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Strategic participatory model for a specialty coffee (*Coffea arabica* L.) cluster in Chinchiná, Caldas, Colombia

Modelo estratégico participativo del clúster de cafés especiales (*Coffea arabica* L.) en Chinchiná, Caldas, Colombia

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ABSTRACT

Global demand for specialty coffees (*Coffea arabica* L.) with origin identity, traceability, and sustainability attributes offers an opportunity for producing territories to improve value capture at origin. This applied research designed a strategic participatory model for a specialty coffee cluster in Chinchiná, Caldas, Colombia. A mixed qualitative and descriptive approach was used, including documentary review, 25 semi-structured interviews with value chain actors, SWOT analysis, social mapping, and the logical framework approach. In addition, a structured survey of 290 actors established baseline evidence on upgrading readiness and collective-action feasibility: 83.1% reported no certification, 17.6% reported current involvement in specialty coffee, 61.7% expressed interest in joining the initiative, and 56.6% were willing to receive training on Good Agricultural Practices. Based on these findings, the model proposes a participatory governance architecture and a phased upgrading pathway (protocols, traceability, and progressive certification) linked to commercialization mechanisms oriented to premium markets. Under an optimistic scenario contingent on governance consolidation, protocol compliance, and premium market access, annual green coffee export targets increase from 50 t (Year 1) to 70 t (Year 2) and 90 t (Year 3), together with a projected 50% income increase and 80% integration of strategic actors. These targets are conditional strategic objectives rather than deterministic forecasts.

Palabras clave:
Sostenibilidad agrícola
Desarrollo agroindustrial
Comercio internacional
Gobernanza participativa
Desarrollo rural
Integración de la cadena de valor

RESUMEN

La demanda mundial de cafés especiales (*Coffea arabica* L.) con identidad de origen, trazabilidad y atributos de sostenibilidad ofrece una oportunidad para que territorios productores mejoren la captura de valor en origen. Esta investigación aplicada diseñó un modelo estratégico participativo para un clúster de cafés especiales en Chinchiná, Caldas, Colombia. Se utilizó un enfoque mixto cualitativo y descriptivo que incluyó revisión documental, 25 entrevistas semiestructuradas con actores de la cadena de valor, análisis DOFA, cartografía social y el enfoque de marco lógico. Adicionalmente, una encuesta estructurada a 290 actores estableció evidencia de línea base sobre alistamiento para el mejoramiento y factibilidad de acción colectiva: 83,1% reportó no contar con certificación, 17,6% reportó vinculación actual con cafés especiales, 61,7% expresó interés en integrarse a la iniciativa y 56,6% manifestó disposición a capacitarse en Buenas Prácticas Agrícolas. Con base en estos hallazgos, el modelo propone una arquitectura de gobernanza participativa y una ruta escalonada de mejoramiento (protocolos, trazabilidad y certificación progresiva), articulada con mecanismos de comercialización orientados a mercados premium. Bajo un escenario optimista condicionado a la consolidación de la gobernanza, el cumplimiento de protocolos y el acceso a mercados premium, las metas anuales de exportación de café verde aumentan de 50 t (Año 1) a 70 t (Año 2) y 90 t (Año 3), junto con un incremento proyectado del 50% en el ingreso y la integración del 80% de actores estratégicos. Estas metas corresponden a objetivos estratégicos condicionados y no a pronósticos deterministas.

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Coffee (*Coffea arabica* L.) is one of Colombia's main agricultural export products and constitutes the economic and sociocultural foundation of numerous rural territories. In particular, the municipality of Chinchiná, located in the department of Caldas, has historically played a leading role in national coffee production due to favorable agroecological conditions and a production culture based on selective harvesting and controlled post-harvest practices (FAO 2012). However, coffee growers in this territory continue to face persistent structural constraints, including international price volatility, weak producer organization, limited value addition at origin, and restricted access to market-related capabilities, reducing their capacity to compete in differentiated segments (Panhuysen and Pierrot 2023; Rodríguez and Correa 2022).

