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Inclusive Agri-Entrepreneurship and Supply Chain Development: A Systematic Literature Review of Smallholder Farmer Integration

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ABSTRACT

More than 80% of farms worldwide are smallholders, making them crucial for food security. Moreover, smallholder farming creates employment and enhances rural development, necessitating their integration into high-value and sustainable agriculture supply chains. Despite their importance, institutional, financial, technological, and structural constraints continue to hinder their incorporation into high-value agriculture supply chains. Thus, the overall purpose of this study is to examine the mechanisms for smallholder inclusion in agricultural value chains and propose an improved hybrid model based on existing literature. The models used to incorporate smallholder farmers into agricultural value chains are examined in this study through a systematic literature review (SLR) using the PRISMA 2020 methodology. A thorough screening process using databases such as Scopus, Web of Science, and Google Scholar resulted in the selection of 25 peer-reviewed articles and institutional reports published between 2008 and 2025. The study employed thematic analysis and qualitative meta-analysis to identify key patterns, including financial barriers, infrastructure deficits, and digital exclusion. Findings indicate that the most common inclusion models are farmer cooperatives, out-grower schemes, and contract farming, which promote market access, collective bargaining, and input provision. However, these models are often limited by poor infrastructure, low digital literacy, and restricted access to finance. The study proposes a hybrid model that combines market access,

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input support, and collective action from existing inclusion mechanisms with digital tools for coordination, pricing, and traceability. The study concludes that effective integration of smallholder farmers into high-value agricultural supply chains can be achieved through a hybrid model that merges inclusive strategies with digital technologies to overcome barriers and ensure sustainable, equitable participation. Future research should explore digital agri-tech impacts, gender-sensitive integration, and policy frameworks supporting inclusive agri-entrepreneurship in South Africa and other developing regions.

Keywords: Smallholder Farmers; Agricultural Value Chains; Inclusive Agri-Entrepreneurship; Hybrid Integration Models; Collective Action Theory

1. Introduction and Background to Study

Smallholder farmers play a pivotal role in agricultural supply chain management, particularly in developing regions. This is supported by Kapari et al.[1] who posited that smallholder farmers improve food security in many households. In addition, smallholder farmers are essential in sustainable agricultural supply chains, contributing to food security and rural livelihoods[2]. Hence, governments from several less developed countries have stepped up to support smallholder farmers to enhance poverty alleviation and household food security[3]. However, for some countries, including South Africa, a significant number of households are battling food insecurity due to high unemployment, income inequality and asset ownership[3]. Nevertheless, considering that smallholder farmers own over 80% of the world's farms[4], they are expected to boost food security beyond the socio-economic challenges. According to Quayson et al.[5], "smallholder farmers are typically marginal and submarginal farm households that own and cultivate less than ten hectares of land and constitute the vast majority of farmers in developing countries". This implies that smallholder farmers not only play a key role in food security in developing countries, but significantly contribute to entrepreneurship, especially community-based entrepreneurship. Hence, Wale and Chipfupa[6] argue that enabling on-farm entrepreneurship is significant for employment creation in the smallholder sector, and the alleviation of rural poverty. However, Wale and Chipfupa[6] study underscores the significance of smallholder farmers' access to markets, membership to a cooperative and access to extension and information from scheme committees in enhancing their entrepreneurial behaviour. Thus, the integration of smallholder farmers in high value agriculture supply chains can improve both food security and entrepreneurial competency. Quayson et al.[5] mention that key players in the agriculture supply chain include transporters and distributors, agricultural extension officers, financial institutions, wholesalers, retailers and consumers and local manufacturers. On the other hand, Ndlovu et al.[3] posited that inclusive value chains aim to connect smallholder farmers to local markets. Thus, access to wholesalers, retailers, cooperatives, extension officers and consumers can ease the integration of smallholder farmers into the supply chain.

Smallholder farmers are crucial for enhancing food security, yet they face significant challenges that hinder their integration into modern supply chains. These challenges threaten food security, economic stability and rural livelihoods[7] . The challenges are exacerbated by the instability of value chains for smallholder farmers, the unanticipated changes of which affect their performance[8] . This necessitates the need for more resilient and inclusive supply chains that can respond to the unique needs and characteristics of smallholder farmers. Otherwise, the exclusion of smallholder farmers from the supply chain may adversely affect their productivity, access to markets and income. Furthermore, the challenges hinder the participation of SMEs and new entrants in agriculture value chains[9] . This implies that the challenges faced by smallholder farmers in the supply chain can hinder entrepreneurship in the agriculture sector. Wale and Chipfupa[6] argue that although there have been significant discussions about treating agriculture as a business, limited knowledge ex-

ists about entrepreneurship within the agricultural sector. On a similar notion, Raza and Jan [10] mention that pursuing agri-entrepreneurial businesses is associated with significant challenges. Yet Wale and Mkuna [11] argue that entrepreneurship plays a vital role in ensuring the profitability of smallholder farming in today's global economy. Thus, the integration and participation of smallholder farmers in supply chains, especially those in marginalized areas, can potentially boost agri-entrepreneurship.

The International Finance Corporation [4] reports that a significant proportion of smallholder farmers have limited access to inputs, finance, technology, labour, knowledge and markets. This limited access not only reduces their productivity but also constrains their ability to participate in increasingly commercialized agricultural value chains. On a similar notion, Agyekumhene et al. [12] purported that smallholder farmers are often not privileged to the use of advanced communication technologies which enhance information exchange. These challenges can be attributed to the exclusion of smallholder farmers in supply chains, highlighting the urgent need for inclusive agriculture supply chains tailored for both large and smallholder farmers. Furthermore, smallholder farmers face challenges like limited resources, market access, and climate change impacts, which hinder their integration into global value chains [13] . For example, in India, supply chain stakeholders, especially small and marginal farmers get little share in consumer rupee owing to "market uncertainty, high post-harvest losses, information asymmetry, lack of processing facilities and the erratic demand-supply situation" [14] .

According to Diwakar et al. [15], a significant number of smallholder farmers are excluded from modern supply chains despite the emergence of new buyers and opportunity for good prices. Consistent with Diwakar et al. [15], Changalima and Ismail [16] argue that even though effective supply chain management gives famers access to markets for agricultural supply chains, managing agricultural supply chains across diverse stakeholders is difficult, especially for smallholder farmers. This is supported by Vorley et al. [17] who argue that the main challenge for agrifood businesses is including small-scale farmers in supply chains to ensure they benefit from economies of scale, traceability and logistics. Yet, smallholder farmers' participation in the market generates significant sums of income [16] , and enhances their success and outcomes [3]. However, smallholder farmers are confronted by several challenges that impact on their decision to, and level of participation in value chains. According to Bitzer et al. [18] , a lack of information on prices and technologies, limited connection to market actors, poor financial markets and scale diseconomies hinder smallholder farmers access to both domestic and international markets. Similarly, Vos and Cattaneo [19] argue that limited access to resources and limited capacity to scale up or implement new practices to meet quality requirements restricts smallholder farmers from connecting with partners in the supply chain.

