
People-Centred Innovation for Sustainable Agroforestry Value Chains in the Amazon

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Abstract: Sustainability-oriented innovation (SOI) in frontier regions is hindered by weak institutions, fragmented value-chain infrastructures, and limited technical and financial resources. This paper examines how people-centred innovation (PCI) contributes to the development of sustainable agroforestry value chains in an Amazonian context where non-state actors play a central orchestration role. Drawing on an exploratory qualitative case study of an emerging agroforestry coffee initiative, the research analyses how lived experience, iterative adaptation, and knowledge co-production shape value chain formation under conditions of institutional fragility. Preliminary findings indicate that while the agroforestry model was externally introduced, its viability depends on continuous producer engagement, adaptive design, and substitute coordination mechanisms that stabilise participation. The study highlights how PCI operates as an enabling mechanism for SOI by supporting context-appropriate solutions, while remaining constrained by land-tenure insecurity, logistical bottlenecks, and reliance on external orchestration. As a research-in-progress contribution, the paper invites feedback on ecosystem governance dynamics.

Keywords: Innovation; sustainability-oriented innovation; people-centred innovation; value chains; orchestration; agroforestry; Amazon region; sustainability governance.

1 Introduction

Sustainability-oriented innovation (SOI) has become a central concern within innovation management scholarship as societies confront climate change, biodiversity loss, and persistent inequalities (Adams et al., 2016; Schot and Steinmueller, 2018). Moving beyond firm centric innovation, this literature increasingly emphasises systemic change and the integration of social, environmental, and economic objectives (Boons et al., 2013). However, much of this work implicitly assumes relatively stable institutions, functional markets, and public governance structures capable of supporting innovation and coordination. These assumptions are frequently transgressed in frontier regions of the Global South, where sustainability challenges are most critical.

In tropical forest regions such as the Amazon, transitions from extractive land use models towards regenerative agroforestry systems represent a promising pathway for combining ecological restoration with livelihood generation (Prado and Motta, 2025). Yet the development of viable value chains for forest compatible agrifood products remains deeply constrained by weak or fragmented institutions, limited state capacity, infrastructural deficits, and land tenure insecurity. Research on institutional voids and emerging markets shows that under such conditions, market formation and coordination cannot be assumed and often depend on non-standard organisational arrangements and intermediary actors (Khanna and Palepu, 2010; Mair et al., 2012; Marquis and Raynard, 2015). These dynamics challenge conventional innovation and value chain models that assume clearly defined governance roles and regulatory frameworks.

Several overlapping literatures offer partial insights into how innovation unfolds under such constraints. People-centred and human-centred design research highlights the importance of grounding innovation in lived experience, local knowledge, and inclusive participation, particularly where standardised solutions are ill suited (Brown and Wyatt, 2010; Manzini, 2015; van der Bijl Brouwer and Dorst, 2017). Innovation ecosystem scholarship, in turn, emphasises coordination among heterogeneous actors, distributed governance, and the role of orchestrators in aligning resources and capabilities in complex settings (Altman et al., 2022; Dhanaraj and Parkhe, 2006; Gomes et al., 2023).

However, these bodies of work are rarely brought together to explain how SOI can be operationalised in institutionally fragile contexts. While SOI provides normative directionality for transformative change, it offers less clarity on how such change can be implemented where regulatory frameworks, market incentives, and public coordination are weak or unreliable. Under these conditions, innovation requires approaches capable of translating sustainability ambitions into workable practices grounded in local realities.

This paper argues that people-centred innovation (PCI) plays a critical enabling role in this translation. Rather than constituting a parallel design tradition, PCI functions as a mechanism through which SOI becomes viable under institutional fragility. By enabling iterative adaptation, local capability building, and legitimacy creation, PCI helps compensate for institutional absences and supports sustained participation in emergent value chains.

Despite growing interest in inclusive and ecosystem-based innovation, innovation management research has yet to adequately explain how PCI contributes to sustainable value chain formation beyond local adaptation, particularly when non-state actors such as non-governmental organisations (NGOs) or hybrid organisations assume central orchestration roles. This paper addresses this gap by conceptualising PCI as a mechanism for sustainable value chain formation under institutional fragility. Drawing on an

exploratory case study of an agroforestry coffee initiative in the Brazilian Amazon, it examines how iterative design practices grounded in producers lived realities interact with ecosystem coordination to stabilise a forest compatible value chain. Specifically, it asks: *How does people-centred innovation enable sustainable value chain formation in frontier contexts where formal institutions and markets are weak?*

2 Theoretical background

Sustainability-oriented innovation (SOI) and institutional fragility

SOI refers to innovation processes that integrate environmental and social objectives alongside economic value creation (Adams et al., 2016). Recent work emphasises systemic change and sustainability transitions rather than firm level eco-efficiency (Boons et al., 2013; Schot and Steinmueller, 2018). However, much of this literature implicitly assumes stable institutional environments, supportive regulation, and functioning markets.

