alone.	Institutions function as context-dependent mediators, shaping how relational ties are mobilised rather than directly driving coordination.
Institutional Facilitation → Sustainability Outcomes	Weak alignment; non-linear pattern	Institutional interventions may enable sustainability when adaptive, but can impose burdens when selectively applied or poorly embedded.	Sustainability outcomes reflect how institutions mediate power and expectations, not the mere presence of institutional programmes.
Technological Enablers → Coordination Processes	Alignment weaker than expected	"The app shows sales data, but the cooperative chair decides what we see." (Ibu Lina)	Divergence indicates that weak quantitative alignment reflects qualitative realities of digital gatekeeping rather than measurement failure.
Technological Enablers → Sustainability Outcomes	Very weak alignment	Digital adoption alone does not address environmental or social challenges without complementary governance safeguards.	Technological tools contribute to sustainability only when embedded in supportive relational and institutional configurations.
Coordination Processes → Sustainability Outcomes	Minimal direct alignment	Coordination improves operational alignment but does not automatically resolve sustainability challenges without broader governance support.	Sustainability emerges from configurational governance effects, not from coordination intensity alone.

Table 2 integrates exploratory quantitative patterns with qualitative process evidence, illustrating how governance dimensions interact in non-linear, context-dependent, and non-causal ways.

A. Sustainability as a governance outcome rather than a technical fix

The findings support a shift from viewing sustainability as a technical achievement to understanding it as a political–institutional accomplishment. While agri-food sustainability initiatives are often framed around standards, certifications, or digital tools, the evidence suggests that such instruments become meaningful only when embedded within governance arrangements capable of mediating interests, coordinating collective action, and stabilising shared expectations.

This interpretation resonates with development scholarship that conceptualises governance not as a neutral coordination apparatus but as a site of negotiation and power (Cleaver, 2012). Where institutional mediation is weak or fragmented, sustainability practices tend to remain partial, symbolic, or unevenly distributed, particularly in SME-based systems characterised by asymmetric market relations. Sustainability therefore appears less as the outcome of tool adoption per se than as the result of governance systems' capacity to organise collective discipline over time.

B. Trust, power, and the limits of relational governance

Consistent with the exploratory findings, relational governance emerges as a foundational yet insufficient governance dimension. Trust facilitates repeated interaction and reduces transactional uncertainty, but it rarely translates into shared decision-making authority. This pattern reflects the “power–trust paradox” identified by Dania et al. (2018), whereby collaboration may deepen relational dependence while leaving structural asymmetries intact.

From a development perspective, these observations underscore the limits of approaches that romanticise social capital or community embeddedness. As Cleaver (2012) notes, trust can normalise inequality when actors lack institutional means to contest unfavourable arrangements. In the cases examined, relational governance contributed to exchange stability but required institutional facilitation and coordination processes to acquire transformative potential rather than merely stabilising existing hierarchies.

C. Institutional facilitation as mediation and redistribution of voice

Institutional facilitation appears as a critical mediating condition shaping whether collaborative governance arrangements reproduce or rebalance power. The findings indicate that institutions matter less through coercive authority than through mediation functions—brokering dialogue, standardising expectations, and protecting weaker actors from extractive practices.

This reading aligns with collaborative governance scholarship emphasising institutions' role in structuring participation and redistributing voice (Ansell & Gash, 2008; Trienekens et al., 2012), as well as with arguments that sustainability emerges through coordinated discipline across public and non-state actors (Cao & Tao, 2025). Where facilitation was selective or embedded in patronage networks, collaborative arrangements became largely performative. Where facilitation was adaptive and locally embedded, it supported collective capacity and enhanced SME agency. These findings challenge neoliberal assumptions that reduced state involvement necessarily enhances efficiency, instead supporting a developmental governance perspective in which the state functions as an enabler of collective action.