Even though they control more than 80% of farms worldwide, smallholder farmers in developing nations are still mainly shut out of high-value agricultural supply chains because of enduring obstacles like restricted access to capital, markets, technology, and infrastructure. In addition, according to Troosters et al. [20] , most food security interventions largely exclude the integration of smallholder farmers in the supply chain and emphasize production-related constraints to food security. Yet, in Africa, emphasis has been placed on advancing value chains to enhance the benefits to agriculture value chain participation for smallholder farmers [3] . Their contribution to equitable agricultural expansion is restricted because of these limitations, which also impair their productivity, negotiating power, and capacity to satisfy market demands. This is supported by Mumuni et al. [21] who posited that "supply chain integration for smallholders represents a significant challenge given their resource constraints, geographic dispersion, and weak bargaining position". Due to smallholder farmers' poor negotiating power and weak position in the value chain, their capacity to form relationships with key stakeholders in the value chain is reduced significantly. Consequently, they are unable to exploit lucrative and formal markets like their large-scale counterparts. This not only confines smallholder farmers to subsistence like form of farming but also limits the expansion of agri-entrepreneurship and community-based entrepreneurship. As such, there is a high risk of the agriculture sector remaining at the

peripheries of entrepreneurship as purported by Wale and Chipfupa [6] . Yet, Raza and Jan [10] argue that agri-entrepreneurship can significantly reduce poverty in developing countries. As such, effective agriculture supply chain management presents opportunities for both smallholder farmers and agri-entrepreneurship.

While previous systematic reviews and scoping studies have explored aspects of smallholder participation, they often concentrate on a single mechanism, such as contract farming, cooperatives, or digitalization, and primarily emphasize production or food security outcomes [22–24]. Few studies provide a consolidated framework that integrates both institutional models and emerging digital tools, or that systematically compares barriers and enablers across different contexts [25–27] . This review addresses that gap by applying the PRISMA 2020 framework to 25 peer-reviewed studies and institutional reports (2008–2025) and synthesizing them into a hybrid model. The hybrid model integrates traditional mechanisms of inclusion (cooperatives, outgrower schemes, and contract farming) with digital coordination tools, financing, and infrastructure, offering a more comprehensive framework for smallholder integration into high-value agricultural value chains. This research tackles the necessity of methodically identifying efficient integration strategies and comprehending the obstacles and possibilities for smallholder farmers to participate inclusively in the supply chain. Thus, this study seeks to:

1. To determine models used to integrate smallholder farmers into agricultural value chains in developing countries.
2. To analyse the key structural factors that either enable or hinder the integration of smallholder farmers into high-value agricultural supply chains.

The theoretical foundation for this research is presented in the following section.

2. Theories Grounding the Study

Collective action theory served as the foundation for this study. According to the collective action theory, people who have similar interests might cooperate to accomplish shared objectives that might be challenging or impossible to accomplish on their own [28] . Based on Mancur Olson's seminal work from 1965, the theory posits that rational individuals may not act in the group's best interests unless there are incentives or protections against free riding, even if collective action would benefit everyone. Olson maintained that coordination and organization are necessary for collective goods like lobbying power, market access, and common infrastructure, particularly in big groupings when individual contributions could seem insignificant. Smallholder farmers are especially affected by collective action theory because they frequently encounter systemic obstacles like weak negotiating leverage, a lack of economies of scale, and difficult access to markets and inputs [29] . Smallholders can solve these challenges through collective structures such as producer associations, farmer cooperatives, and joint marketing groups by pooling resources, sharing risks, and enhancing their negotiating power with consumers and input suppliers [30] . According to Ostrom [31], a prominent figure in modern collective action theory, effective group efforts require trust, rules, and oversight and enforcement mechanisms. When smallholder farmers need to collaborate to meet quality and volume requirements in high-value supply chains, Ostrom's concepts are immediately useful. For instance, farmers that work in cooperatives are in a better position to standardize quality, coordinate production, and obtain financial services or training that would not otherwise be available [32] . Collective action increases resilience, enabling smallholders to use shared information and adaptive tactics to better respond to climate shocks or market changes [33]. In this way, the theory not only clarifies why smallholders organise into groups but also highlights the importance of these organizations for inclusive, sustainable agricultural value chains. This study confirms the importance of collective action methods, like producer organizations and cooperatives, in resolving market failures and incorporating smallholder farmers into high-value chains. The study's hybrid model builds upon collective action theory by combining it with contract farming models and technological platforms. It allows for coordinated action and collective bargaining while using digital tools for efficiency, scale, and traceability. The

research methodology for this study is described in the following section.

3. Methodology and Meta-Analysis

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework was used to conduct a SLR to guarantee methodological rigor, transparency, and replicability. Even though the term "meta-analysis" is typically linked to statistical effect size computations and quantitative synthesis (such as odds ratios and Cohen's d), this study used a methodology and qualitative meta-synthesis technique. As such, results from various empirical and conceptual investigations were integrated without the need for statistical aggregation. The eight methodical steps in the review process, which followed the guidelines of PRISMA 2020, were designed to increase the legitimacy and comprehensiveness of the literature evaluation. Identification, screening, eligibility evaluation, and study inclusion are all represented graphically in **Figure 1** (PRISMA flow diagram). To ensure consistency with PRISMA 2020, these steps were mapped onto the four standard stages of the PRISMA flow diagram. Specifically, Steps 1 to 3 (systematic review planning, objectives/question formulation, and literature search strategy including database searching) correspond to the identification stage of PRISMA. Steps 4 to 6 (selection through inclusion and exclusion criteria, abstract reading, and full-text reviewing) align with the screening and eligibility stages of PRISMA, where studies were excluded at both the abstract and full-text levels. Steps 7 and 8 (synthesis and process monitoring) correspond to the Inclusion stage, in which 25 peer-reviewed articles and institutional reports were retained for analysis. This mapping confirms that while **Figure 1** presents a more detailed internal process, it is fully consistent with the four key stages of the PRISMA 2020 framework.

