



THE ROLE OF AGRIBUSINESS INNOVATIONS IN STRENGTHENING GLOBAL AGRICULTURAL VALUE CHAINS: INSIGHTS FOR SOYBEAN

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ABSTRACT

This literature review examines how agribusiness innovations contribute to stronger and more resilient global agricultural value chains (GAVCs). Drawing on 19 studies published between 2020 and 2025, the review shows that technological and digital innovations improve productivity, traceability, and supply chain resilience, though their benefits vary across countries and depend on local capabilities and infrastructure. Evidence highlights that innovation outcomes are shaped by factors including education, investment capacity, geographic access, and the ability of firms and producers to manage knowledge and adopt new processes. The review further finds that innovation capabilities within agri-business firms and production units are essential for transforming technologies into value-added activities. Inclusive and sustainability-oriented innovations, supported by coordination among multiple actors, help integrate smallholders and ensure environmental and social alignment within value chains. Financial innovations, particularly FinTech and blockchain, address challenges of trust, transaction costs, and financial exclusion, but require strong digital literacy and supportive infrastructure to be effective. Policy frameworks and state interventions play a decisive role, influencing how innovations diffuse and whether they lead to meaningful upgrading and value capture. Overall, the literature indicates that strengthening GAVCs requires a combination of technological, organizational, financial, and policy innovations tailored to specific contexts, with coordinated strategies that promote resilience, inclusion, and sustainability.

KEYWORDS: Agribusiness Innovation, Global Agricultural Value Chains, Digital Transformation, FinTech and Blockchain, Smallholder Inclusion, Supply Chain Resilience

INTRODUCTION

Global agricultural value chains (GAVCs) are undergoing rapid transformation driven by technological, organizational, and institutional innovations that aim to simultaneously increase efficiency, resilience, and sustainability (Li *et al.*, 2025). The core concern is how agri-business innovations, from digital technologies and FinTech to inclusive governance models and policy frameworks, can strengthen GAVCs in ways that enhance value capture, especially for smallholders and developing regions, while addressing environmental and social constraints (Horton *et al.*, 2023). Existing research emphasizes that strengthening agricultural value chains requires more than isolated technologies; it involves complementary changes in capabilities, institutions, and structures across multiple scales, from farm-level production systems to national policy regimes (Nogueira *et al.*, 2025).

The 19 studies synthesized in this study converge on several cross-cutting themes: (i) technological and digital innovation for upgrading and resilience; (ii) innovation capabilities and knowledge management in agri-business firms and production units; (iii) inclusive and sustainable value chain governance; (iv) financial and FinTech innovations for smallholder inclusion; and (v) institutional and policy frameworks for structural transformation and GVC upgrading. At the same time, important gaps remain: many innovations perform differently across income levels and regions; adoption is constrained by human and financial capital; and the integration of sustainability, inclusion and digitalization is still partial and uneven. This literature review is organized thematically to map these contributions, critically analyze points of convergence and divergence, and clarify how agri-business innovations can more effectively strengthen GAVCs, particularly under conditions of climate change, market volatility and persistent structural inequalities.



Methodology

A systematic literature review was done concerning; the role of agribusiness innovations in strengthening global agricultural value chains. This approach of review was adopted in this study because the subject matter was narrower and more specific to warrant a scoping literature review method. A review protocol was outlined prior to conducting the systematic review which is in accordance with the review guidelines proposed by Kitchenham *et al.* (2010). The research questions were first defined after which the key words identified in this research were input into databases to select the relevant literature materials. The databases that were used to source for literature materials in this study included; Science Direct, Google scholar, Web of Science, and Research gate. Search Keywords or Statement used in this study are as follow:

1. Role of agribusiness innovation in strengthening global agricultural value chain
2. Role AND Innovation OR Agribusiness Innovation AND agricultural value chain
3. Innovation AND Agribusiness AND value chain enhancement

A selection criterion consisting of “documents within agricultural export, export market, international market and published between 2020 - 2025” was used to filter the documents and select relevant literature. A total of 64 literature materials were obtained using the above keywords and criteria for searching literature in the various search engines. Out of this number, only 19 were selected based on the information on “the relevance of agribusiness innovation in agricultural value chain” they provided. All other pertinent information was gathered from the selected literature materials and subsequently synthesised in accordance with the main theme of the research, emerging trends in agricultural export. A thematic analysis was used to discuss the relevant information captured in the literature section.