D. Coordination processes as the operational core of sustainability

One of the study's most generative insights concerns the role of coordination processes as the operational core of integrative governance. The exploratory structural patterns indicate that relational governance alone shows only limited alignment with sustainability-related outcomes. Qualitative evidence clarifies this pattern: ecological and resource-efficiency practices become visible primarily where trust is channelled through formalised coordination routines, such as joint planning, shared standards, and collective monitoring.

This interpretation corroborates and extends Moreno-Miranda and Dries's (2024) argument that coordination mediates the relationship between relational governance and ecological performance. It also resonates with collective action theory, which emphasises rule-making, monitoring, and enforcement over voluntary cooperation alone (Ostrom, 1990; Poteete et al., 2010). By empirically positioning coordination as the bridge between goodwill and system-level outcomes, the study moves beyond abstract partnership narratives toward a practice-oriented understanding of sustainability governance.

E. Digitalisation as a governance amplifier rather than an equaliser

The analysis of technological enablers further cautions against techno-solutionist narratives in development policy. While digital tools were associated with income stability and market access, the qualitative evidence indicates that these patterns are highly contingent on governance arrangements. Rather than democratising transparency or participation, digitalisation frequently amplified existing hierarchies through practices of data control and digital gatekeeping.

This finding aligns with critical digital development scholarship that rejects assumptions of technological neutrality (Heeks, 2017; Birch & Bronson, 2022; Puhakainen & Väyrynen, 2021), as well as with observations that intermediaries may strategically restrict transparency to preserve informational advantage (Otter & Robinson, 2024). In contexts characterised by uneven digital literacy and weak institutional safeguards, digital tools thus function less as instruments of empowerment than as conditional amplifiers of prevailing power relations.

F. Implications for development theory and governance design

Taken together, the findings support a political–economy-informed framework of integrative collaborative governance grounded in Global South contexts. Rather than proposing a universal governance model, the framework foregrounds:

- relational governance as socially embedded but politically contingent,
- institutions as mediators of asymmetry rather than neutral enablers;
- coordination processes as the operational link between trust and collective outcomes;
- technology as a conditional amplifier rather than a universal driver.

This contribution responds to calls to decolonise sustainability thinking by centring context, contestation, and endogenous governance pathways (Escobar, 2018; Vásquez Neyra et al., 2025). For policy and practice, the findings caution against interventions that prioritise platforms, certifications, or partnerships without parallel investment in institutional mediation and coordination capacity. Effective governance design must therefore move beyond inclusion rhetoric toward structural redress, recognising informal power relations, data sovereignty, and the need for durable collective decision-making infrastructures.

VI. CONCLUSION AND IMPLICATIONS

A. Theoretical contribution: toward a power-sensitive theory of integrative collaborative governance

This study reframes sustainability in SME-based agri-food supply chains (AFSCs) not as a technical or firm-level achievement, but as a collective, emergent, and politically mediated governance outcome. By empirically examining how relational governance, institutional facilitation, coordination processes, and technological enablers interact in practice, the study advances an integrative collaborative governance framework grounded in the political–economic realities of the Global South.

Crucially, the findings challenge depoliticised notions of “collaboration” by demonstrating that trust does not automatically translate into equity, and that digital tools do not inherently guarantee inclusion. Sustainability-oriented practices become more durable only where power asymmetries are actively mediated through institutional brokering, participatory rule-setting, and governance arrangements that protect voice and data access. This insight aligns with Dania et al. (2018), who argue that power must be analysed alongside trust, and with Otter and Robinson (2024), who show how intermediaries may strategically restrict digital transparency to preserve control.

By positioning coordination processes as the operational link through which relational trust is translated into collective and ecological practices, the study extends recent governance scholarship (e.g., Moreno-Miranda & Dries, 2024). More broadly, it shifts analytical attention from who collaborates to how

collaboration is organised, mediated, and sustained. In doing so, the study contributes a practice-oriented and power-sensitive theory of collaborative governance, offering a Southern epistemological perspective that centres context, contestation, and collective agency over template-based sustainability solutions.