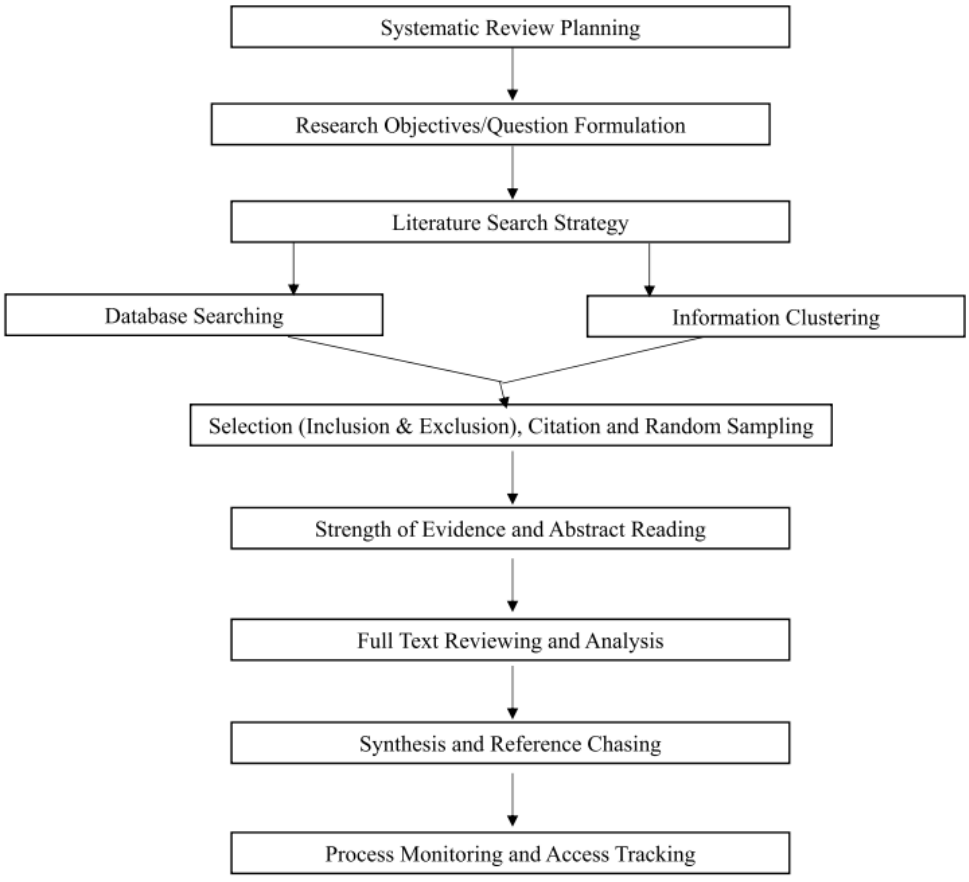

Figure 1. PRISMA flow chart.

Source: Author (2025).

Below is a breakdown of the actions taken:

3.1. Systematic Review Planning

The review was designed to understand how smallholder farmers are integrated into agricultural value chains in developing contexts, particularly in sub-Saharan Africa. The motivation behind this planning stage was to identify and evaluate existing models of inclusion (e.g., contract farming, out-grower schemes, cooperatives), recognise the enablers and barriers to integration, and discover knowledge gaps which set the agenda for future research. At this stage, a review protocol was established to define the scope, inclusion criteria, review tools, and databases. This ensured consistency and minimized selection bias.

3.2. Research Objectives and Questions

The research questions and objectives for the review are developed as follows:

3.2.1. Research Questions

1. What are the models used to incorporate smallholder farmers into agricultural value chains?
2. What are the structural factors that influence integration of smallholder farmer participation into agricultural value chains?

3.2.2. Research Objectives

1. To identify models that are used to incorporate smallholder farmers into agricultural value chains.
2. To examine the structural factors that influence integration of smallholder farmer participation into agricultural value chains.

The study also emphasized the need for scalable frameworks to facilitate smallholder involvement and address research gaps in inclusive supply chain development.

3.3. Literature Search Strategy

A thorough and methodologically sound search of the literature was done to find academic and policy-relevant papers that fit the review's goals. A systematic mix of synonym variations, Boolean operators, and regulated vocabulary items were used in the search method to guarantee both sensitivity and specificity. Among the main search terms were: (”smallholder farmers,” ”small-scale farmers,” or ”subsistence farmers”); AND (”agricultural supply chains,” ”value chains,” ”agribusiness networks,” or ”food systems”; AND (”integration,” ”inclusion,” ”participation,” or ”linkage”; AND”) AND (”developing countries,” ”low-income countries,” ”Sub-Saharan Africa,” or ”emerging economies”. Scopus, Web of Science, ScienceDirect, SpringerLink, and Google Scholar were among the databases for which this string was modified as necessary. Because of their thorough coverage of interdisciplinary, agricultural, and development-focused literature, these databases were chosen. Only research published between 2008 and 2025 was included in the search to include both early and more current advancements in inclusive agricultural supply chains. The focus was on peer-reviewed journal papers, institutional reports, and conceptual or empirical research that directly related to smallholder integration, and only English-language publications were taken into consideration. Use of citation chaining and Google Scholar allowed for the selective inclusion of grey literature. To improve completeness, more important sources were found by performing both forward and backward citation searches. The document category, selection criteria, and total number of documents are displayed in **Table 1**.

Table 1. Document category, selection criteria, and total number of documents.

Criteria for Selection	Document Category	Number of Documents
Year		
	2008–2012	3
	2013–2017	4
	2018–2020	7
	2021–2024	11
Total	4	25

Table 1. *Cont.*

Criteria for Selection	Document Category	Number of Documents
Authors		
	Academia	17
	Private sector	3
	Civil society	5
	Politics	0
Total	4	25
Geographical		
	Sub-Saharan Africa	10
	Asia	7
	Latin America	4
	EU and USA	4
Total	4	25
Research design		
	Empirical/experimental	18
	Theoretical/conceptual	7
Total	2	25
Thematic		
	Inclusion models	8
	Barriers and enablers	6
	Digitalization and tech	6
	Finance and infrastructure	5
Total	4	25
Area of use		
	Rural	12
	Urban	3
	Not specified	10
Total	25	

Source: Author (2025).

As shown in **Table 1**, 25 research papers, mostly from 2021–2025, but published between 2008 and 2025, were examined in the review. With some assistance from the commercial sector and civil society, academics wrote most of the studies. Sub-Saharan Africa and Asia were the main subjects of primarily empirical research. Digitalization, infrastructure, impediments, and inclusion models were among the major themes, and most of the research was conducted in rural areas.

As shown in **Table 2**, the years of publication range from early studies like Vorley et al. (2008) to more recent studies like Choruma et al. (2024). Growing interest in this field is indicated by the considerable concentration of research papers published between 2020 and 2023. Academic researchers from a wide range of geographical and thematic contexts are well represented among the authors, which include both individual and institutional contributors. **Table 2** shows an overview of the works that were part of the systematic review (2008–2025).

Table 2. List of reviewed research with the years of publication.