In parallel, specialty coffee markets increasingly reward differentiation based on sensory quality, traceability, and sustainability attributes. Capturing these premiums requires coordinated upgrading, including standardized protocols, post-harvest consistency, and credible verification mechanisms (Teuber and Herrmann 2012; Panhuysen and Pierrot 2023; Laukaleja and Kruma 2018). In producing regions, these requirements create a strategic challenge: differentiation is not only a technical issue but also an organizational one, because it depends on collective coordination and shared investments that are difficult to sustain through isolated individual action.

The cluster approach provides an operational logic to address this challenge by organizing cooperation among interconnected actors and aligning collective action around shared objectives, services, and market-oriented upgrading pathways (Porter 1999). In Latin America, cluster initiatives have been discussed as instruments to strengthen territorial production systems, yet their performance depends on governance quality, institutional alignment, and the ability to translate coordination into concrete value creation (Dirven 2000; Monge-González et al. 2018). From a governance perspective, participatory architectures with defined roles and specialized committees are commonly used to reduce fragmentation, clarify responsibilities, and sustain collective action over time (Gobierno Vasco–Grupo SPRI Taldea–Idom 2020). Moreover, inclusive value chain approaches highlight the importance of strengthening participation mechanisms and capacity building to reduce asymmetries and improve value capture for smallholders (OIT 2022).

Despite these conceptual advances, there is still limited applied evidence on how to operationalize a replicable, stepwise model at the municipal scale that integrates governance design, stakeholder coordination, and market insertion mechanisms for specialty coffee systems. This research addresses that gap by developing a strategic participatory model grounded on the cluster perspective and a value chain integration lens, emphasizing participatory governance and coordinated upgrading mechanisms (Porter 1999; Monge-González et al. 2018; Gobierno Vasco–Grupo SPRI Taldea–Idom 2020). Accordingly, this study aimed to design a strategic model for a specialty coffee cluster in Chinchiná, oriented toward strengthening value chain coordination, establishing an inclusive governance architecture, and defining market insertion pathways based on protocols, traceability, and differentiated commercialization.

This paper is organized as follows: the next section describes the methodological design, data sources, and analytical procedures. The results and discussion section presents the proposed governance and market strategy and discusses their implications for municipal-scale cluster development in specialty coffee systems. Finally, the conclusion summarizes contributions, limitations, feasibility considerations, and future research needs.

MATERIALS AND METHODS

The study was conducted in the municipality of Chinchiná, department of Caldas (Colombia), at altitudes ranging from 1,360 to 1,800 meters above sea level (masl), with an average temperature of 21 °C, relative humidity of 81%, and annual precipitation of 2,135 mm—conditions that are highly favorable for the cultivation of specialty coffee (*Coffea arabica* L.). The study area forms part of the Coffee Cultural Landscape declared by UNESCO as a World Heritage Site and represents a relevant node for coffee production in the region.

The methodological approach was qualitative, exploratory, interpretative, and participatory, aiming to understand territorial and organizational dynamics of the local coffee system. The research integrated documentary review, semi-structured interviews with key actors,

SWOT analysis, social cartography, and the logical framework approach, which is suitable for analyzing socio-productive systems characterized by multiple institutional and economic interactions (Hernández et al. 2014; Hoyos 2018).

Data collection

Interviews. A total of 25 semi-structured interviews were conducted in both face-to-face and virtual formats with stakeholders involved in the specialty coffee value chain, including coffee growers, buyers/traders, quality actors (cuppers), cooperative/association representatives, nursery operators, and public/support and academic stakeholders. Inclusion criteria were defined based on experience level, knowledge of specialty coffee markets, and degree of articulation with local organizations. Non-probability purposive sampling was applied, and theoretical saturation was considered reached when no new relevant information emerged from the last interviews (Hoyos 2018).

Survey

A structured survey was applied to 290 value chain actors to establish a baseline on upgrading readiness and feasibility of collective participation. Survey results were summarized through descriptive frequencies and percentages.