B. Policy implications: from techno-solutionism to governance-first design

For policymakers in Indonesia and comparable emerging economies, the findings point to the need for a governance-first approach to sustainability interventions, rather than technology-led or firm-centric strategies. Sustainability-oriented tools and standards appear most meaningful when preceded by investment in collective governance capacity.

First, institutional facilitation should be reconceptualised as active mediation rather than passive support. Local governments, cooperatives, and extension services can play a critical role by:

- convening multi-stakeholder forums with credible decision-making authority;
- establishing participatory pricing and quality-setting mechanisms that include SME representation;
- supporting SME-led monitoring arrangements to oversee platform governance, data access, and dispute resolution.

Second, digitalisation policies should be conditional on governance readiness. As illustrated by Cao and Tao's (2025) analysis of technology-enabled oversight, digital tools function more effectively when embedded within clear accountability structures, shared enforcement costs, and incentive-compatible designs. In the Indonesian context, this implies prioritising public or cooperative digital platforms that safeguard producer data ownership and incorporate transparent grievance mechanisms, rather than relying exclusively on proprietary private applications.

Third, coordination infrastructure should be treated as a public good. Joint planning routines, shared storage facilities, and collective waste-management systems constitute core sustainability infrastructure rather than auxiliary support. Public investment strategies should therefore prioritise these collective arrangements over isolated training or certification initiatives that fail to institutionalise learning into sustained collective action.

C. Managerial implications: collaboration as strategic practice, not courtesy

For SME managers and cooperative leaders, the findings underscore that sustainability is neither an individual endeavour nor a matter of goodwill alone, but a strategic collective practice. While relational trust remains important, it requires complementary governance arrangements to translate into shared benefits.

In practical terms, this entails:

- formalising coordination routines through regular joint planning, shared performance indicators, and collective risk-sharing mechanisms;
- engaging critically with institutional actors by scrutinising who sets standards, who controls data, and how disputes are mediated;
- adopting digital tools selectively, ensuring that technology reinforces—rather than substitutes for—relational and institutional foundations.

As one participant observed, *"You cannot trace your way to fairness."* Technology may enhance visibility, but governance ultimately shapes how value, risk, and benefits are distributed across the supply chain.

D. Limitations and future research: toward a comparative political economy of afsc governance

This study is situated within Indonesia's peri-urban agri-food clusters, characterised by high SME density, institutional hybridity, and informal coordination practices. While the proposed framework offers analytical generalisability, future research should examine its applicability across diverse Global South contexts, including:

- peripheral regions with severe infrastructure constraints (e.g., eastern Indonesia);
- non-agricultural MSME sectors with distinct labour regimes;
- transnational supply chains where global lead firms intersect with local governance arrangements.

The cross-sectional design also limits causal inference. Future studies employing longitudinal, comparative, or ethnographic approaches could illuminate how governance configurations evolve over time, particularly under conditions of disruption such as climate shocks or market volatility, and whether such shifts mitigate or entrench power asymmetries.

Finally, the study invites scholars to engage more explicitly with critical political economy perspectives, including labour relations, structural exploitation, and Southern epistemologies, to interrogate not only how collaboration functions, but whose interests it ultimately serves.

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APPENDIX

Appendix A: Descriptive statistics and correlation matrix

Table A1: Descriptive Statistics and Correlations among Key Constructs

Construct	Mean	SD	1	2	3	4	5
1. Relational Governance	—	—	1.00	—	—	—	—
2. Institutional Facilitation	—	—	—	1.00	—	—	—
3. Coordination Processes	—	—	—	—	1.00	—	—
4. Technological Enablers	—	—	—	—	—	1.00	—
5. Sustainability Outcomes	—	—	—	—	—	—	1.00

Notes:

Values represent construct-level correlations used for descriptive and diagnostic purposes only.