No.	First Author	Year	Title	Journal
1	Agyekumhene et al. [12]	2020	Making Smallholder Value Chain Partnerships Inclusive	Sustainability
2	Bitzer et al. [18]	2010	Partnering to Facilitate Smallholder Inclusion in Value Chains	Routledge (Book Chapter)
3	Bontsa et al. [34]	2023	Utilisation of Digital Technologies by Smallholder Farmers in South Africa	South African Journal of Agricultural Extension

Table 2. *Cont.*

No.	First Author	Year	Title	Journal
4	Changalima and Ismail [16]	2022	Agriculture Supply Chain Challenges and Smallholder Maize Farmers' Participation	Tanzania Journal of Agricultural Sciences
5	Choruma et al. [35]	2024	Digitalisation in Agriculture: A Scoping Review	Journal of Agriculture and Food Research
6	das Nair and Landani [9]	2020	Making Agricultural Value Chains More Inclusive through Technology and Innovation	WIDER Working Paper
7	de Brauw and Swinnen and Kuijpers [36]	2019	Building Inclusive Value Chains for Smallholders: Role of Finance	Elgaronline – Economics
8	Devaux et al. [37]	2018	Agricultural Innovation and Inclusive Value-Chain Development: A Review	Journal of Agribusiness in Developing and Emerging Economies
9	Diwakar and Roberts [15]	2023	Factors Affecting Smallholder Participation in Modern Supply Chains	Asia Pacific Journal of Marketing and Logistics
10	Fernandez-Stark et al. [38]	2012	Inclusion of SMEs in High-Value Agro-Food Value Chains	Technical Report – *Center on* Globalisation, Governance & Competitiveness
11	Hasan and Habib [13]	2023	The Role of Smallholder Farmers in Creating Sustainable Agricultural Supply Chains	International Supply Chain Technology Journal
12	International Finance Corp. [4]	2023	Working with Smallholders: A Handbook for Firms Building Sustainable Supply Chains	World Bank Publications
13	Ismail [8]	2021	From a Loser to a Winner: Collective Marketing in Tanzania	Tanzania Journal of Agricultural Sciences
14	Kapari et al. [1]	2023	Contribution of Smallholder Farmers to Food Security	Frontiers in Sustainable Food Systems
15	Kolavalli et al. [39]	2015	Agricultural Value Chain Development in Practice: Private Sector-Led Smallholder Development	IFPRI Discussion Paper
16	Luh [40]	2020	Inclusiveness of Contract Farming along the Modern Food Supply Chain	Agriculture
17	Melese [41]	2012	Contract Farming: Models that Maximise Smallholder Inclusion	Uniform Law Review
18	Mtombeni et al. [42]	2019	Infrastructure and Inputs as Barriers for Emerging Farmers	Competition Commission SA Working Paper
19	Ndlovu et al. [3]	2021	Factors Influencing Vegetable Value Chain Participation	Land Use Policy
20	Poku et al. [43]	2018	Contract Farming Arrangements in Cassava Outgrower Schemes in Ghan	Sustainability
21	Quayson et al. [5]	2021	Technology for Social Good: Smallholder Perspectives	IEEE Transactions on Engineering Management
22	Sjauw-Koen-Fa et al. [44]	2016	Critical Success Factors for Smallholder Inclusion	International Food and Agribusiness Management Review
23	Smidt and Jokonya [45]	2022	Factors Affecting Digital Technology Adoption by Small-Scale Farmers	Information Technology for Development
24	Vorley et al. [17]	2008	Business Models that are Inclusive of Small Farmers	FAO/UNIDO/IFAD Global Agro-Industries Forum Paper

Table 2. *Cont.*

No.	First Author	Year	Title	Journal
25	Vos and Cattaneo [19]	2020	Smallholders and Rural People: Making Food System Value Chains Inclusive	Global Food Policy Report – IFPRI

Source: Author (2025).

3.3.1. Inclusion and Exclusion Criteria

Table 3 contains a detailed description of the inclusion and exclusion criteria used in the review. The relevance, caliber, and focus of the chosen research on smallholder farmers' involvement in value chains in developing and emerging nations were guaranteed by these standards.

The review process followed the PRISMA 2020 guidelines. As shown in **Figure 2**, the initial search identified 812 records from databases including Scopus, Web of Science, ScienceDirect, SpringerLink, and Google Scholar. After removing 176 duplicates, 636 records remained. Titles and abstracts were screened, and 488 records were excluded at this stage. A total of 148 full-text articles were assessed for eligibility, of which 123 were excluded due to reasons such as lack of methodological rigor, limited relevance, or duplication. 25 peer-reviewed journal articles and institutional reports were included in the qualitative meta-synthesis.

3.3.2. Data Extraction and Clustering

Relevant data was extracted from the selected studies using qualitative coding techniques. The information was categorized based on key models of smallholder inclusion (e.g., contract farming, cooperatives, out grower schemes), barriers to integration (e.g., limited access to finance, infrastructure deficits, low digital literacy), and enabling factors that support participation in agricultural value chains (e.g., institutional support, digital technologies, access to markets).

3.3.3. Synthesis and Qualitative Meta-Synthesis

A wide range of published sources and methodological approaches support the review's soundness. A summary of the examined journals, their publishers, and the quantity of cited articles is provided in **Table 4**.

3.3.4. Process Monitoring and Quality Assessment

A multi-stage quality assurance procedure was applied to this systematic literature review to ensure its methodological robustness and coherence. The intercoder agreement rate was 88% after two independent reviewers thematically coded a subset of ten publications, selected for intercoder reliability assessment. The reliability of the thematic synthesis was enhanced by this process, which also ensured that all parties grasped key concepts. Throughout the review process, Mendeley was used to track full-text access, manage references, and cluster topics. The research was separated into four subject themes: enabling mechanisms, integration barriers, smallholder inclusion models, and the implications of the results for social and economic development. This classification was based on how frequently themes appeared, how well they applied to inclusion frameworks, and how well they fit into the literature on rural development and inclusive value chain theories. To ensure methodological rigor, the Critical Appraisal Skills Programme (CASP) checklist was used to assess the quality of both qualitative and mixed-method studies, while also providing adaptable criteria for experimental and empirical studies. CASP was selected because it allows for the evaluation of clarity, methodological soundness, and transferability across diverse research designs. In addition, experimental and empirical studies were included in the review as they provide direct evidence of smallholder integration models in practice, thereby complementing conceptual and qualitative insights. This combination strengthens the robustness of the synthesis and ensures a balanced representation of both theoretical and applied perspectives. The models that are frequently used to incorporate smallholder farmers into lucrative value chains are examined in the next section.

Table 3. Criteria for selecting and excluding studies.

Criteria Type	Criteria Description
Inclusion Criteria	Studies focused on smallholder farmer participation or integration in value chains. Empirical or conceptual articles from peer-reviewed journals or recognized institutional reports. Articles published in English between 2008 and 2024. Research focused on developing emerging economies.
Exclusion Criteria	Articles focusing exclusively on commercial farming or supply chains without reference to smallholders. Opinion pieces, dissertations, or editorials without analytical depth. Non-English publications. Duplicates or inaccessible full texts.