In frontier regions of the Global South, innovation instead unfolds under conditions of institutional fragility, characterised by weak property rights enforcement, fragmented regulation, and limited state capacity (Khanna and Palepu, 2010; Mair et al., 2012). Under such conditions, markets are incomplete and coordination mechanisms underdeveloped, shaping both the feasibility of SOI and the forms of organisation through which it is pursued (Marquis and Raynard, 2015).

People-centred innovation (PCI) as a mechanism

PCI builds on human centred design and inclusive innovation traditions that foreground lived experience, contextual knowledge, and participatory problem solving (Brown and Wyatt, 2010; Manzini, 2015). Beyond design outcomes, PCI can be understood as a process level mechanism that enables learning, adaptation, and capability building among actors. Human centred approaches gain strategic relevance when they support organisational and system level learning rather than isolated artefacts (van der Bijl Brouwer and Dorst, 2017).

Under institutional fragility, PCI becomes particularly relevant by fostering trust, legitimacy, and sustained engagement – necessary conditions for collective action where formal institutions are weak. However, its role in enabling value chain formation has received limited attention in innovation management research.

Ecosystems and value chains

Innovation ecosystem research highlights orchestration among interdependent actors rather than hierarchical control (Dhanaraj and Parkhe, 2006). In sustainability contexts, NGOs and hybrid organisations frequently assume orchestration roles, mobilising resources, aligning actors, and compensating for institutional gaps (Altman et al., 2022; Gomes et al., 2023).

From a value chain perspective, sustainable value chain formation in frontier regions is not an endogenous market outcome but a socially constructed process. Coordination

devices such as certification and guaranteed purchasing function as stabilising mechanisms rather than efficiency tools (Gereffi et al., 2005; Heron et al., 2018; Ponte and Sturgeon, 2014; Trienekens, 2011). This paper conceptualises sustainable value chain formation as an outcome of PCI operating within orchestrated ecosystems under institutional fragility.

3 Research design

The study adopts a qualitative, exploratory research design based on a single in depth case study of a pioneering agroforestry coffee initiative located in a remote Amazonian municipality in Brazil. The case was selected due to its explicit sustainability orientation, its operation in a frontier context characterised by weak institutions, and its involvement of a non-state actor with a central orchestration role.

Data collection consists of semi structured interviews with key stakeholder groups, including agroforestry producers, technical staff, organisational leaders, commercial managers, and external partners such as impact investors. In total, nine interviews were conducted between October 2025 and January 2026, with an average of sixty minutes length. Documentary analysis of project reports, market materials, policy documents, and value chain descriptions complements the interview data. Data analysis follows an iterative thematic approach, combining inductive coding with sensitising concepts derived from the literature on PCI and sustainable value chains. Data collection is complete, and analysis is ongoing; findings presented here reflect a preliminary analytical synthesis.

4 Findings

People-centred innovation (PCI) as adaptive capability-building

Findings indicate that PCI operates as an adaptive mechanism that enables agroforestry practices to become viable under local socio-economic and ecological conditions. Although the agroforestry coffee model was initially introduced by an external technical organisation, its implementation evolved through iterative adaptation informed by producers lived experiences. Farmers contribute actively to decisions concerning species mixes, spatial arrangements, and management practices, particularly in response to constraints such as labour availability, household income needs, and local environmental conditions. The use of rapid-cycle intercrops during the early years of coffee establishment illustrates how design choices are shaped by producers' short-term livelihood imperatives rather than abstract technical optimality.

These adaptations emerge through informal PCI practices such as field demonstrations, responsive technical visits, and peer to peer exchanges, which support learning and capability building over time. Participation remains uneven across producers, highlighting both the enabling and constraining features of PCI under resource constraints.

Institutional fragility and the need for substitute coordination mechanisms

Institutional fragility strongly conditions the innovation process and the form that value-chain coordination takes. Land-tenure insecurity restricts producers' access to public programmes and carbon markets, reducing incentives for long-term agroforestry investment and limiting avenues for institutional support. Infrastructural remoteness increases production and transaction costs, undermining the feasibility of spot-market coordination and creating high levels of income volatility.