Documentary review

A complementary documentary review was carried out using secondary sources, including official statistics, coffee sector technical reports, and published case studies on agro-industrial clustering and specialty coffee differentiation (FAO 2012; Panhuysen and Pierrot 2023; Gobierno Vasco–Grupo SPRI Taldea–Idom 2020). **T**he profile of the interviewees and the selection criteria applied in this study are presented in Table 1.

Table 1. Profile of interviewees and selection criteria (total interviews=25).

Stakeholder group	Typical roles represented	Main contribution to the study	Inclusion criteria	Interview mode (face-to-face/ virtual)
Coffee growers	Small and medium producers	Production constraints, quality practices, adoption barriers	Experience in coffee production and/or specialty practices	As conducted
Traders / buyers	Intermediaries, local buyers	Commercial constraints, price formation, requirements	Direct experience in buying/selling coffee	As conducted
Quality actors	Cuppers, quality managers	Quality protocols, sensory profile, defects, traceability needs	Experience in cupping/quality evaluation	As conducted
Cooperatives / associations	Leaders, technical staff	Governance, service provision, collective action	Participation in organized structures	As conducted
Nursery operators	Plant material suppliers	Varietal availability, renewal constraints	Role in supplying seed/seedlings	As conducted
Institutional actors	Sector support institutions (research, extension, training, and regulation), as applicable.	Technical support, programs, coordination possibilities	Institutional role in coffee sector	As conducted
Academic actors	University staff / researchers (as applicable)	Methodological validation, territorial analysis	Experience in coffee/ agro-industrial research	As conducted

Recorded variables

Variables recorded through the survey included: (i) certification status, (ii) current involvement in specialty coffee production/commercialization, (iii) knowledge of the cluster concept and its perceived advantages, (iv) interest in joining the cluster initiative, and (v) willingness to receive training on Good Agricultural Practices. Interview themes focused on: (i) coordination arrangements and governance gaps, (ii) quality and post-harvest practices, (iii) market access constraints, and (iv) feasibility conditions and risks for collective action.

Data analysis

Interview information was analyzed through thematic content analysis. An initial open coding stage identified recurrent themes associated with governance, coordination failures, value chain bottlenecks, upgrading opportunities, and market access barriers. Codes were subsequently grouped into analytical categories aligned with the study components (diagnosis, actor mapping, governance design, and market strategy). Findings were contrasted with documentary evidence and tools applied in each phase (SWOT, social mapping, and logical framework), enabling methodological triangulation and strengthening internal consistency.

Survey information was analyzed descriptively using frequencies and percentages. No inferential statistical methods were applied, as the study was exploratory rather than experimental. To ensure methodological transparency, Table 2 presents the traceability matrix linking the study objectives, methods, evidence sources, and expected analytical outputs.

Table 2. Traceability matrix links objectives, methods, evidence, and model outputs.

Study component / objective	Methods and tools	Evidence / data sources	Analytical output (what is produced)	Where it appears in the manuscript
Identify bottlenecks and opportunities in the local system	Documentary review; interviews; SWOT	Official statistics; sector technical reports; interview notes	SWOT synthesis of constraints/opportunities	Materials and Methods; Results/Discussion (diagnosis)
Map actors and articulation gaps	Social mapping; interviews	Actor lists; relationship patterns; stakeholder inputs	Actor map + articulation gaps and power relations	Materials and Methods; Results/Discussion (governance need)
Design participatory governance structure	Interviews; comparative review; governance guideline	Interview themes; governance models	Governance architecture (assembly/committees/ roles)	Results/Discussion (governance model)
Define market insertion and upgrading mechanisms	Documentary review; interviews; logical framework	Market requirements; certification and protocol needs	Strategic lines, roadmap, indicators (as scenarios)	Results/Discussion (market strategy)
Ensure consistency and credibility	Triangulation + participatory validation	Cross-check across tools and sources	Validated findings and coherent model logic	End of Methods; Discussion

Analytical phases

The analysis was structured in three sequential phases:

Territorial diagnosis. A SWOT analysis was conducted to identify strengths, weaknesses, opportunities, and threats across productive, social, institutional, and commercial dimensions (García and Olaya 2006).