Technological Innovation and GAVC Position

Several studies demonstrate that technological innovation is a core driver of upgrading within agricultural value chains, but its effects are heterogeneous across countries and depend on complementary capabilities and structures. Chen and Zhang (2023) show that both services development and technological innovation positively affect the embedded location of agricultural GVCs across 57 countries, yet they exhibit a mutual substitution effect, suggesting that firms often lack the absorptive capacity to integrate complex service technologies effectively. Their income-stratified analysis further reveals that while high- and upper-middle-income countries gain from these innovations, lower-middle-income countries experience inhibitory effects, implying that technology alone may deepen existing structural weaknesses when not matched by supportive capabilities and institutions.

At the sectoral level, Valdes *et al.* (2023) highlight how technology adoption among small horticultural producers strengthens value chains by raising productivity and competitiveness, but adoption intensity is shaped by location, education and investment capacity. Geographic proximity to markets and extension services emerges as the most critical determinant of multi-technology adoption, indicating that innovation benefits are spatially uneven and contingent on infrastructural connectivity. These findings resonate with the multilevel evidence of Li *et al.* (2025), who show that agricultural technology innovation significantly promotes agricultural economic growth, but its impact is amplified when coupled with rural industrial structural transformation, such as shifts toward processing and services. Together, these studies suggest that GAVC strengthening through technological innovation depends less on technology per se and more on the alignment of technology with services, structural change and localized enabling environments.

Digital Transformation and Supply Chain Resilience

Digital transformation emerges as a pivotal agri-business innovation that enhances both innovation performance and supply chain resilience, yet its impact is contingent on strategic alignment and complementary capabilities. Zhou *et al.* (2024) found that digital transformation in Chinese agri-business firms directly increases both the quantity and quality of innovation output, with financing constraint alleviation and technological upgrading acting as key mediating mechanisms. By reducing information asymmetry and easing access to finance, digital transformation enables firms to undertake longer-term, higher-risk innovation projects that strengthen their position in GAVCs.

From a broader systemic perspective, Wang *et al.* (2025) show that an innovation-driven digital economy significantly improves the resilience of industrial and supply chains, with entrepreneurial activity moderating and amplifying this effect, and positive spatial spillovers extending resilience benefits to neighboring regions. Taghikhah *et al.* (2025) complement this macro perspective by disentangling the roles of specific digital capabilities in the resilience of agri-food supply chains, distinguishing short-term persistence roles of logistics technologies from long-term adaptation and transformation roles of advanced analytics and innovation-oriented capabilities. Jantapoon and Saenchaiyathon (2025) further link technology implementation and information sharing to supply chain resilience in agricultural SMEs, demonstrating that resilience then drives sustainable supply chain management, albeit under negative moderation by



volatile and uncertain environments. Collectively, these studies indicate that digital innovations strengthen GAVCs primarily by enabling more robust and adaptive supply chains, but their effectiveness hinges on managerial choices about which digital capabilities to prioritize for different resilience horizons.

Blockchain and FinTech as Institutional Innovations

A subset of the literature focuses on digital institutional innovations, especially blockchain and broader FinTech solutions, as mechanisms to tackle information asymmetry, trust deficits and financial exclusion within agricultural value chains. Silvestri *et al.* (2025) show that blockchain technology not only improves operational efficiency through formalized, traceable information flows but also strengthens relational dynamics by enhancing trust and perceived information quality among chain partners. The mediating role of relational quality in linking blockchain adoption to supply chain performance underscores that technology must be embedded in social and relational contexts to fully strengthen agri-food GAVCs.

Rayhan *et al.* (2024) conceptualize FinTech more broadly, covering mobile money, crowdfunding, digital payments and blockchain, as a critical lever for building sustainable agricultural value chains from the perspective of smallholders. They argue that FinTech enhances financial inclusion, reduces transaction costs and supports transparency and traceability, which are essential for participation in sustainability-sensitive global markets. Yet both studies note that these institutional innovations are constrained by infrastructural deficits and low digital literacy, particularly in rural contexts. Thus, while blockchain and FinTech hold substantial promise for strengthening GAVCs by formalizing transactions and information exchange, their transformative potential depends on complementary investments in infrastructure, education and relational governance that ensure these technologies translate into inclusive benefits.

Innovation Capabilities in Agri-business Firms

Another key theme concerns the internal capabilities that allow agri-business firms to translate technologies into performance gains and higher value chain positions. Leo *et al.* (2022) identify development capability as a universal driver of innovative performance across upstream, midstream and downstream agri-business firms in Brazil, while management capability is particularly important for upstream firms and transaction capability for downstream firms. Their results imply that firms operating in under-developed chain segments require a combination of development, management and transaction capabilities to escape low-value activities and move into more profitable positions within GAVCs.