In response to these structural constraints, the initiative relies on substitute coordination mechanisms that compensate for absent or ineffective institutions. These include guaranteed purchasing arrangements that reduce market risk for producers, participatory organic certification that supports market differentiation and legitimacy, and local processing partnerships that partially mitigate logistical challenges. Such mechanisms are not simply managerial choices but necessary adaptations to institutional fragility.

From people-centred innovation (PCI) to value chain formation

PCI acts as a linking mechanism between design adaptation and value chain formation. By grounding innovation in producers' realities, the initiative builds agricultural and organisational capabilities, enhances legitimacy among participants, and supports sustained engagement. These effects enable the implementation of coordination devices, such as certification and purchasing guarantees, that stabilise participation under volatility.

Early evidence suggests improvements in soil conditions, biodiversity recovery, and household income. However, these outcomes should be interpreted as perceived and indicative rather than measured impacts. The value chain remains dependent on external orchestration, continued financial support, and further development of local collective capacity.

5 Discussion

This study advances an explanation of how sustainable agroforestry value chains can emerge under institutional fragility by theorising PCI as a central enabling mechanism. Rather than treating people-centred practices as an ethical or normative design approach, the findings suggest that such practices perform a specific functional role in contexts where formal institutions and market infrastructures are weak or unreliable. In this case, PCI supports value chain formation by fostering adaptive capability-building, relational alignment, and legitimacy among participants.

Under conditions of institutional fragility characterised by land tenure insecurity, limited state capacity, and infrastructural constraints, innovation actors cannot rely on formal rules or market signals to stabilise participation. Instead, innovation unfolds through iterative problem solving anchored in lived experience. PCI enables producers to adapt agroforestry practices to livelihood constraints, while simultaneously building agricultural and organisational capabilities that support sustained engagement in the value chain.

PCI also facilitates relational alignment by embedding innovation in trust-based interactions, informal learning, and responsive support, generating legitimacy where institutional credibility is weak. In this sense, PCI functions as a pre-coordination mechanism that enables governance devices such as certification or guaranteed purchasing to operate effectively rather than replacing them.

The findings also contribute to ecosystem scholarship by illustrating how orchestration operates differently under institutional fragility. Rather than optimising complementarity or efficiency, orchestration in this context focuses on maintaining participation, buffering risk, and compensating for institutional absence. Non-state actors play a central role in translating between producers' realities, market requirements, and sustainability standards. However, the effectiveness of this orchestration depends on people-centred processes that continuously adapt innovation to local conditions. Ecosystem coordination, therefore, does not substitute for PCI but builds upon it.

From a value chain perspective, the study highlights that sustainable value chain formation in frontier regions is not an endogenous outcome of market dynamics but a socially constructed process. Governance mechanisms such as participatory certification and guaranteed purchasing emerge not as efficiency-seeking solutions but as stabilising devices that reduce uncertainty and enable learning. PCI thus operates as the connective tissue linking micro-level design practices to meso-level coordination arrangements.

Importantly, the findings also highlight the limits of PCI as a mechanism. While it enables adaptation and early stabilisation, the sustainability of the value chain remains contingent on continued external orchestration, access to patient capital, and the gradual strengthening of local collective organisation. This suggests that PCI is most effective when understood as an enabling process that lowers barriers to participation and coordination, rather than as a complete substitute for institutional development.

Furthermore, this research contributes to SOI theory by showing how PCI functions not only as a design philosophy but as a mechanism that enables sustainable value chain formation under institutional fragility. By foregrounding this mechanism, the study challenges ecosystem and value chain frameworks that implicitly assume institutional stability, and it opens space for more context-sensitive theorisation of innovation in frontier regions.

6 Areas for feedback & development

As a piece of research-in-progress contribution, the paper seeks feedback and guidance on both conceptual refinement and ongoing analytical development. First, feedback is invited on how the conceptualisation of PCI as a mechanism for sustainable value chain formation can be further enhanced to strengthen its theoretical contribution to innovation management scholarship. Second, the authors welcome suggestions on how institutional fragility can be more systematically operationalised and compared across contexts in order to enhance analytical clarity and future generalisability. Third, feedback is sought on how the preliminary findings can be consolidated into a coherent process model suitable for subsequent journal submission.

In terms of further development, the study will extend its analysis of institutional conditions by incorporating a systematic review of relevant policy and governance documents, including national and sub national agroecology policies (e.g. PNAPO), climate and forest governance instruments (e.g. REDD+), and local institutional

arrangements. This policy analysis will be used to strengthen the discussion of institutional fragility, clarify the governance landscape within which the case unfolds, and more explicitly link people-centred practices to prevailing and evolving policy frameworks. Integrating this dimension will support a more robust theorisation of how non-state actors navigate, complement, or compensate for institutional arrangements in SOI processes.

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