Social mapping. Social cartography was used to locate key actors, identify power relationships, and recognize articulation gaps among sectors (Dirven 2000).

Strategic formulation. The logical framework approach was applied to construct the problem tree, objective tree, and strategic lines for cluster development. This phase

incorporated value chain characterization and governance design criteria and was complemented by the collaborative governance approach described in Gobierno Vasco–Grupo SPRI Taldea–Idom (2020).

RESULTS AND DISCUSSION

The results derived from interviews, SWOT analysis, social mapping, and the logical framework approach indicate that the local specialty coffee system combines high territorial potential with persistent organizational and market-related constraints. The proposed cluster model is therefore structured as a phased upgrading process, in which governance consolidation, collective services, and market insertion mechanisms are designed to address the baseline conditions evidenced by the survey and the qualitative analysis.

Territorial diagnosis and articulation gaps

The territorial diagnosis identified three critical constraints that limit participation in differentiated specialty markets. First, organizational fragmentation reduces collective bargaining capacity and limits coordinated investment in quality upgrading. Second, value addition at origin remains constrained by heterogeneous post-harvest practices and uneven adoption of standardized protocols. Third, market access is affected by limited coordination among value chain actors and weak articulation between technical upgrading and commercialization decisions. These findings are consistent with cluster and value chain perspectives that emphasize the role of coordination and governance as prerequisites for upgrading and value capture (Porter 1999; Dirven 2000; Monge-González et al. 2018).

Social mapping revealed gaps in horizontal coordination among producers and limited structured interaction between private actors and support stakeholders. This gap is relevant because participatory governance models require a minimum level of trust and shared incentives to sustain collective action over time (Gobierno Vasco–Grupo SPRI Taldea–Idom 2020). In addition, interview-based evidence indicates that stakeholders associate successful upgrading with clear rules, transparent decision-making, and access to shared services (technical assistance, quality control, and market linkage). These are governance-dependent functions rather than isolated farm-level actions.

"Many producers work individually, and coordination only happens during harvest peaks" (Interviewee 7, coffee grower).

Survey-based baseline evidence (n=290)

Survey results provide descriptive baseline evidence on the recorded variables defined in the methodological design. Upgrading readiness is limited at baseline: 83.1% of respondents reported not having certification, while only 8.6% reported having at least one certification. Participation in specialty coffee is also limited: 17.6% reported they are currently producing or commercializing specialty coffee. Knowledge gaps were identified: 14.1% reported knowing the meaning of "cluster" and 13.8% reported knowing the advantages of cluster participation.

Despite these constraints, feasibility of collective participation is supported by adoption readiness indicators. Interest in joining the initiative reached 61.7%, 20.3% were undecided, and 17.9% were not interested. In addition, 56.6% reported willingness to receive training in Good Agricultural Practices. These baseline indicators justify a phased implementation approach beginning with awareness building and capacity strengthening, followed by progressive upgrading and structured market insertion (FAO 2012; OIT 2022).

Stakeholder articulation and governance gaps

Social mapping identified weak horizontal coordination among producers and limited structured interaction between private and public actors. Institutional presence exists, but without a formalized collaborative governance structure.

"There is institutional support, but no shared strategic plan connecting all actors" (Interviewee 14, institutional actor).

Strategic participatory cluster model (governance and coordination)

Based on the diagnosis and the baseline evidence, the proposed cluster model is structured as a multisectoral cooperative governance system with defined roles and operational committees. The governance architecture includes:

– General Assembly of stakeholders (strategic direction and legitimacy)

– Coordination Committee (operational leadership and follow-up)
– Technical Committees (quality and post-harvest; production practices; commercialization and market linkage)
– Clear membership rules and transparency mechanisms (participation, decision-making, and accountability)

This architecture is aligned with widely used cluster development frameworks in agro-industrial systems, which emphasize coordination mechanisms, service provision, and governance rules as the basis for sustained collective action and competitiveness (Porter 1999; Monge-González et al. 2018; Gobierno Vasco–Grupo SPRI Taldea–Idom 2020). In practical terms, the governance design responds directly to the main bottlenecks observed: it reduces fragmentation through structured participation, strengthens negotiation capacity through coordinated commercialization, and supports upgrading through technical committees with defined mandates.