Source: Author (2025).

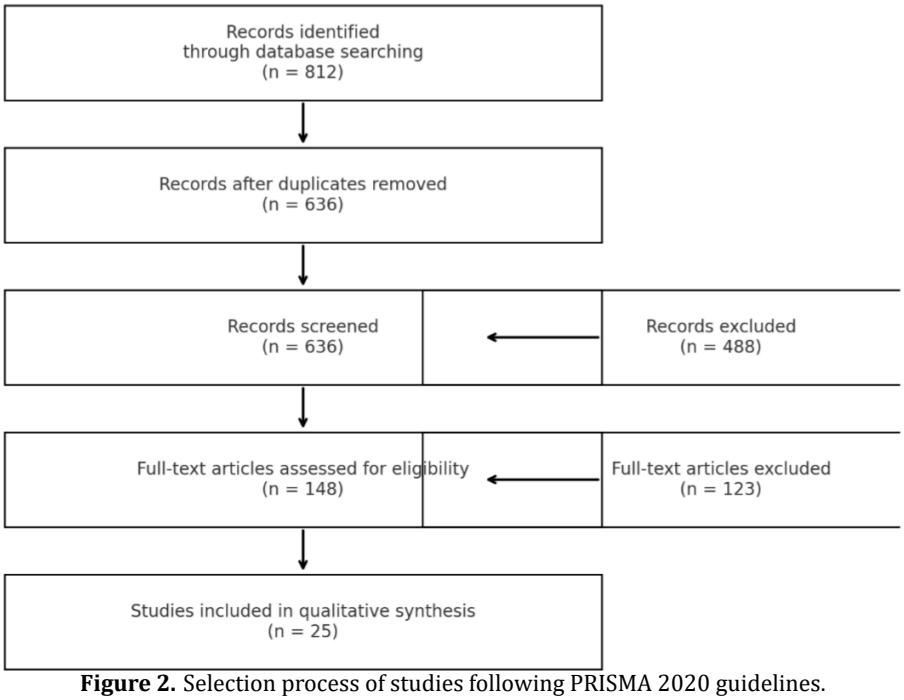

Figure 2. Selection process of studies following PRISMA 2020 guidelines.

Source: Author (2025).

Table 4. List of journals reviewed, along with their publishers and quantities.

Journal	Publisher	Quantity
Sustainability	MDPI	2
Value Chains, Social Inclusion and Economic Development	Routledge	1
South African Journal of Agricultural Extension	South African Society for Agricultural Extension	1
Tanzania Journal of Agricultural Sciences	Tanzania Agricultural Research Institute	2
Journal of Agriculture and Food Research	Elsevier	1
WIDER Working Paper	UNU-WIDER	1
Elgaronline – Economics	Edward Elgar Publishing	1
Journal of Agribusiness in Developing and Emerging Economies	Emerald Publishing	1
Asia Pacific Journal of Marketing and Logistics	Emerald Publishing	1
Technical Report – Center on Globalization	Duke University – CGGC	1
International Supply Chain Technology Journal	ISCTJ	1
World Bank Publications	World Bank	1
Land Use Policy	Elsevier	1
Frontiers in Sustainable Food Systems	Frontiers Media SA	1
IFPRI Discussion Paper	IFPRI	1
Agriculture	MDPI	1
Uniform Law Review	Oxford University Press	1
Working Paper – Competition Commission SA	Competition Commission South Africa	1

Table 4. *Cont.*

Journal	Publisher	Quantity
IEEE Transactions on Engineering Management	IEEE	1
International Food and Agribusiness Management Review	IFAMA	1
Information Technology for Development	Taylor & Francis	1
FAO/UNIDO/IFAD Conference Paper	FAO/UNIDO/IFAD	1
Global Food Policy Report	IFPRI	1

Source: Author (2025).

3.4. Models for Integrating Smallholder Farmers into High-Value Agricultural Supply Chains

3.4.1. Contract Farming

Melese[41] reported that contract farming enhances the inclusion of, and benefits derived by smallholder farmers from the value chain. In support of Melesse[41], Devaux et al.[37] posited that contract-farming arrangements facilitate inclusive value-chain development. Through contract farming, smallholder farmers can gain reliable access to markets, receive support in the form of inputs and technical advice and increase their capacity to meet quality and quantity standards required in high-value markets. However, Luh[40] study found that contracting firms in Taiwan prefer large-scale growers to small-scale. These findings underscore a perpetuating inclusion challenge of smallholder farmers from high-value agriculture food supply chains. Large-scale farmers can take advantage of economies of scale, are positioned to better comply with quality and safety standards of high-value supply chains and have better risk management than smallholder farmers, hence are better preferred. In line with Luh[40] , most recent research conducted by Msomi and Zenda[46] found that 59.4% smallholder crop farmers in the Gauteng province of South Africa lack access to contracts from lucrative markets. This limitation not only hinders smallholder farmers' income potential but highlights their exclusion from profitable agri-food value chains. With limited access to profitable agri-food value chains, smallholder farmers remain marginalized from high value chains and may not benefit from benefit from stable market relationships, prices and long-term investment opportunities. Thus, smallholder farmers not only need access to contracts, but access to lucrative contracts for effective integration into high value supply chains.

3.4.2. Outgrower Schemes

Like contract farming, Fernandez-Stark et al.[38] argue that outgrower schemes facilitate the inclusion of small producers in high-value agriculture chains. The authors argue that producers who are smallholder farmers enjoy benefits including guaranteed access to markets, lower risk and access to resources to ensure quality production[38] . These benefits help overcome the barriers to inclusion in high-value supply chains identified by Vos and Cattaneo (2020) as limited access to resources and inability to scale operations to meet the requirements of high value supply chains. However, a study conducted by Poku et al.[43] emphasize that the capacity and commitment of firms to design contracts that include embedded support services is crucial for enabling smallholder farmers' participation in outgrower schemes. This suggests that the integration of smallholder farmers into supply chains using outgrower schemes is more than just access to the schemes, but the value and quality of the schemes. It also suggests that outgrower schemes without tangible benefits for smallholder farmers may fail to mitigate the challenge of inclusion for smallholder farmers and reinforce existing inequalities between large-scale and smallholder farmers.