Nogueira Dias *et al.* (2025) extend this capability-based view by showing, via qualitative comparative analysis, that high innovation performance arises from specific configurations of knowledge resources, public institutional support and network centrality. They identify two main pathways: a knowledge-support pathway that combines strong internal knowledge with robust public support, and a network-compensatory pathway in which central network positions and high knowledge resources can partially substitute for limited public support. These findings emphasize that there is no single necessary condition for innovation; instead, firms must assemble tailored “recipes” of resources and relationships to generate innovations that enable GAVC upgrading. Together with evidence on digital transformation and technological capabilities, this literature suggests that innovation-led strengthening of agri-business value chains is capability-intensive, requiring coordinated investments in human capital, knowledge management, managerial systems and external linkages.

Knowledge Management and Innovation in Production Units

While much of the literature targets firms and national systems, some studies highlight innovation and knowledge management at the level of agricultural production units (APUs) and smallholder-based systems. Ramírez Molina *et al.* (2023) show that APUs in a developing economy primarily adopt technological and process innovations, such as new production technologies and distribution channels, to improve efficiency and market access, with knowledge management serving as the foundation for these strategies. Their analysis underscores that innovation capacity is anchored in the strategic management of internal resources and external linkages, and that sustainable value chain strengthening requires APUs to shift from merely optimizing production to creating new services and diversified value chains.

Valdes *et al.* (2023) reinforce this micro-level view by linking technology adoption intensity among small horticultural producers to education, investment intensity and family labor structure, with location as the dominant constraint. Together, these studies reveal that micro-level innovation strategies are constrained by human, financial and spatial



factors but can significantly contribute to GAVC strengthening when embedded in supportive knowledge and extension systems. The implication is that value chain interventions must explicitly address the knowledge and resource gaps of APUs and smallholders, rather than assuming that innovations will diffuse automatically along the chain.

Inclusive Innovation and Smallholder Integration

Inclusivity is a central concern across several contributions that examine how innovation can benefit marginalized actors, especially smallholders in developing countries. Horton *et al.* (2023) argue that inclusive innovation in agricultural value chains requires a systems approach that combines value chain development, innovation systems development and organizational development, coordinated through multi-stakeholder platforms. Their case studies demonstrate that successful interventions involve complex innovation packages, combining improved varieties, new seed systems, post-harvest techniques, market contracts and quality standards, co-created through participatory processes that allow smallholders to influence design and benefit from upgrading.

Hidayati *et al.* (2021) similarly emphasized that sustainable agrifood value chain transformation in developing countries must balance economic, social and environmental goals while addressing the structural marginalization of smallholders. Their framework highlights the importance of governance arrangements, external facilitation and capacity building to move chains from traditional, informal systems toward integrated, certified and branded global chains. When considered alongside FinTech-focused work and APUs' innovation strategies, these studies indicate that inclusive agri-business innovations must go beyond technology deployment to reshape governance, facilitation and support mechanisms that determine who participates and captures value in reconfigured GAVCs.

Sustainability-Oriented Innovations and Circular Models

The literature also stresses the role of sustainability-oriented innovations and circular models in strengthening agricultural value chains under environmental and climate constraints. Rushchitskaya *et al.* (2024) survey the transformative potential of sustainable practices and technological innovations, such as precision farming, biotechnology and renewable energy, in reshaping global agri-business dynamics, concluding that these technologies improve resource efficiency, reduce environmental degradation and enhance climate resilience, despite facing adoption barriers related to investment costs and skills. Corallo *et al.* (2023) complement this perspective by proposing an innovative agri-food value chain model that integrates Industry 4.0 technologies, stakeholder inclusivity and circular recirculation flows to simultaneously achieve economic, environmental and social objectives.

At the micro level, Ramírez Molina *et al.* (2023) show that sustainability-related challenges such as climate change and resource scarcity act as key drivers pushing APUs toward innovative strategies that emphasize efficiency, certifications and new services. Together, these contributions suggest that sustainability-oriented agri-business innovations strengthen GAVCs by aligning value chains with evolving regulatory and market requirements, reducing environmental risks and creating new value from circular flows, but they require coordinated adoption across multiple actors and levels.

Entrepreneurship, Value Addition and Local Upgrading

Entrepreneurship and value addition are repeatedly identified as mechanisms for capturing more value domestically and at the farm or SME level within GAVCs. Sharma and Bhatt (2022) argue that agri-business entrepreneurship and innovation are essential to transform farmers from price-taking producers of undifferentiated commodities into market-oriented entrepreneurs who engage in processing, branding and other value-adding activities. Their analysis of Indian policy initiatives and case examples indicates that value addition yields the highest returns but demands supportive incubation ecosystems, targeted funding and technology development programs.