Construct-level means and standard deviations are intentionally omitted because the quantitative analysis is employed solely for exploratory pattern identification and construct coherence assessment, rather than for descriptive profiling, hypothesis testing, or inferential comparison.

Sustainability outcomes comprise economic, social, and environmental dimensions and are modelled as a higher-order latent construct for analytical integration. Correlation coefficients are not interpreted as causal effects and do not substitute for the exploratory pattern analysis conducted using PLS-based structural mapping. Interpretation of relationships is undertaken exclusively through integrated quantitative–qualitative analysis presented in the Results and Discussion sections.

Appendix B. Operationalisation of integrative collaborative governance constructs

Table B1: Governance Constructs and Indicators

Governance Dimension	Analytical Definition	Illustrative Quantitative Indicators (Survey)	Illustrative Qualitative Probes (Interviews)
Relational Governance	Socially embedded coordination based on trust, repeated interaction, and informal norms	Frequency of interaction; perceived trustworthiness of trading partners; willingness to share information	How are trading relationships initiated and sustained? When does trust reduce risk—and when does it constrain voice?
Institutional Facilitation	Mediation and brokering by public or collective actors to stabilise expectations and redistribute voice	Perceived accessibility of government/cooperative support; fairness of dispute resolution	Who mediates conflicts? How inclusive are institutional programmes and decision spaces?
Coordination Processes	Formalised routines that translate relational ties into collective action	Presence of joint planning; shared standards; collective monitoring practices	How are decisions coordinated across actors? What routines enable collective outcomes?
Technological Enablers	Digital tools embedded within governance arrangements	Use of digital platforms; access to data dashboards; perceived transparency	Who controls digital tools and data? How does technology reshape coordination and power?
Sustainability Outcomes	Economic, social, and environmental improvements emerging from governance configurations	Income stability; waste reduction practices; perceived inclusion	What changes are experienced over time? Who benefits and who bears risk?

Note: Quantitative indicators were used to examine directional associations among governance dimensions, while qualitative probes captured processual and relational dynamics. The study does not claim causal inference. The operationalisation reflects a process-oriented and power-sensitive understanding of governance. Indicators are not treated as interchangeable proxies, but as complementary signals used to identify exploratory patterns rather than to test confirmatory causal hypotheses.

Appendix C: Survey instrument

This appendix provides an abridged version of the survey instrument used to collect quantitative data from SME actors in agri-food supply chains. Items were measured using a five-point Likert scale (1 = strongly disagree; 5 = strongly agree), unless otherwise specified.

Section C1. Relational Governance

- I have long-term trading relationships with my main buyers/suppliers.
- I trust my trading partners to treat me fairly.
- Information is openly shared within my supply chain relationships.

Section C2. Institutional Facilitation

- Government or cooperative institutions are accessible when problems arise.
- Institutional actors help mediate disputes fairly.
- Support programmes respond to the needs of SMEs like mine.

Section C3. Coordination Processes

- There are regular meetings or forums for joint planning.
- Quality standards are discussed and agreed collectively.
- Coordination helps reduce waste and inefficiencies.

Section C4. Technological Enablers

- Digital tools help me access market information.
- I can view or verify data related to prices, sales, or traceability.
- Digital platforms increase transparency in transactions.

Section C5. Sustainability Outcomes

- My business income is more stable than before.
- Our supply chain has reduced waste or resource use.
- I feel included in decision-making processes.

Note: The full survey instrument is available from the authors upon reasonable request.

Appendix D. Interview protocol (summary guide)

Semi-structured interviews were conducted to explore governance mechanisms and power dynamics not fully captured through survey data. Interviews lasted between 45–75 minutes and followed a flexible guide organised around thematic domains.

Section D1. Relational Dynamics

- How did your current trading relationships develop?
- When does trust help cooperation? When does it limit your ability to negotiate?