3.4.3. Farmer Cooperatives

Fernandez-Stark et al.[38] identified cooperatives as a model that facilitates the inclusion of small producers in high-value agriculture chains. Consistent with Fernandez-Stark et al.[38] , Sjauw-Koen-Fa et al.[44] posited that enacting and empowering producer organizations improves the inclusion of smallholder farmers in high-adding supply chains. Ghanayem and Mohd Nor[47] mention that farmer cooperatives can improve access to technical expertise and market information. By establishing cooperatives, small holder farmers can improve their bargaining power with buyers and suppliers,

improve their access to resources and inputs and meet the quality and quantity requirements of high-value markets. As such, cooperatives help smallholder farmers overcome structural barriers such as poor productivity and market access, and limited production scale. This in turn enhances their inclusion in competitive, high-value agriculture supply chains. Research conducted by Christian et al.[48] found that cooperatives enhance smallholder farmers' participation in agri-food value chains, supporting earlier findings by Fernandez-Stark et al.[39] and Sjauw-Koen-Fa et al.[44]. However, Christian et al.[48] research underscored the significance of quality, quantity, level of education and access to information in boosting the level of participation. These findings imply that cooperative membership does not guarantee the successful participation of smallholder farmers in sustainable agri-food chains. Factors such as level of education and access to information significantly mediate the relationship between cooperative membership and participation in sustainable agri-food chains as established by Christian et al.[48]. As such, while cooperatives provide a platform for smallholder farmers' inclusion in agri-food value chains, their successful participation depends on the establishment of various support systems. Hence, Christian et al.[48] recommended a blended financing model to support smallholder farmers with no access to collateral, and advisory services to address the training needs of smallholder farmers. The following section explores the obstacles and facilitators that affect smallholder involvement in agricultural value chains, providing a more thorough understanding of the dynamics at work.

3.5. Enablers and Barriers to Smallholder Farmer Integration in Agricultural Value Chains

3.5.1. Access to Finance and Input

Improving accessibility and affordability in rural financing to improve smallholder farmers' investments increases their inclusion in high value-adding supply chains[44] . This means that smallholder farmers' access to credit and loans can facilitate investment in good quality inputs, improve their risk management and capacity to meet the quality and volume of high value supply chains. This is supported by Fernandez-Stark et al.[38] who argue that integration into the value chain demands investments in infrastructure, equipment and relevant certification. Confronted with lack of collateral to obtain funding and high interest rates, the capability of smallholder farmers to operate in high value supply chains is reduced significantly. A recent study by de Brauw and Swinnen[49] emphasized that access to finance reduces lack of investment capital and risks associated with trying new types of production. Thus, it is evident that access to capital increases smallholder farmers' visibility to businesses operating in high value supply chains and thus improves their integration.

3.5.2. Infrastructure and Logistics

Infrastructure development, advancements in agriculture research and education and enactment of policies increase the inclusion of small-scale farmers[17] . This corresponds to Vos and Cattaneo[19] assertion that poor infrastructure and skills limit the development of supply chains in low-income African countries. This suggests that transport inefficiencies, lack of storage facilities, poor availability of electricity and communication networks hinder the development of supply chains in low-income African countries. Mtombeni et al.[42] reported that emerging farmers in South Africa have limited access to land, water, logistics and agricultural machinery. Limited access to resources and logistics can limit smallholder farmers from meeting the requirements for value supply chains.

3.5.3. Digital Literacy and Technology Adoption

Vorley et al.[17] identified skills development as an important step in the inclusion of small-scale farmers. The authors argue that skills development enhances farmers' reliability as both suppliers and partners[17]. Commenting on digital technologies, Choruma et al.[35] posited that digital technologies can potentially transform smallholder farmers in sub-Saharan Africa. Choruma et al.[35] is aligned with Smidt and Jokonya[45] who argue that digital technologies help eliminate barriers to participation in agriculture value chains for smallholder farmers. Through digital technologies, smallholder farmers can access market information including

e-commerce platforms, e-learning platforms, farmer networks and digital banking. This allows smallholder farmers, especially those in marginalized areas, to overcome barriers such as geographic isolation, information asymmetry and weak bargaining power. However, Smidt and Jokonya [45] argue that there are significant challenges to the adoption of digital technologies by small-scale farmers. On a similar notion, Choruma et al. [35] identified poor connectivity and digital literacy as critical barriers to the extensive adoption of digital technologies smallholder farmers in Sub-Saharan Africa. In addition, Bontsa et al. [34] identified end-user, service provider and digital technology characteristics as limitations to the adoption of digital technologies by smallholder farmers in South Africa. Thus, it is essential to develop frameworks, advance policies and heighten digital technologies support for smallholder farmers to facilitate effective integration in agriculture supply chains. In support, Olawuyi et al. [50] recommended prioritizing digital platforms to improve smallholder farmers' access to timely information. However, Bontsa et al. [34] argue that smallholder farmers utilize low-tech digital technologies which they are more familiar with, to limit the challenges to adoption. Key findings from the study are discussed in the next section.

4. Discussion of Results

The two main goals of this systematic review were to (1) identify the models used to integrate smallholder farmers into sustainable agricultural value chains and (2) identify obstacles and possibilities on inclusive agriculture supply chains. The study found that different smallholder integration models exist, such as farmer cooperatives, out-grower programs, and contract farming, each of which has special advantages for connecting small farmers with markets. Out-grower programs and contract farming give smallholders consistent access to markets as well as frequent input or technical assistance [51] . Farmers' ability to achieve quality requirements and lower their market risks can both be improved by these agreements. Therefore, if businesses believe that South African farmers with little land and resources are unproductive, they may be left out of contract agreements. This emphasizes how important it is for farmer associations and public policy to support inclusive contract conditions that consider the reality faced by smallholder farmers in rural areas. However, by combining resources and organizing sales, cooperatives empower farmers through group action [52] . In high-value chains, smallholders can become more competitive by obtaining access to inputs, improving their negotiating power, and achieving economies of scale [53] . Thus, cooperatives in South Africa, which provide shared logistics, input access, and a collective voice, can be a lifeline for farmers in remote rural regions. But to overcome management and financial constraints and create successful cooperatives, strong local leadership and outside assistance are needed. However, every model, though, has its limitations. Evidence from Taiwan, for instance, indicates that contracting companies frequently favour large-scale producers over smallholders, highlighting the difficulty of including the smallest farmers [40] . Similar to this, out grower schemes only work if businesses are dedicated to offering embedded support services; in the absence of observable advantages, they might not adequately involve smallholders and might even exacerbate inequality [54]. Although cooperatives help overcome scale constraints, their effectiveness can be hindered by managerial inefficiencies and limited access to funding.

The analysis of the study found barriers and enablers that are common across all models mentioned above. One recurrent feature was found to be access to financing. Smallholders can more easily invest in their farms and satisfy the formal supply chains' quality or volume requirements when they can access reasonably priced loans and high-quality input [55] . Their ability to engage in profitable marketplaces, on the other hand, is severely limited by a lack of cash or high borrowing costs [56] . The study has shown that both logistics and infrastructure were crucial. Weak extension services, inadequate storage, erratic electricity, and bad rural roads all make it difficult for smallholders to integrate into the market [57] . For example, it is hard for many young farmers in South Africa to regularly supply commercial value chains because they lack access to land, water, and equipment [58] .