Ado *et al.* (2025) examine the “trade paradox” in African resource-rich economies, demonstrating that resolving this paradox and achieving value chain upgrading requires strong and strategic government intervention that functions simultaneously as shareholder, producer, regulator and negotiator vis-à-vis foreign firms. Their case studies of Niger and Chad show that coercive local content expectations and early upgrade plans were crucial for securing technology transfer and greater local value capture, contrasting sharply with countries that remain locked into primary commodity exports. These studies together highlight that entrepreneurship and local upgrading strategies must be embedded within supportive institutional and policy frameworks; otherwise, agri-business innovations risk reinforcing patterns of external value capture.



Policy Frameworks and Structural Conditions

The broader institutional and policy environment strongly shapes whether agri-business innovations translate into strengthened GAVCs. Awokuse *et al.* (2024) synthesize evidence on policy frameworks for agri-food GVC resilience and sustainability, emphasizing that trade specialization and inter-connectedness, while focusing on efficiency enhancing, introduce systemic risks that require robust policy responses. Their review underscores the importance of investments in transportation and infrastructure, regulatory innovations to align trade with sustainability goals, and domestic policy measures to manage distributional impacts and ensure inclusive growth.

Li *et al.* (2025) and Wang *et al.* (2025) reinforce the policy dimension by demonstrating how coordinated support for technological innovation, structural transformation and digital economy development can drive agricultural growth and supply chain resilience at the provincial level. Meanwhile, Ado *et al.* (2025) emphasize that state capacity and strategic intervention are indispensable for overcoming structural barriers to technology transfer and value chain upgrading in resource-dependent economies. Taken together, these studies argue that agri-business innovations cannot be fully effective in strengthening GAVCs without complementary policy frameworks that invest in infrastructure, incentivize sustainability and inclusion, and strategically intervene to rectify structural imbalances in value capture.

Thematic Synthesis

Across these bodies of work, several converging patterns emerge regarding how agri-business innovations strengthen GAVCs. First and foremost, technological and digital innovations, ranging from precision agriculture to blockchain and artificial intelligence, enhance efficiency, traceability, resilience and innovation outputs, but their benefits are unevenly distributed and often require absorptive capabilities, human capital and supportive structures to avoid reinforcing existing divides. Furthermore, internal innovation capabilities and knowledge management within firms and APUs are crucial for transforming technologies into value-adding products, processes and services; without development, management, transaction and network capabilities, even advanced technologies yield limited chain-wide upgrading.

Additionally, inclusive innovation and sustainability-oriented models are central to future GAVC trajectories, as they determine smallholder integration, environmental outcomes and social legitimacy of global food systems. Moreso, financial and institutional innovations, particularly FinTech and blockchain, address key constraints of finance, trust and information asymmetry, but depend on infrastructure and relational governance to become genuinely transformative. Finally, overarching policy frameworks and state interventions set the structural conditions under which all these innovations can interact to generate sustained upgrading and resilience across local, national and global levels.

Table 1: Thematic Summary Table: Agri-business Innovations in Global Agricultural Value Chains

Theme	Core Findings/Contributions	Key Studies	Implications for GAVC Strengthening
Technological & Digital Innovation	Technologies (e.g., precision farming, IoT, blockchain) enhance efficiency, resilience, and GVC embedding but show substitution effects with services and income-level heterogeneity; digital transformation boosts innovation via financing and upgrading.	Chen & Zhang (2023); Valdes <i>et al.</i> (2023); Rushchitskaya <i>et al.</i> (2024); Zhou <i>et al.</i> (2024); Wang <i>et al.</i> (2025); Taghikhah <i>et al.</i> (2025); Jantapoon & Saenchaiyathon (2025); Silvestri <i>et al.</i> (2025)	Enables resilience and traceability but requires absorptive capacity and infrastructure to avoid uneven benefits across regions.
Innovation Capabilities & Knowledge Management	Development capability is universal; management key for upstream, transaction for downstream; configurations of knowledge, networks, and public support drive performance; APUs focus on process/tech strategies rooted in knowledge.	Leo <i>et al.</i> (2022); Nogueira Dias <i>et al.</i> (2025); Ramírez Molina <i>et al.</i> (2023)	Firms/APUs need tailored capability "recipes" (e.g., internal efficiency + market leverage) to upgrade from low-value activities.
Inclusive & Sustainable Governance	Systems approaches with MSPs deliver complex innovation packages; transformation needs synergies across	Horton <i>et al.</i> (2023); Hidayati <i>et al.</i> (2021); Corallo <i>et al.</i> (2023)	Shifts from linear to adaptive, pro-poor models ensure