Section D2. Institutional Mediation

- Which institutions are involved in your supply chain?

- How are conflicts resolved, and who plays a mediating role?

Section D3. Coordination Practices

- How are decisions coordinated across actors?
- Are there routines for joint planning or shared standards?

Section D4. Digitalisation and Power

- What digital tools are used in your supply chain?
- Who controls access to data and platforms?
- Have digital tools changed power relations?

Section D5. Sustainability and Change

- What sustainability-related changes have you observed?
- Who benefits most from these changes, and who bears the costs?

Raziskovanje integriranega sodelovalnega upravljanja v agroživilskih oskrbovalnih verigah, ki temeljijo na malih in srednje velikih podjetjih: ugotovitve raziskave mešanih metod v Indoneziji

Izvleček – Izzivi trajnosti v kmetijsko-živilskih oskrbovalnih verigah so še posebej izraziti v gospodarstvih v razvoju, v katerih prevladujejo mala in srednje velika podjetja, ki delujejo v razdrobljenih, institucionalno heterogenih in izrazito asimetričnih okoljih. Prevladujoči pristopi k trajnosti – od režimov skladnosti, osredotočenih na podjetja, do tehnološko usmerjenih modelov digitalizacije – v takšnih kontekstih pogosto izkazujejo omejeno pojasnjevalno moč, saj trajnost obravnavajo predvsem kot tehnično ali organizacijsko vprašanje, ne pa kot rezultat kompleksnih upravljavskih in politično-ekonomskih dinamik. V raziskavi je predstavljena perspektiva integriranega kolaborativnega upravljanja, s pomočjo katere avtorji preučujejo, kako trajnost ne izhaja iz izoliranih tehničnih ali organizacijskih intervencij, temveč iz medsebojnega prepletanja relacijskega upravljanja, institucionalnega posredovanja, koordinacijskih procesov in tehnološkega razvoja. Raziskava temelji na pragmatičnem metodološkem pristopu mešanih metod ter združuje podatke ankete, izvedene med 120 akterji malih in srednje velikih podjetij, in 32 pol strukturiranih intervjujev, opravljenih v agroživilskih grozdih na obmestnih območjih Vzhodne Jave v Indoneziji. Rezultati raziskave kažejo, da so trajnostni učinki – gospodarski, socialni in okoljski – kolektivne, nastajajoče in politično posredovane narave ter ne predstavljajo neposredne posledice posameznega mehanizma upravljanja. Zaupanje sicer predstavlja ključno družbeno podlago za sodelovanje, vendar se je izkazalo, da lahko v odsotnosti institucionalnega posredovanja in strukturiranih mehanizmov koordinacije utrjuje asimetrične odnose odvisnosti, namesto da bi omogočalo transformativne učinke. Koordinacijski procesi se tako kažejo kot osrednji operativni mehanizem, prek katerega postane integracija upravljanja dejansko izvedljiva. Digitalne tehnologije pri tem ne delujejo kot avtonomni nosilci trajnosti, temveč kot ojačevalci obstoječih upravljavskih struktur, ki lahko bodisi krepijo vključujoče oblike sodelovanja bodisi reproducirajo izključujoče prakse, odvisno od načinov urejanja dostopa do podatkov, odgovornosti in odločanja. S poudarjanjem pomena interakcij, razmerij moči in konteksta, raziskava prispeva k razvoju epistemologije trajnostnega upravljanja, ki presega depolitizirane in tehnološko deterministične modele preobrazbe agroživilskega sektorja. Ugotovitve raziskave obenem ponujajo pomembne praktične implikacije za oblikovalce politik in strokovnjake, ki si prizadevajo za razvoj vključujočih, odpornih in kontekstualno prilagojenih modelov upravljanja kmetijsko-živilskih oskrbovalnih verig v državah globalnega juga.

Ključne besede – tržna usmerjenost, učinkovitost dobavnih verig, digitalna pripravljenost, trajnost