Upgrading pathway: protocols, traceability, and progressive certification

The model integrates a phased upgrading pathway that connects technical improvement with market requirements. Specialty coffee differentiation depends on consistent quality, traceability, and credible verification, which require standardized post-harvest practices and coordinated compliance (Teuber and Herrmann 2012; Panhuysen and Pierrot 2023; Laukaleja and Kruma 2018). Given the baseline condition (83.1% without certification), the model proposes progressive certification readiness rather than immediate certification as an entry condition. This is consistent with inclusive value chain approaches that recommend capacity strengthening and participation mechanisms to reduce asymmetries and enable smallholder inclusion in higher-value segments (OIT 2022).

Accordingly, the technical committees are designed to operationalize training, protocol adoption, and traceability requirements. The model prioritizes: (i) standardization of post-harvest protocols, (ii) traceability practices aligned with buyer requirements, and (iii) progressive certification steps coordinated through collective services to reduce individual costs and adoption barriers.

Commercialization strategy and value capture at origin

The commercialization logic of the model focuses on reducing intermediation through coordinated aggregation, improving negotiation capacity, and aligning quality differentiation with commercialization channels oriented to premium markets. This approach is consistent with evidence that value capture at origin depends on coordinated upgrading and credible differentiation mechanisms (Panhuysen and Pierrot 2023; Teuber and Herrmann 2012). In addition, strategies that strengthen domestic consumption of specialty coffee in producing countries can complement export-oriented pathways by retaining value locally and supporting stable demand for differentiated products (Espíndola 2020; Kim et al. 2022). Finally, incorporating insights on consumer decision-making in key import markets, such as Germany, can help refine differentiation narratives and commercialization approaches without assuming deterministic outcomes (Rosero 2022).

Scenario-based targets and feasibility conditions (annual green coffee exports)

To avoid presenting projections as deterministic results, targets are framed as scenario-based strategic objectives contingent on governance consolidation, protocol compliance, and premium market access. Three scenarios are considered:

- Conservative scenario: partial coordination and limited protocol adoption; commercialization mainly through traditional channels
- Base scenario: structured governance and standardized post-harvest practices; access to national specialty buyers
- Optimistic scenario: consolidated governance, progressive certification readiness, and access to premium export channels

The proposed cluster model addresses the main productive, commercial, institutional, and social constraints identified during the diagnosis. Table 3 summarizes the current conditions, the main constraints, the proposed interventions, and the expected scenario-based improvements associated with the implementation of the cluster model.

Table 3. Current conditions and expected improvements under the proposed cluster model.

Dimension	Current situation	Identified constraint	Proposed intervention	Expected improvement (scenario-based)
Productive	Heterogeneous practices	Limited protocol standardization	Quality and post-harvest technical committee	Improved consistency and compliance
Commercial	Intermediated sales	Limited buyer negotiation capacity	Coordinated commercialization and market linkage	Better price positioning and value capture
Institutional	Fragmented coordination	Weak articulation and role clarity	Participatory governance rules and committee mandates	Improved coordination and accountability
Social	Low associativity	Trust deficits and participation barriers	Inclusive governance and progressive capacity building	Increased collaboration and adoption

Under the optimistic scenario, the plan targets annual green coffee exports increasing from 50 t (Year 1) to 70 t (Year 2) and 90 t (Year 3), together with a projected 50% increase in average farmer income and 80% integration of strategic actors into coordinated commercialization schemes. These values represent conditional targets rather than deterministic forecasts, and their achievement depends on the assumptions and mitigation measures summarized in Table 4.

Table 4. summarizes the assumptions and main risk factors underlying the scenario-based targets for export volumes, income improvement, and actor integration.