	economic/social/environmental goals; circular models integrate Industry 4.0 and stakeholders for triple sustainability.		smallholder inclusion and environmental alignment in global chains.
Financial & FinTech Innovations	FinTech (mobile money, blockchain) reduces costs, boosts inclusion/traceability; blockchain mediates efficiency via trust/relational quality.	Rayhan <i>et al.</i> (2024); Silvestri <i>et al.</i> (2025)	Overcomes finance/trust barriers for smallholders but hinges on digital literacy and infrastructure.
Entrepreneurship, Value Addition & Policy	Entrepreneurship via value addition (processing/branding) yields high returns with policy incubation; strategic state intervention resolves trade paradoxes; policies needed for infrastructure/sustainability.	Sharma & Bhatt (2022); Ado <i>et al.</i> (2025); Awokuse <i>et al.</i> (2024); Li <i>et al.</i> (2025)	Local upgrading and policy frameworks prevent external value capture, enabling domestic resilience.

Key Gaps and Inconsistencies in Literature

Despite rich insights, the literature presents several gaps and inconsistencies that justify further research. One notable gap concerns the differential impact of innovations across income levels and regions, as evidenced by Chen and Zhang’s (2023) finding that services development and technological innovation inhibit GVC embedding in lower-middle-income countries, in contrast to positive effects elsewhere. This raises questions about the specific institutional, infrastructural and capability conditions that mediate these outcomes and whether there are thresholds beyond which innovation becomes beneficial rather than destabilizing.

A second gap relates to the integration of inclusivity, sustainability and digitalization: many studies treat these dimensions in isolation, focusing on either digital resilience, sustainable practices or inclusive governance, but fewer explore how they interact in concrete value chain configurations. Third, micro-level analyses of APUs and smallholders remain relatively limited in scope and scale compared to firm- and macro-level studies, leaving uncertainties about how micro innovations aggregate into meso- and macro-level GAVC transformations. Finally, empirical work on long-term impacts of blockchain, FinTech and circular models is still nascent, with most studies providing conceptual or early-stage evidence rather than longitudinal assessments of performance, distributional effects and potential unintended consequences.

Implications for Strengthening Global Agricultural Value Chains

The synthesis suggests several implications for how agri-business innovations can be designed and governed to better strengthen GAVCs. First, innovation strategies should be context-specific, aligning technological adoption with local capabilities, income levels, infrastructure and institutional arrangements, rather than assuming uniform positive effects. This involves targeting capacity-building and extension support where absorptive capacity is low, and sequencing innovations so that services, technology and structural transformation advance in mutually reinforcing ways.

Second, value chain strengthening requires deliberate combination of technological, organizational and institutional innovations; packages that integrate production technologies with market linkages, quality standards, financial innovations and inclusive governance mechanisms are more likely to yield durable upgrading and broader participation. Third, digital innovations should be strategically deployed according to resilience objectives and time horizons, with operational technologies supporting short-term stability and data-analytic and innovation capabilities fostering long-term adaptation and transformation. Lastly, state and policy interventions remain essential to address infrastructure deficits, regulate sustainability, foster entrepreneurial ecosystems and negotiate favorable terms for technology transfer and value capture in global chains.

CONCLUSION

Overall, the reviewed literature indicates that agri-business innovations, spanning technologies, capabilities, governance models, financial tools and policy frameworks, play a critical role in strengthening global agricultural value chains, but their effectiveness depends on complex, context-specific interactions. Technological and digital innovations can enhance efficiency, resilience and innovation performance, yet they may exacerbate inequalities or remain underutilized if not coupled with absorptive capacities, inclusive institutions and supportive policies. Inclusive



and sustainability-oriented approaches emphasize that value chain strengthening must simultaneously address smallholder integration, environmental stewardship and social outcomes, while financial and institutional innovations like FinTech and blockchain tackle long-standing problems of finance, trust and information asymmetry.

Future Research Directions

Future research should prioritize comparative, longitudinal and multi-level analysis that examine how different innovation configurations perform across regions and over time, particularly in lower-income and structurally disadvantaged contexts. There is a need for deeper empirical investigation into the joint deployment of digital, sustainability and inclusive governance innovations within the same value chains, and for better understanding of how micro-level innovations among APUs and smallholders accumulate into systemic change. Such work would not only advance scholarly understanding but also provide more precise guidance for policymakers, firms and development practitioners seeking to mobilize agri-business innovations for robust, inclusive and sustainable GAVCs.

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