The results demonstrate that access to information and technology are important factors. Smallholder farmers find better prices and connect with buyers by overcoming information asymmetries and geographic isolation with the aid of digital tools like digital finance, e-extension, and mobile market platforms. However, issues including inadequate connectivity and limited digital literacy that are not suited to the needs of small farmers continue to hinder the adoption of sophisticated technologies [35] . Thus, the results show that boosting these crucial support areas (financial, infrastructure, and technology) is just as important for the successful integration of smallholder farmers as implementing inclusion methods. For smallholder integration to undergo a revolutionary change, isolated models must give way to multi-stakeholder, context-specific approaches that bridge technological, financial, and structural divides. For agricultural value chains to be robust and inclusive, innovation, institutional support, and farmer-driven cooperation will be essential. The following section expands on these findings by putting forth a hybrid model, recognizing that no one strategy works in every situation and that integrating components from different models could improve smallholder inclusion.

4.1. A Hybrid Model for Smallholder Participation

This study makes it very evident that there is no one-size-fits-all inclusion methodology. Therefore, the best results for integrating smallholder farmers may come from a hybrid strategy that incorporates aspects of several models. Every model under consideration has unique benefits, for instance, cooperatives provide economies of scale and collective strength [59] ; contract farming provides guaranteed markets and technical assistance [60] ; and out-grower plans frequently package inputs and ensure purchasing, thus reducing farmers' risks. Rather than being mutually exclusive, these characteristics enhance one another. A hybrid integration paradigm that capitalizes on the advantages of all three is suggested by this study. One way to achieve size and negotiating power while engaging in contractual agreements with larger agribusinesses or merchants is for smallholders to band together and form cooperatives or clusters to share access to inputs, training, and storage facilities. Such group contracts would give farmers a price guarantee and steady market access, along with embedded services like buyer-provided quality inputs or extension advice that are frequently included in contract farming agreements. In addition, the cooperative structure guarantees that farmers exchange information, lower their individual expenses (for marketing, transportation, etc.), and negotiate as a single entity.

Because smallholders may approximate the volume and consistency of larger farms by working together, this type of synergy can assist buyers overcome the prejudice of only choosing large-scale suppliers. To replicate the efficiency of large farms, recent research from Malawi specifically suggests a hybrid model that combines aspects of contract farming, cooperative development, and even land consolidation [61] . Coordination of production plans and schedules among members allows smallholders to supply buyers collectively, operating like a single large farm while still retaining individual ownership. This approach can be seen as a form of land consolidation without formal land merging.

Digital tools and platforms should be incorporated into the design of a contemporary hybrid model. Digital coordination can improve the contract partnership (e.g., through traceability systems or mobile payment for produce) and streamline the cooperative's internal management (e.g., aggregating produce, disclosing market information) [62] . Research has shown that by filling in knowledge gaps and linking distant farmers to markets and services, digital technology can revolutionize smallholder participation [35] . Therefore, a digital cooperative contract farming model might be the best hybrid model in South Africa. In this model, farmers establish a producer company or association, use a digital platform to link markets and coordinate, and enter contracts with buyers who may also use the platform to offer technical assistance or input loans.

Several theories support the proposed hybrid paradigm for smallholder involvement. Transaction cost economics [63] demonstrates that contracts and group arrangements mitigate the significant costs and hazards encountered by smallholders in market access. Social capital theory [64] elucidates the role of trust and

networks within cooperatives in fostering collective action, knowledge dissemination, and resilience. Contract Farming theory emphasizes the advantages of assured markets, inputs, and technical assistance, while communal frameworks mitigate power imbalances[60] . Innovation Diffusion Theory[65] backs the use of digital platforms, which make it easier to work together, make things clearer, and provide people with better access to markets. These frameworks show that the hybrid method is the best way to deal with smallholder problems since it uses the best parts of contracts, cooperatives, and digital tools.

The hybrid model would mitigate individual disadvantages while combining the advantages of all inclusion methods, including the guaranteed market and support from contracts, the scale and shared resources from collaboration, and the efficiency and reach of technology. For instance, if one farmer finds it difficult to meet quality standards, the cooperative can redistribute resources or offer peer support to ensure that the collective contract is met and that no single small plot failure puts the market relationship at risk. Members are encouraged to invest in quality enhancements because they know their produce will be sold, and the buyer's contract guarantees the cooperative a guaranteed outlet. The theory of collective action, which holds that farmers benefit more in the long run from working together than from working alone, is consistent with this hybrid. It is a realistic model for smallholders in South Africa, who frequently face resource limitations. Through deliberate collaboration and teamwork, farmers can gain access to high-value chains that would be impossible for them to do on their own. The next section provides the theoretical contribution of this study.

4.2. Theoretical Contribution

The theoretical knowledge of smallholder supply chain integration and inclusive agri-entrepreneurship is advanced in a few ways by this study. The results provide a conceptually comprehensive understanding of smallholder inclusion. One contribution consists of identifying the various interconnected institutional, technological, and structural elements that support successful integration. This synthesis equally emphasizes the roles of technological innovation (digital inclusion) and social/institutional arrangements (farmer organizations, partnerships) as crucial enablers. Previous works on inclusive value chains commonly focused on economic and structural factors (e.g. farm size, market structure). This study thereby connects the literature on innovation uptake, rural development, and supply chain management into a broader framework. The study offers a more comprehensive theoretical perspective on smallholder inclusion by presenting the "conceptual connections" that connect various categories. The results, for example, confirm the applicability of collective action theory in contemporary agricultural value chains. In line with Ostrom's ideas that cooperation produces benefits for both parties, farmer cooperatives are a prime example of how group organizations may overcome market failures and empower marginalized farmers. This study builds on concepts of inclusive value-chain growth by taking into account the growing impact of digital technologies. Although previous frameworks[38] concentrated on institutional models such as co-ops or contracts, our research shows that digital connection is a game-changer that should be included in theoretical models of inclusion. This study suggests that theories of smallholder integration should adapt to incorporate viewpoints from the digital ecosystem, highlighting the potential of digital platforms as a new kind of intermediary or support mechanism.

Another theoretical takeaway from this work is the focus on business model hybridization for inclusiveness. Since successful inclusion frequently entails hybrid arrangements (multi-stakeholder partnerships, public-private collaborations, farmer companies, etc.), traditional theory may examine contract farming or cooperatives separately, but this study shows that the lines between these models are becoming increasingly blurred in practice. This leads to a change in theory, wherein several actors (farmers, businesses, NGOs, the government, and technology providers) create a network to support smallholders. This is seen through the lenses of network theory and hybrid business models. Therefore, by going beyond one-factor explanations and offering a modern, multifaceted understanding of inclusive agri-entrepreneurship, this study advances the-

ory. It establishes a theoretical framework upon which other scholars might construct models or frameworks that more accurately depict the intricacy of incorporating small farmers into contemporary supply chains. In the end, this enhanced theoretical viewpoint facilitates more fruitful academic research and the creation of policies targeted toward smallholder development. The next section provides lessons for smallholder farmers in South Africa.