Indicator	Baseline condition	Assumptions under optimistic scenario	Risk factors	Mitigation measures embedded in the model
Annual green coffee exports (t/year)	Fragmented sales and limited aggregation	Coordinated aggregation, premium buyer access, export channels	Market volatility; inconsistent quality; working capital constraints	Standardized protocols; traceability; phased market insertion; committee-led follow-up
Average farmer income (%)	Conventional pricing and intermediation	Price premium via differentiation and reduced intermediation	Certification costs; uneven adoption	Progressive certification strategy; training plan; monitoring indicators
Actor integration (%)	Low associativity	Formal governance with participation incentives	Trust deficits; coordination costs	Transparent decision-making; committee-based accountability; progressive engagement

In summary, the results suggest that the cluster model is feasible under a phased strategy that starts with building awareness and capacity strengthening and advances toward coordinated upgrading and premium market insertion. Baseline evidence supports the need for progressive certification and governance consolidation, while the scenario-based targets provide measurable objectives linked to explicit assumptions, risks, and mitigation measures.

Contributions, limitations, and feasibility

This study contributes to applied research on agro-industrial clusters by operationalizing a municipal-scale strategic model that integrates (i) territorial diagnosis, (ii) participatory governance design, and (iii) market insertion mechanisms aligned with specialty coffee differentiation requirements. The framework offers a replicable stepwise logic that links objectives, methods, evidence, and outputs, strengthening transparency and implementation readiness (Porter 1999; Monge-González et al. 2018; Gobierno Vasco–Grupo SPRI Taldea–Idom 2020).

Limitations are inherent to qualitative and participatory designs. Evidence was built from purposive interviews, survey-based descriptive results, and documentary sources and therefore reflects the contextual conditions of the analyzed territory. Scenario-based targets depend on adoption, coordination capacity, and market access achieved during implementation, and should be interpreted as conditional objectives rather than deterministic forecasts.

Regarding feasibility, key constraints include coordination costs, trust deficits, certification investment requirements, and exposure to price volatility. The model embeds mitigation mechanisms such as transparent decision rules, specialized committees, phased adoption of protocols and progressive certification, and continuous monitoring to support implementation capacity and resilience over time.

CONCLUSION

This study developed a strategic participatory model for a specialty coffee cluster in Chinchiná, designed as a phased upgrading process that integrates territorial diagnosis, multi-stakeholder governance, and market insertion mechanisms aligned with specialty coffee differentiation requirements. Qualitative evidence (interviews, SWOT, social mapping, and logical framework) and descriptive baseline evidence from the survey indicate that the local system combines limited upgrading readiness (e.g., low certification coverage and limited current participation in specialty coffee) with a substantial willingness to engage in collective action and capacity-building. These conditions support an implementation pathway that begins with awareness building and training, followed by governance consolidation, standardized protocols, traceability, and progressive certification readiness.

The proposed governance architecture—organized through a General Assembly, a Coordination Committee, and specialized technical and commercialization committees—provides an operational mechanism to reduce fragmentation, strengthen transparency and accountability, and enable coordinated service provision and market linkage. From a commercialization perspective, the model prioritizes coordinated aggregation and differentiated market access to improve value capture at origin.

Annual green coffee export targets (50 t in Year 1, 70 t in Year 2, and 90 t in Year 3), together with a projected 50% income increase and 80% integration of strategic actors, are presented as scenario-based strategic objectives contingent on governance consolidation, protocol compliance, and premium market access. Therefore, these targets should be interpreted as conditional implementation goals rather than deterministic forecasts.

Future research should focus on implementation pilots and longitudinal monitoring to evaluate governance performance, adoption dynamics, and market outcomes under different scenarios, as well as to refine the model's feasibility mechanisms and risk mitigation strategies.

CONFLICT OF INTEREST

The author declares no conflict of interest.

ETHICAL APPROVAL

All participants were informed about the purpose of the study and voluntarily agreed to participate in the interviews.

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