4.3. Lessons for Smallholder Farmers in South Africa

There are several lessons for smallholder farmers in South Africa who want to improve their integration into agricultural value chains. Associations, farm production clusters, or cooperatives are good places for smallholder farmers to join. Farmers in South Africa can negotiate better prices and contracts by combining their resources and working together to produce enough to meet the demands of big buyers. Collective action provides shared resources (e.g., jointly owned equipment or storage) and increases farmers' negotiating power with markets and input suppliers. Smallholder farmers can receive supportive services and steady market outlets by participating in out-government programs or contract farming. Thus, smallholder farmers should look for alliances with respectable processors, retailers, or agribusinesses that provide equitable contracts that include credit, training, or input provision. These contracts can boost farm revenue and lessen market volatility, but farmers must make sure they understand the terms and have options in case purchasers break their promises. Smallholders can fortify their position and guarantee that contracts meet their needs by organizing them to enter contracts. However, regarding cooperatives, alliances and associations, smallholder farmers should consider their quality, governance and information due to their success being relative. For instance, poor management, lack of trust among cooperative members, lack of transparency, inequalities and poor capacity-building initiatives can influence smallholder farmers' level of participation and benefit from the supply chain. As such, smallholder farmers should look beyond their involvement with farmer cooperatives and associations as their success vary across several factors. The same applies to contracts, they should seek more favourable and inclusive contracts.

Smallholder farmers must adhere to delivery schedules and quality standards to thrive in high-value chains. To increase output and product quality, farmers should concentrate on enhancing agronomic techniques, possibly through extension and training initiatives. This includes better seed varieties, suitable post-harvest handling, and even obtaining the required certifications, if applicable for specific markets. Equally important is supply consistency; even very small producers can jointly guarantee year-round or adequate supply volumes by coordinating their production and cooperating with other farmers. Smallholder farmers are more desirable partners for supermarkets or exporters when their quality and supply are consistent. As such, they should leverage capacity-building interventions offered by the government or other farmer support organizations to improve their technical and management skills, and supply chain readiness.

For smallholder farmers, adopting technology and becoming digitally literate can change everything. Traditional hurdles can be removed using even basic instruments like mobile phones with market price apps, WhatsApp groups for farmer collaboration, or mobile money services. To learn better farming practices, connect with buyers outside of their local area, and obtain price information, South African farmers should make use of all available digital platforms, such as online marketplaces, e-extension services, and market information systems run by the government or non-profit organizations. It is advised to begin with readily available low-tech solutions (such as SMS-based notifications and basic mobile banking) due to the difficulties with connectivity and tech access in rural areas. With time, smallholder farmers will be able to access e-commerce and advanced agri-tech innovations that can further level the playing field by developing their digital skills, perhaps through training sessions led by extension officers or farm organizations. However, the persistent challenges of digital technologies and digital divide cannot be overlooked, especially concerning smallholder farmers who are often marginalized. Challenges such as

weak internet connectivity, limited access to digital infrastructure and innovation hubs, exorbitant data costs and poor digital literacy should be prioritized for effective adoption by digital technologies by smallholder farmers. Thus, collaborative efforts from the government, relevant service providers and stallholder farmers are essential to achieve digital inclusion. Efforts should go beyond providing digital infrastructure and ensure smallholder farmers have the capacity to effectively utilize digital technologies to bridge the gap between skills, access and sage divide.

Smallholder farmers should interact with larger support networks in addition to working together. To do this, they must keep in regular contact with agricultural extension agents, non-governmental organizations, or farm assistance programs that provide guidance, training, and market opportunities. Smallholder farmers can take advantage of subsidies or grants and pilot programs by keeping up with government programs or development initiatives targeted at smallholder inclusion. Another effective approach is peer learning; to keep getting better, smallholder farmers in South Africa might join farmer field schools or study successful farming techniques from exemplary farmers. Essentially, proactive knowledge and partnership-seeking can assist smallholders in adapting to and taking advantage of changing value chains. The limitations and future research directions are provided below.

5. Conclusion

This systematic review examined models for integrating smallholder farmers into sustainable agricultural value chains and identified key barriers and enablers of inclusion. The analysis shows that no single model, whether cooperative, contract farming or outgrower schemes, fully addresses the challenges faced by smallholders. Building on this, the study proposes a hybrid model that combines the collective strength of cooperatives, the stability of contractual arrangements, and the efficiency of digital platforms to enhance market access and resilience. Theoretically, the study extends inclusive value-chain and agri-entrepreneurship literature by integrating social, institutional, and digital perspectives into one framework. Practically, it emphasises the need for farmer collaboration, equitable partnerships, and digital inclusion as central pillars of sustainable integration.

Limitations and Future Research Directions

Even though this study provides insightful information, it has several shortcomings that indicate crucial areas for further investigation. The fact that this study is based on widely accessible published literature raises the possibility of publication bias because successful integration examples are more likely to be reported than unsuccessful ones. To present a more balanced perspective, future studies should include unpublished data and gray literature. With more case studies focused on nations and value chains, there is a geographical and thematic imbalance that restricts generalizability. Comparative studies between different commodities and geographical areas, such as South Asia, Latin America, and Sub-Saharan Africa, might be useful in determining context-specific success factors. Causal inference on long-term effects is limited by the mostly qualitative character of current research. Longitudinal studies that monitor smallholder households over time are required to evaluate shifts in resilience, production, and income. More research should examine how inclusion models impact women and young farmers, considering their unique needs and limitations, as gender and youth perspectives are understudied. Digital technologies are often mentioned, but it is still unclear how effective they are in fostering inclusion. Future studies should evaluate the effects of platforms such as blockchain, ICT-based services, and mobile apps in environments with limited resources. Not enough attention is paid to the institutional and policy frameworks that facilitate successful integration. The ways in which trade policy, infrastructure development, and government activities help or impede inclusive value chains should be the subject of future research.

Future research should consider the role of mediating factors between the proposed models and the integration of smallholder farmers into high-value agricultural supply chains. Future research should consider the

strategies for the effective implementation of the proposed models for the integration of smallholder farmers into high-value agricultural supply chains, taking into consideration diverse contextual factors. For instance, future research can consider the influence of policy frameworks and regulations, market conditions, infrastructure and training and development interventions on the effective implementation of the integration models. Future research should consider the applicability of the proposed models in diverse locations, for example, marginalized and urban locations. This allows for an analysis of context-specific challenges and enablers of the proposed integration models, and their adaptability across diverse socio-economic and geographic contexts. Closing these gaps will help develop evidence-based, inclusive smallholder integration solutions.

Author Contributions

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